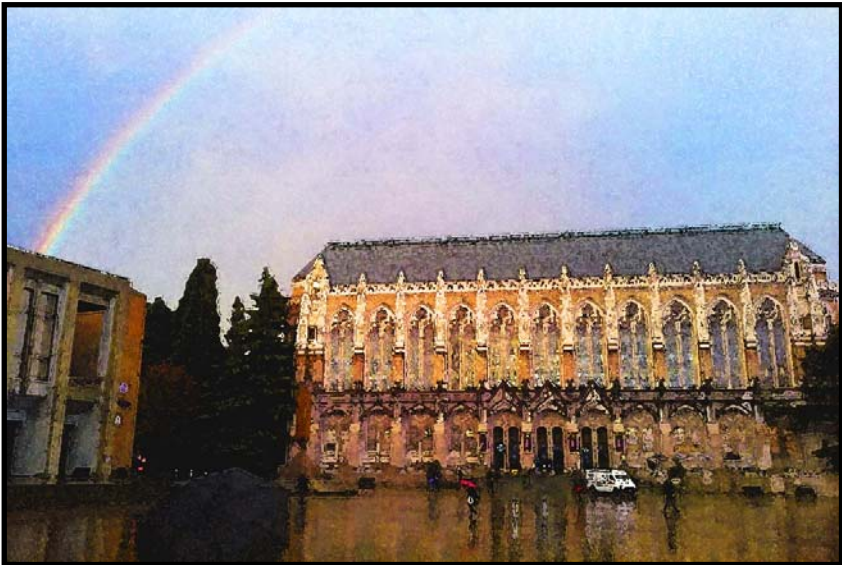


The McNair Scholars Journal  
*of the University of Washington*



Volume XV  
Summer 2016

THE MCNAIR SCHOLARS JOURNAL  
*University of Washington*

McNair Program  
Office of Minority Affairs & Diversity  
University of Washington  
171 Mary Gates Hall  
Box 352803  
Seattle, WA 98195-2803  
uwmcnair@uw.edu  
<http://depts.washington.edu/uwmcnair/>



The Ronald E. McNair Postbaccalaureate Achievement Program operates as a part of TRiO Programs, which are funded by the U.S. Department of Education.

Cover Photo by Mark Bennett, UW McNair Scholar  
Edited by Wei Zuo, 2014—2015 Graduate Student Advisor

*Program Director*  
Gabriel Gallardo, Ph.D.

*Associate Director*  
Todd Sperry, Ph.D.

*Graduate Student Advisors*  
Cyndi Lopez  
Cynthia Simekha

*McNair Scholars' Research Mentors*  
Dr. Jude Apple, Western Washington University  
Dr. Sara Billey, Mathematics  
Dr. Rick Bonus, American Ethnic Studies  
Dr. Veronica Distilio, Biology  
Dr. Maria Elena Garcia, Comparative History of Ideas  
Dr. Angelina Godoy, Law, Societies & Justice  
Dr. Julia Herschensohn, Linguistics  
Dr. Jerald Herting, Sociology  
Dr. Benjamin Kerr, Biology  
Dr. Hedwig Lee, Sociology  
Dr. Kate McLaughlin, Psychology  
Dr. Jan Newton, Environmental & Information Systems  
Dr. Yuichi Shoda, Psychology  
Dr. Joe Smith, Global Health  
Dr. Stewart Tolnay, Sociology  
Dr. Lori Zoellner, Psychology

Volume XVI  
Copyright 2016

From the  
**Vice President and Vice Provost for Diversity**

One of the great delights of higher education is that it provides young scholars an opportunity to pursue research in a field that interests and engages them. The McNair Scholars Program offers support and opportunity for students to pursue scholarly research, and The *McNair Scholars Journal* plays an important part in that support by publishing their results. The Office of Minority Affairs and Diversity is pleased to publish the fifteenth edition of *The McNair Scholars Journal* of the University of Washington.

The McNair Scholars Program offers opportunities to a diverse group of students—students who may not otherwise get the chance to work closely with a faculty mentor on in-depth research. The young scholars who participate in the McNair program are among the most motivated and dedicated undergraduates at the UW. Their hard work and accomplishments put them in a position to succeed in graduate school. The *McNair Scholars Journal* plays an important part in the career of these young scholars by publishing their research at an early stage.

Please join me in thanking the faculty, staff, and students who came together and made this journal possible.

Sheila Edwards Lange, Ph.D.

Vice President for Minority Affairs  
Vice Provost for Diversity

From the  
**Director**

I am very pleased to present the sixteenth edition of the University of Washington's *McNair Scholars Journal* to our reading audience. The collective excellence of these projects is a testament to the hard work of our students and the unwavering support of faculty mentors who supervised these projects. As always, I want to extend my gratitude to the faculty, whose guidance and support has allowed our students to grow in meaningful ways, while giving our scholars the foundation to enter graduate school with confidence and solid research experience.

The McNair Program at the University of Washington strives to create meaningful academic experiences that will enable our students to succeed at the next level. The research component for McNair Scholars has two specific goals: First, engage students in the research enterprise at the undergraduate level so they develop the analytical and methodological skills, academic sophistication, and confidence that will make them successful students in graduate school. Second, provide students a unique opportunity to publish their undergraduate research, so the scholars gain an early understanding of the critical role that publishing will play in their academic careers. In this respect, the McNair Journal is a key component in the preparation of our scholars for careers in research and teaching.

Our journal involves the work of several people who work behind the scenes proofreading, editing, and preparing the final draft for publication. I would like to extend my appreciation to the UW McNair staff, Dr. Todd Sperry, Associate Director, Nataly Brockwell, Program Coordinator, and our graduate student staff, Cyndi Lopez and Cynthia Simekha, for their commitment to the McNair mission and for bringing this project to completion. They are an asset to the program and have been instrumental in preparing this high quality journal.

On behalf of the entire McNair Staff, I sincerely hope that you enjoy reading the fifteenth edition of the *McNair Scholars Journal*.

Dr. Gabriel E. Gallardo  
Director, McNair Program  
Associate Vice President, Office of Minority Affairs

From the  
**Vice Provost and Dean of the Graduate School**

The disciplines, interests and pursuits that inspired the research papers within this journal are as diverse and impressive as the McNair Scholars who produced them. By reading these works, you will quickly see that our next generation of leaders and innovators is right here at the University of Washington.

As you know, the McNair Scholars Program supports traditionally underrepresented students in their undergraduate programs and prepares and encourages them to pursue graduate study. At the UW, we know that earning advanced degrees will propel these scholars into positions of influence within academic institutions, communities and businesses throughout our state, nation and world. For this reason, the UW Graduate School is honored to partner with the McNair Scholars Program and the Office of Minority Affairs & Diversity.

Clearly, these scholars already have the curiosity, intelligence and ambition that are essential to identifying emerging problems and finding innovative answers. Through graduate education, they will gain the additional experience, expertise and knowledge they will need for a lifetime of discovery and leadership.

Congratulations to the scholars whose work is published here and thank you to the faculty, staff and graduate student mentors who have contributed to this journal and to the success of the UW McNair Scholars Program. Your commitment has contributed to a legacy of outstanding scholars.

David L. Eaton  
Vice Provost and Dean of the Graduate School  
Professor, Environmental and Occupational Health Sciences

## **Journal Disclaimer**

While the McNair Program Staff has made every effort to assure a high degree of accuracy, rigor and quality in the content of this journal, the interpretations and conclusions found within each essay are those of the authors alone and not the McNair Program. Any errors or omission are strictly the responsibility of each author.

THE MCNAIR SCHOLARS JOURNAL

*of the University of Washington*

Volume XVI

Summer 2016

<b>Understanding Higman’s Conjecture via Induced Multiplication on Simple Graphs.....</b>	<b>1</b>
<i>Mark Bennett</i>	
<b>Student Advocacy in Mexican Rural Teacher Colleges.....</b>	<b>13</b>
<i>Elizabeth Castro</i>	
<b>Toxic Stress, Development, and Internalizing Disorders .....</b>	<b>65</b>
<i>Victoria Chambers</i>	
<b>Physical and Microbial Drivers of Oxygen Dynamics and Hypoxia in Bellingham Bay, WA.....</b>	<b>85</b>
<i>Natasha Christman</i>	
<b>The Relationship Between Trait Anxiety, Heart Rate, and Intrusive Memories.....</b>	<b>99</b>
<i>Martina Fruhbauerova</i>	
<b>Red State versus Blue State: “Who does Better for our Kids?” .....</b>	<b>119</b>
<i>Ferdose Idris</i>	
<b>The Benefit of Microbial Evolution Experiments and Why Some Like it Gradually Hot .....</b>	<b>151</b>
<i>Cierra Leon Guerrero</i>	
<b>Chronic Health Effects of Racial Discrimination: NLAAS data correlation analysis .....</b>	<b>169</b>
<i>Claudia Linares</i>	
<b>Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds? .....</b>	<b>185</b>
<i>Kenny Lino</i>	
<b>SHOTS FIRED! An Alternative Perspective for Mass Shootings in the United States.....</b>	<b>205</b>
<i>Ferdinand Orbino</i>	



**First-generation College Students and Adversity:  
Mechanisms of coping and sources of support compared to  
continuing-generation college students .....221**  
*Alicia Sawers*

**“All of this Belongs to Us:” Land, Horses, and  
Indigenous Resistance on the Yakama Indian  
Reservation, 1900-1950 ..... 241**  
*Jennifer Smith*

# Understanding Higman's Conjecture via Induced Multiplication on Simple Graphs

Mark Syd Bennett

## Abstract

*In 1960, Graham Higman postulated that the number of conjugacy classes of  $U_n(q)$ , the group consisting of all  $n \times n$  unitriangular matrices, is polynomial with respect to  $q$ . To this day, this conjecture has no definitive answer, with Higman's Conjecture being verified for  $n \leq 16$ . We use Higman's Conjecture as motivation and review facts from important papers on this conjecture and share our own investigations. Ultimately, we seek to better understand the structure of  $U_n(q)$ , as this will allow for better understanding of the corresponding conjugacy classes. When  $q = 2$ , we can identify simple graphs on  $n$  vertices with elements in  $U_n(2)$  and vice versa. Thus, the group  $U_n(2)$  is in one-to-one correspondence with simple graphs on  $n$  vertices. We induce a multiplication on these graphs. To do this, we define a binary operator on the set of all simple graphs on  $n$  vertices that is dependent on bijections between  $U_n(2)$  and the set of simple graphs on  $n$  vertices. This provides both a physical representation of elements in the group  $U_n(2)$  and makes the set of graphs on  $n$  vertices a group. In this paper, we consider the consequences of defining multiplication between simple graphs on  $n$  vertices by multiplication in  $U_n(2)$ . We investigate the conjugacy classes of the group of simple graphs on  $n$  vertices that we have constructed. For any fixed  $n$  and any simple graphs  $G = ([n], E_G)$  and  $H = ([n], E_H)$ , we work towards an explicit formula for  $G \cdot H = ([n], E_{G \cdot H})$  by producing multiplication tables for  $n \leq 3$ .*

## Introductory Remarks

Graham Higman was interested in enumerating  $p$ -groups when he postulated that the number of conjugacy classes of  $U_n(q)$  is polynomial with respect to  $q$ . If his conjecture were to be true, then he could produce a better upper bound on another result he was interested in. Over 50 years have passed, and no resolution to this conjecture has been produced.

In our study of combinatorics, we learned to ask "what else

does this count?" Finding alternate representations of what we are counting allows for more ways to understand. Denote the set of simple graphs on  $n$  vertices by  $\mathcal{G}_n$ . Recall that

$$\text{Eq. 1} \quad |\mathcal{U}_n(q)| = q^{\binom{n}{2}} = q^{\frac{n(n-1)}{2}},$$

and when  $q = 2$  this number coincides with  $|\mathcal{G}_n|$ . It is obvious, by comparison of adjacency matrices, that elements in  $\mathcal{U}_n(2)$  can be identified by elements in  $\mathcal{G}_n$ .

We wished to develop intuition with respect to conjugacy classes of  $\mathcal{U}_n(2)$  as a means of understanding conjugacy classes of  $\mathcal{U}_n(q)$  for arbitrary  $q$ . Having the ability to identify elements of  $\mathcal{U}_n(2)$  by graphs provides new information in the sense that we can view elements of  $\mathcal{U}_n(2)$ . To understand conjugacy in  $\mathcal{U}_n(2)$  in terms of elements in  $\mathcal{G}_n$  and justify our work, we must formally define some multiplication on  $\mathcal{G}_n$ . Thus, we sought out how multiplication in  $\mathcal{U}_n(2)$  can be viewed as multiplication on graphs.

*A Correspondence between Graphs and  $\mathcal{U}_n(2)$*

We now provide the bijection  $\Phi$  that we used for our work. Actually, this bijection is completely obvious when one compares unitriangular matrices to adjacency matrices. Fix a positive integer  $n$  and choose any  $M = [m_{ij}] \in \mathcal{U}_n(2)$ . Construct the adjacency matrix  $M'$  by

$$M' = [m'_{ij}], \text{ where } m'_{ij} = \begin{cases} m_{ij} & \text{if } i < j \\ 0 & \text{if } i = j \\ m_{ji} & \text{if } i > j \end{cases}.$$

Then let  $\Phi(E) = G$ , where  $G$  is the graph obtained from the adjacency matrix  $M'$ .

To show that  $\Phi$  is a bijection we produce the inverse. Choose any  $G \in \mathcal{G}_n$  and consider the adjacency matrix  $M_G = [m'_{ij}]$ . Then, construct a matrix  $M$  by

$$M = [m_{ij}], \text{ where } m_{ij} = \begin{cases} m'_{ij} & \text{if } i < j \\ 1 & \text{if } i = j \\ 0 & \text{if } i > j \end{cases}.$$

It follows that  $M$  is upper triangular and thus invertible. Since each of the diagonal entries are 1, and since, for  $i > j$ , the entry  $m'_{ij} = 0$ , we have that  $M \in \mathcal{U}_n(2)$ .

*Theoretical Justification for our Work*

We induce the following multiplication on  $\mathcal{G}_n$ . If given the

bijection  $\Psi: \mathcal{U}_n(2) \rightarrow \mathcal{G}_n$ , then we define the binary operation that follows. Let  $\cdot_\Psi: \mathcal{G}_n \times \mathcal{G}_n \rightarrow \mathcal{G}_n$  be such that, for any  $G, H \in \mathcal{G}_n$ ,

$$\text{Eq. 2} \quad \cdot_\Psi(G, H) = \Psi(\Psi^{-1}(G)\Psi^{-1}(H)).$$

We show that  $\mathcal{G}_n$  together with  $\cdot_\Psi$  forms a group. Let  $I$  be the  $n \times n$  identity matrix and put  $E = \Psi(I)$ . Then observe that, for all  $G \in \mathcal{G}_n$ ,

$$\text{Eq. 3} \quad \cdot_\Psi(E, G) = \cdot_\Psi(G, E) = \Psi(\Psi^{-1}(G)) = G.$$

Choose any  $G \in \mathcal{G}_n$ . Then  $\Psi(M) = G$  for some  $M \in \mathcal{U}_n(2)$ . Write  $\Psi^{-1}(M^{-1}) = W$  to see that

$$\text{Eq. 4} \quad \cdot_\Psi(W, G) = \cdot_\Psi(G, W) = E.$$

Finally, since

$$\text{Eq. 5} \quad \cdot_\Psi(A, \cdot_\Psi(B, C)) = \Psi(\Psi^{-1}(A)\Psi^{-1}(B)\Psi^{-1}(C)),$$

we have that

$$\text{Eq. 6} \quad \cdot_\Psi(A, \cdot_\Psi(B, C)) = \cdot_\Psi(\cdot_\Psi(A, B), C).$$

We have shown that  $\mathcal{G}_n$  together with  $\cdot_\Psi$  forms a group.

We shall call  $\cdot_\Psi$  the  $\Psi$ -induced multiplication on  $\mathcal{G}_n$  by multiplication in  $\mathcal{U}_n(2)$ . As is done with any multiplication, we write  $G \cdot_\Psi H$  in place of  $\cdot_\Psi(G, H)$ , for any  $G, H \in \mathcal{G}_n$ , to simplify our notation.

## Literature Review

Higman conjectured that, given the data acquired for small  $n$ , the number of conjugacy classes of a  $p$ -syllow subgroup of the General Linear Group of degree  $n$  over  $\mathbb{F}_q$  is polynomial with respect to  $q$  [Hig]. Since  $\mathcal{U}_n(2)$  is a  $p$ -syllow subgroup of the General Linear Group of degree  $n$  over  $\mathbb{F}_q$ , Graham Higman's conjecture is equivalent to the following statement.

*For any  $n \in \mathbb{N}$ , the number of conjugacy classes of  $\mathcal{U}_n(2)$ ,  $k(\mathcal{U}_n(q))$ , is polynomial with respect to  $q$ .*

This is how Higman's Conjecture is typically stated in contemporary literature. It should also be noted that, in general,  $k$  is a function of  $n$  and  $q$  that enumerates the number of conjugacy classes, however the conjecture is concerned with the behavior of  $k$  as  $n$  is fixed.

Computing the number of conjugacy classes can become very complicated very quickly. Higman proved that the conjecture was valid for  $n \leq 5$  [PS]. Gudivok et al. extended this number to 8 [Gud]. Arregi and Vera-Lopez found that the conjecture is valid for  $n \leq 13$  [VA]. Pak and Soffer used an indirect enumeration technique to verify

Higman's Conjecture for  $n \leq 16$  [PS].

There are people that believe Higman's Conjecture is false. For example, Halasi and Palfy show that for certain subgroups of  $\mathcal{U}_n(q)$  the number of conjugacy classes is not polynomial. Pak and Soffer, showed that  $k(\mathcal{U}_n(q))$  can be computed in terms of these subgroups. So, Pak and Soffer conjectured that Higman's Conjecture fails for  $n \geq 59$  [Conjecture 1.6, PS].

*Literature on  $\mathcal{U}_n(2)$  and Operations Induced on Graphs via Operations on  $\mathcal{U}_n(q)$*

It was suggested that we look for literature that relates to our work in  $\mathcal{U}_n(2)$ . We found *On-Line Encyclopedia of Integer Sequences* (OEIS) to be a useful resource in that regard. The numbers  $\{k(\mathcal{U}_n(2))\}$  for  $n \in \mathbb{N}$  form an integer sequence. We found literature pertaining to this sequence while on the OEIS website. According to OEIS, the sequence  $\{k(\mathcal{U}_n(2))\}$  is called the Generalized Euler Numbers [OEIS]. We provide the a table of known values for  $\{k(\mathcal{U}_n(2))\}$  [PS] In table 1.

$n$	$k(\mathcal{U}_n(2))$
1	1
2	2
3	5
4	16
5	61
6	275
7	1430
8	8506
9	57205
10	432113
11	3641288
12	34064872
13	352200229
14	4010179157
15	50124636035
16	685996839568

Table 1. Known Values of the Generalized Euler Sequence.

We also found the work of Aguiar, Bergeron and Thiem. In the

paper *Hopf Monoids from Class Functions on Unitriangular Matrices*, the authors construct simple graphs from any unitriangular matrix [Hopf]. They consider the set of all Unitriangular Matrices. Given a  $n \times n$  unitriangular matrix  $M$ , a graph on  $n$  vertices can be constructed by considering the nonzero entries. If the  $ij$ th entry is nonzero and  $i \neq j$ , then there is an edge between the  $i$ th and  $j$ th vertex. These graphs can be identified, not with standard multiplication, but with direct sums. By choosing an integer  $n$ , we can partition the first  $n$  integers into  $S_1$  and  $S_2$ , which preserve the linear order. We can consider two matrices  $M(S_1) = [m'_{ij}]$  and  $M(S_2) = [m''_{ij}]$  where  $S_1$  and  $S_2$  order the columns. The direct sum produces a  $n \times n$  matrix  $M = [m_{ij}]$  from  $M(S_1)$  and  $M(S_2)$  where

$$m_{ij} = \begin{cases} m'_{ij} & \text{if both } i \text{ and } j \text{ are in } S_1 \\ m''_{ij} & \text{if both } i \text{ and } j \text{ are in } S_2 \\ 0 & \text{otherwise} \end{cases}$$

### Methodology and Results

We computed the products of elements in  $\mathcal{G}_n$  with respect to the multiplication we definite. Since  $\mathcal{U}_n(2)$  and  $\mathcal{G}_n$  are isomorphic by definition, this was done via explicit computations in  $\mathcal{U}_n(2)$  for  $n \leq 4$ . Graphs on 4 vertices had to be generated on the computer using Sage Math Cloud since there are 4096 possible pairings. We produce multiplication tables for  $n \leq 3$ , with  $n = 3$  given in Figure 1.


Figure 1. The Induced Multiplication Table of the Set of A Graphs on 3.

We investigated how certain properties of graphs behaved under multiplication. For instance, it is clear from the table above that the product of two trees need not be a tree and the product of two cycles need not be cycles. We have attempted to develop intuition for the general case via this simpler case. If a property of graphs can be exploited, then it will extend to  $\mathcal{U}_n(2)$ . Then, in such a situation, we could see if this extends  $\mathcal{U}_n(q)$  when  $q$  is prime

Unfortunately, we have not found anything particularly promising. Our definitions of graph products are currently rather complicated. The reality is that because there are so many questions one could ask, more time is needed to explore these products.

Over the last few quarters, we computed many matrices and looked at corresponding graphs. This was important for a few reasons. First, we developed real intuition by computing conjugacy classes of  $\mathcal{U}_n(2)$  by hand. Second, the computation provided a sense of just how impractical computing conjugacy classes would be by hand. There is a reason why there are only results for sixteen cases. Third, we hoped to extract important facts about the general case from these cases.

In terms of conjugation, the results were straight forward for  $n = 1$  and  $n = 2$ . In these cases there was not much complexity and so not much could be gained from the conjugacy classes of  $\mathcal{G}_1$  and  $\mathcal{G}_2$ . When  $n = 3$ , we saw that commutativity was lost. Conjugacy classes in  $\mathcal{G}_3$  exhibited a patterned that could be described by a simple

decision tree. We would like to find a way to describe conjugation more naturally.

## Conclusion/Future Work

Higman's conjecture provides the opportunity to investigate an open problem from many points of view. We feel that connecting the various topics produced the most understanding. We feel that the data we have obtained for  $\mathcal{G}_4$  and  $\mathcal{G}_3$  should be investigated more. For example, how does multiplication in these groups behave with respect to graph isomorphisms. Trying to apply graph theoretical concepts to our work would be a great next step. In the future, we hope work towards finding a generating function for  $k(\mathcal{U}_n(2))$ . With respect to Higman's Conjecture, we are faced with a dilemma similar to having a small plate in a buffet. There is so much to try, and yet only so little can be considered.

## References

- [Hopf] M. Aguiar, N. Bergeron, and N. Thieme, *Hopf Monoids from Class Functions on Unitriangular Matrices*, arXiv preprint arXiv:1203.1572
- [Arm] M.A. Armstrong, *Groups and Symmetry*, Springer-Verlag, New York, NY, 1988.
- [VA] J. M. Arregi and A. Vera-Lopez, *Conjugacy classes in unitriangular matrices*, *J. Algebra* (1992), 119.
- [Fin] D.R. Finston, P.J. Morandi, *Abstract Algebra: Structure and Application*, Springer, 2014.
- [For] D. Forney, 6.451 *Principles of Digital Communication II, Spring 2005. (Massachusetts Institute of Technology: MIT OpenCourseWare)*, <http://ocw.mit.edu> (Accessed 4 May, 2016). License: Creative Commons BYNC-SA
- [Gud] P. Gudivok, Y. Kapitonova, S. Polyak, V. Rud'ko, A Tsitkin, *Classes of Conjugate Elements of a Unitriangular Group*, *Kibernetika (Kiev)* 1990, no. 1, 40-48. 80
- [Hig] G. Higman, *Enumerating p-groups. I. Inequalities*, *Proc. London Math. Soc* 3 (1960), 24-40.
- [OEIS] OEIS Foundation Inc. (2011), *The On-Line Encyclopedia of Integer Sequences*, <http://oeis.org/A007976>.



- [PS] I. Pak, A. Soffer, *On Higman's  $k(\mathcal{U}_n(q))$  Conjecture*, arXiv:1507.00411v1
- [Rud] W. Rudin, *Principles of Mathematical Analysis*, McGraw-Hill, 1964.
- [Sag] B.E. Sagan, *The Symmetric Group*, Springer-Verlag, New York, NY, 2001.
- [Str] G. Strang, *Introduction to Linear Algebra*, Wellesley- Cambridge, 1998.
- [Wik] Wikipedia contributors. *General linear group*, Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 17 Apr. 2016. Web. May 2016.

### Acknowledgements

People who know me know that gratitude is a huge component of my identity. I am cognizant of the fact that I am one out of many who have found their way out of despair. But, I am also acutely cognizant that I could have never made it out of the mess I was in on my own. Even now, as I work towards whatever it is I am to become, it was the friendship, guidance, and warmth that I have received from others that has helped me to continue on. I wish to thank all the people who have helped me as I find myself. Johnny O. and Ren $\acute{e}$  T. have been fundamental to my growth. Thalia G. has been a great friend and companion. It would be impossible to thank everyone individually. Homeless youth programs helped me off the streets, community college helped spark a passion for science, and there have been so many people who have helped me along the way.

I wish to give thanks to the Mathematics Department here at the University of Washington. I am not sure I could find more people in the same building that I wished to be. The level of rigor and the passion for mathematics that I find here provides me with excitement, challenge, and something to emulate.

The Ronald E. McNair Scholars Program has been critical for my success. I have been able to meet other students who share similar stories and who are, at times, also unsure that they belong. Watching them succeed has helped me feel more confident in my own abilities. Moreover, the amount of direction I received from this program really helped me develop professionally. I always enjoy spending time with my fellow "McNerds", as some of us call themselves.

I owe, and wish to give, the biggest thanks I can to Professor

Sara Billey. Coming to the university was scary, and there truly are times when I feel like I don't belong. It has been important for my development to meet Professor Billey. She has had an incredible level of patience with me as I question my place at UW.

As a family oriented person, I am grateful for my little family. My brother Sean has helped me raise my beautiful son Elijah. I am not sure that where I would be without my brother. My son is, and has been, my motivation ever since I found my way out of the abyss. He has been patient with me as I figure out what it means to be an adult, and he has been patient with me with respect to time. It's funny that, at times, I learn more about being good natured from my son than I do from anyone else. I am a very proud father. Thank you Sean and Elijah.

The last person I wish to say thanks to is my mother Deborah Anne Bennett, who passed away during my first quarter at the university. I can only hope to make her proud.



# Student Advocacy in Mexican Rural Teacher Colleges

Elizabeth Castro

## Abstract

*In September of 2014, students from the Ayotzinapa rural teacher college became victims in a series of massive human rights violations. While dozens of young men survived the attacks, 43 students were victims of enforced disappearance and six people died. These attacks brought unprecedented global attention to the Raúl Isidro Burgos rural teacher college in Ayotzinapa, Guerrero. Within the context of these events, this research positions the Ayotzinapa rural teacher college and student advocacy within a network of colleges across Mexico. Rural teacher colleges historically serve as an avenue for young men and women from humble, rural, and farmworking backgrounds to train as elementary and bilingual educators. These colleges emerged from the spirit of the Mexican Revolution, and they have long weathered disenfranchisement. The aim of this study is to illuminate how rural teacher college students are continuously advocating for issues such as securing their enrollment terms, responding to use of force, and reacting to education reform. This research identifies student-driven advocacy strategies, which exist beyond calls for justice for the missing 43 students. The study is based on two questions: what are rural teacher college students advocating for? and what are the strategies students engage in to promote advocacy issues? This study draws from semi-structured interviews with one rural teacher college student and online document analysis examining social media webpages, reinforcing identified issues. Findings indicate student advocacy strategies are innovative in the absence of financial resources. Through student advocacy, students exhibit commitment to rural teacher colleges and sustaining their own educational opportunity. When national and international audiences receive shorts bursts or narrow frames of student advocacy, strategies risk being lost to misperception or oversight. Student advocacy points to a need for national, and international, solidarity in protecting the right to education, a fundamental human right.*

## Introduction

On the night of September 26, 2014, dozens of students from a rural teacher college were attacked as they rode in borrowed buses

through the town of Iguala, in the Mexican state of Guerrero. In an attack that included the complicity of local police, 43 students were victims of enforced disappearance. While dozens of young men survived the events of that night, six people died. In the ensuing weeks, the world's attention turned to the tragic events and unfolding investigation. The Mexican state's inadequate and delayed response to the attacks fueled immense frustration. International and national outrage erupted in solidarity with the Ayotzinapa rural teacher college.<sup>1</sup> At over twenty months since the September 2014 attacks, the Ayotzinapa college's 43 students remain missing and the investigation is ongoing. Since the case began, the significance behind the number 43 has reached global audiences. For many readers, the rural teacher college model of education was unfamiliar, yet it has long traditions in Mexico. In this paper, I set out to examine the broader context in which these young men, and the student network they are part of, engage in student advocacy.

The Ayotzinapa college is one of seventeen rural teacher colleges that remain in Mexico. At these *escuelas normales rurales*<sup>2</sup> young men and women from humble, rural, or farmworking backgrounds are able to continue their education. As public institutions of higher education, rural teacher colleges train elementary school educators and bilingual educators in indigenous languages. At the Ayotzinapa rural teacher college, *normalistas*<sup>3</sup> do not have to pay for tuition or their dormitories, once accepted into the new generation, or freshman cohort. The pro-

<sup>1</sup>An extensive list of resources related to the September 2014 attacks on students. Washington Office on Latin America, "Analysis and Information on Mexico's Ayotzinapa Case," accessed April 29, 2016, [http://www.wola.org/commentary/analysis\\_and\\_information\\_on\\_mexicos\\_ayotzinapa\\_case](http://www.wola.org/commentary/analysis_and_information_on_mexicos_ayotzinapa_case).

<sup>2</sup>Escuela normal rural: rural teacher college. In this text, rural teacher colleges are referred to as "escuelas normales rurales," "escuelas normales," or "normales," unless stated otherwise. Official college names often start with the term, "Normal Rural..." and include the name of a prominent figure in Mexico or the college's history. As another naming system, each college is referred to informally by its locality (e.g. the Ayotzinapa college, Tiripetío college or Aguilera college).

<sup>3</sup>Normalista: a student from a Mexican rural teacher college. The terms rural teacher college student and normalista are utilized interchangeably in this text. It was found that "normalista" characterizes the way students self-identify in Spanish.

grams offered at the Ayotzinapa college are a Bachelor's degree in "Primary Education" and "Primary Education with a Bilingual Intercultural Focus," for students who speak indigenous languages.

Normalistas formulate a social justice consciousness at rural teacher colleges that extends from the spirit of the Mexican Revolution. Throughout the twentieth century, a large portion of rural teacher colleges were shut down within a broader history of teacher organizing and public education movements in the nation. It was a major strike in 1969 when President Gustavo Díaz Ordaz ...closed 15 of the 29 institutions.<sup>4</sup> In President Díaz Ordaz's arguments, he accused the *normales* of being *nidos comunistas*, or communist nests.<sup>5</sup> Recent attacks against the *escuelas normales rurales* have criticized them as "seedbeds of guerrillas."<sup>6</sup> Rural teacher colleges have long weathered disenfranchisement, and they demonstrate involvement to social struggle in Mexico that extends decades. Within this context, normalistas have historically engaged in student advocacy, and they demand various forms of educational rights.

Student advocacy is defined as a series of coordinated actions to protect and sustain these colleges and ensure educational opportunity. Encompassing an array of student advocacy strategies are activities such as posting petitions or calls to action on social media, and mobilizing in public marches or protest. Yet, perhaps less visible to a non-local audience, student advocacy is also the act of entering into negotiations with government authorities over a college issue, hosting student-driven radio, or traveling to other rural teacher colleges to support sibling institutions. Across the network of rural teacher colleges, student advocacy is amplified.

"Gonzalo Guerrero"<sup>7</sup> is a normalista from the Ayotzinapa rural

<sup>4</sup>Tanalís Padilla, "Las Normales Rurales: Historia Y Proyecto De Nación," *El Cotidiano*, no. 154, 2009, 92, <http://www.redalyc.org/articulo.oa?id=32512736009>. All quotations of Padilla are the author's translations unless stated otherwise.

<sup>5</sup>*Ibid.*

<sup>6</sup>Laura Poy Solano, "La Jornada: Las normales rurales, semillero de guerrilleros, afirma Gordillo," *La Jornada*, August 6, 2010, <http://www.jornada.unam.mx/2010/08/06/sociedad/035n1soc>. Translation by author.

<sup>7</sup>"Gonzalo Guerrero" is a pseudonym used in the entirety of this text. All references to Gonzalo G are abbreviated thereafter as GG.

teacher college in the state of Guerrero, Mexico. The author met Gonzalo in-person while attending a 2015 advocacy event attended by survivors of the September 2014 attacks. Gonzalo is an active normalista and a current student at the Ayotzinapa rural teacher college. He demands justice for the enforced disappearance of 43 of his missing peers while addressing current issues at rural teacher colleges. Through interview dialogue, some of the issues that surfaced were enrollment concerns, examples of abuse faced by students, and the campaign of discredit waged against normalistas. Exchanges with Gonzalo led to the formation of this research study. Two research questions were solidified to understand student experiences: 1. what are rural teacher college students advocating for? 2. What are the strategies students engage in to promote those issues?

## **Historical Background and Literature**

Rural teacher colleges form an education model comprised of five axes including Academics, Production Modules, Athletics, a Cultural axis, and the prominent Political axis. In an initial meeting, normalista Gonzalo summarizes, “those are the axes. All the rural teacher colleges have those five axes.”<sup>8</sup> In brief, the Academics axis includes coursework and hands-on experiences such as a classroom practicum. The Production Modules are at the heart of the definition of an escuela normal rural, with a history of serving rural communities. These Modules include raising animals and working the land to cultivate crops. The Cultural axis includes the assembly of musical and dance groups, such as folkloric dance or banda de guerra, a form of Mexican marching band often playing national hymns. The Athletic axis naturally includes the formation of sports teams like basketball and soccer. Through the Political axis, students learn about social issues affecting Mexico and obtain a political formation. As Gonzalo puts it, through the Political axis, students “create their own political consciousness.”<sup>9</sup>

The Political axis is a prominent aspect of rural teacher colleges given its relevance over decades of student and teacher organizing. This axis is particularly a focal point in previous scholarly work. The 1968 massacre left 200 protestors dead, including students, by some

<sup>8</sup>“Gonzalo Guerrero,” meeting by author, meeting via internet communication, July 28, 2015.

<sup>9</sup>Ibid.

estimates, and forever shaped Mexican history.<sup>10</sup> The 1968 massacre is an example of student social movements from the twentieth century, which today are commemorated by rural teacher college students.<sup>11</sup> In a summary of events from the 1960s and 1970s, O'Neill Blacker-Hanson describes, "[a]fter three violent government assaults on protesters, the two most prominent teacher-activists, Genaro Vázquez Rojas and Lucio Cabañas, abandoned public protest and led guerrilla movements in the Sierras."<sup>12</sup> Rojas and Cabañas are two of the most prolific figures linked to rural teacher colleges. At almost one hundred years of history, rural teacher colleges consistently rise up under the use of force by authorities. Today, students learn about social struggle from past decades while it shapes their own consciousness as normalistas.

The current enforced disappearance of the missing 43 students is linked to activism from an earlier period. During Mexico's Dirty War,<sup>13</sup> some of the grandparents of Ayotzinapa college students were disappeared in the 1960s and 1970s. Gonzalo confirmed in an interview that several of his 43 missing peers have grandparents who were

<sup>10</sup>While accounts vary from the official narrative on the 1968 massacre, Vanguardia notes that a paramilitary battalion opened fire killing at least 200 people in the incident. See Agencias, "2 de Octubre, 46 Años Después de La Matanza de Tlatelolco," Vanguardia, October 2, 2014, <http://www.vanguardia.com.mx/2deoctubre46anosdespuesdelamatanzadetlatelolco-2177615.html>. Translation by author.

<sup>11</sup>In particular, Ayotzinapa college students had aims to attend the annual commemoration marches for the 1968 massacre in the autumn of 2014 before they were attacked on September 26, 2014. See Grupo Interdisciplinario de Expertos Independientes (GIEI), "Informe Ayotzinapa II," Inter-American Commission on Human Rights, 185, <https://www.scribd.com/doc/310269260/Informe-Ayotzinapa-II#fullscreen>.

<sup>12</sup>O'Neill Blacker-Hanson, "La Lucha Sigue! = The Struggle Continues! : Teacher Activism in Guerrero and the Continuum of Democratic Struggle in Mexico" (doctoral dissertation, University of Washington, 2005), abstract.

<sup>13</sup>The Dirty War is described as an "internal conflict between the ruling Institutionalized Revolutionary Party (PRI) and leftist guerrilla movements, which surged during the PRI's more than 70 years in power," See Gabriela Gorbea and Andrea Noel, "Mexico Quietly Placed Archives Related to Its 'Dirty War' Under Lock and Key," *Vice News*, April 1, 2015, <https://news.vice.com/article/mexico-quietly-placed-archives-related-to-its-dirty-war-under-lock-and-key>.



disappeared in an earlier era.<sup>14</sup> This means that within families, parents have faced the loss of their own parents, and now their sons in September 2014. Enforced disappearance within normalista families is, sadly, a multi-generational practice.

Historically, normalistas critique and question government actions, and in each decade the authorities respond to them. The term “teacher-activists,” employed by Blacker-Hanson, is an apt way of describing the multiple generations of teachers discussed in her dissertation.<sup>15</sup> If one views the acts of teaching as a form of activism, in and of itself, then teacher-activism naturally becomes a doubly reinforced term. In the same vein, student experience accompanies an awareness of education systems and a direct understanding of its limitations and challenges, leading normalistas to become parallel student-advocates to their teacher-activist counterparts. That the process of student advocacy and teacher-activism go hand in hand is evident in the way normalistas draw from knowledge and strategies from previous generations or support from sibling rural teacher colleges.

Blacker-Hanson details 20<sup>th</sup> century teacher-activism and argues, “[teachers] made the professional choice that would best facilitate the transmission of progressive thought to another generation, their students.”<sup>16</sup> Blacker-Hanson concludes, the “long-lasting contribution to progressive organizing was [the teachers’] role in assuring that academic campuses would survive as sites of progressive discourse and community activism... Through their students, *la lucha sigue* (‘the struggle continues’)”<sup>17</sup> Today’s student advocacy strategies are linked to the groundwork laid by graduates, alumni, and teacher-activists. Blacker-Hanson’s 2005 analysis informs the thread of rural teacher college sustainability at the heart of student advocacy.

The case of the 43 missing students had led to a new push for literature on rural teacher colleges that is investigative and commemorative. Since 2014, multiple volumes have focused on the Ayotzinapa college and the context of the missing 43. *The Crossing of the Turtles*, or *La Travesía de las Tortugas* is one example of an edited volume of

<sup>14</sup>“Gonzalo Guerrero,” July 28, 2015.

<sup>15</sup>Blacker-Hanson, abstract.

<sup>16</sup>Ibid, xi.

<sup>17</sup>Ibid, x.

stories collected by different reporters to create profiles and personal histories of the 43 missing students from the Ayotzinapa college.<sup>18</sup> The Spanish-language text, *The Night of Iguala and the Awakening of Mexico: Texts, Images And Poems Against Barbarity* analyzes the 43 missing student case through lenses of politics, state terrorism, mining, and education history.<sup>19</sup> Overall, the case of the missing 43 students has spurred numerous investigation analyses, poems, and artwork. International portrayals have led to conflicting views in understanding the colleges.

Media outlets serve as a primary medium to inform English-speaking international communities about rural teacher colleges. Following attacks on students in September 2014, major international newspapers ran headlines about the case. The *New York Times* read, “43 Missing Students, a Mass Grave and a Suspect: Mexico’s Police,”<sup>20</sup> while Canada’s *The Globe and Mail* posited, “Mexican investigators fear mass grave might hold 43 missing students.”<sup>21</sup> In the ensuing weeks, the international community was jolted awake to the circumstances at rural teacher colleges, normally a topic of local and national Mexican dialogue. While larger scholarly work outlines context and historical positioning, newspapers are snapshots. One of the risks of international media reporting is the use of vocabulary and language translations, which can position normalistas in a negative light if done with disregard. When inflammatory language surfaces in Spanish-language media about rural teacher colleges, it risks replication in its English language

<sup>18</sup>Nayeli Roldán, “La travesía de las tortugas, el rostro de los 43 estudiantes de Ayotzinapa,” *Animal Politico*, September 24, 2015, <http://www.animalpolitico.com/2015/09/la-travesia-de-las-tortugas-el-rostro-de-los-43-estudiantes-de-ayotzinapa/>. Translation by author.

<sup>19</sup>Manuel Aguilar Mora, and Claudio Albertani, *La Noche De Iguala Y El Despertar De México : Textos, Imágenes Y Poemas Contra La Barbarie*. (México: Juan Pablos Editor, 2015). Translation by author.

<sup>20</sup>Randal C. Archibold, “43 Missing Students, a Mass Grave and a Suspect: Mexico’s Police,” *The New York Times*, October 6, 2014, [http://www.nytimes.com/2014/10/07/world/americas/43-missing-students-a-mass-grave-and-a-suspect-mexicos-police-.html?\\_r=0](http://www.nytimes.com/2014/10/07/world/americas/43-missing-students-a-mass-grave-and-a-suspect-mexicos-police-.html?_r=0).

<sup>21</sup>Jose Antonio Rivera, “Mexican investigators fear mass grave might hold 43 missing students,” *The Globe and Mail* (Canada), October 5, 2014, <http://www.theglobeandmail.com/news/world/mexican-investigators-fear-mass-grave-might-hold-43-missing-students/article20937256/>.

counterparts, which reverberates the messages of critics of the colleges. In 2009, Padilla notes that few communication mediums report on the struggles of normalistas and when they do, it tends to follow a known formula: of rebellious students, idle young people, and institutions that are from a bygone era.<sup>22</sup> English media coverage of the December 12, 2011 demonstration by Ayotzinapa college students is a precise example of the influence of vocabulary choice, as it subtly shapes public portrayal of the colleges. Flor Goche highlights that students were demanding a hearing with the governor to solve student demands, in 2011, when two students were killed by public servants.<sup>23</sup>

The 2011 Associated Press headline, “Students Lie Dead in a Mexican Street after Clash with Government Officers ‘Over Education Standards’”<sup>24</sup> provides a brief (and chilling) snapshot of the international portrayal of escuelas normales rurales. This Associated Press (AP) coverage negatively positions normalistas, while diverting the reader from issues of student advocacy. AP describes how in December 2011, about 300 Ayotzinapa normalistas took part in a major highway blockage that resulted in violence. The Associated Press positions, prosecutors said students hijacked buses and set fire to a gasoline station before police fired tear gas and then shots rang out.<sup>25</sup> The AP article acknowledges a local organization, Tlachinollan, amongst others who released a statement on the event. AP analyzed the statement and commented students, “staged the protest seeking to persuade the state government ‘to meet their educational demands,’ but did not specify what those were.” AP corroborates from a state government release that then-Governor, Angel Aguirre, “had ‘solved the majority’ of the students demands in previous meetings and was ready to engage in dialogue with them.” The Associated Press sums up the account in the last sentence outlining, “Mexico’s public rural teachers colleges, some founded in the 1930s

<sup>22</sup>Padilla, “Las Normales Rurales,” 85.

<sup>23</sup>Flor Goche, “Ayotzinapa: La Resistencia Que Se Impone,” in *La Noche De Igualdad Y El Despertar De México : Textos, Imágenes Y Poemas Contra La Barbarie*, ed. Manuel Aguilar Mora and Claudio Albertani (Mexico: Juan Pablos Editor, 2015), 137. All quotations of Goche are the author’s translations unless stated otherwise.

<sup>24</sup>Associated Press, “Students lie dead in a Mexican street after clash with government officers ‘over education standards,’” *Daily Mail*, December 13, 2013, <http://www.dailymail.co.uk/news/article-2073442/Students-lie-dead-Mexican-street-clash-government-officers-education-standards.html>.

<sup>25</sup>Ibid.

with a socialist philosophy, have long been a *hot bed of radical activism*.<sup>26</sup> [emphasis added].

While the piece narrates the events of the attacks on students, it misses the opportunity to explore these noticeably air quoted “educational demands.” The Associated Press’ quotation marks around “educational demands,” suggest a level of uncertainty. There is an absence of the critical juncture in connecting student blockage of a highway, la Autopista de Sol,<sup>27</sup> and the escalation of student advocacy and incomplete hearings. In the Associated Press article, it seems reporters are equally at a loss in knowing what those “education demands” are as their readers.

The inflection of the Associated Press’s last line reads, “hot bed of radical activism.” This phrase lies side by side to the long-standing Spanish comments of the colleges as “communists nests”<sup>28</sup> or “hot bed of guerrillas.”<sup>29</sup> The Associated Press’ use of the term “hot bed” is a critical judgment under the definition, “a place or environment favoring rapid growth or spread, especially of something disliked or unwanted.”<sup>30</sup> Thus, the recounting of a sad 2011 event, the death of young people, is concluded with the sentiment that these young men stem from a place that is already fermenting something undesirable. Key words utilized in media, position advocacy efforts, and their rationale, as something to be glossed over. Well before the case of the missing 43 students emerged, media influenced the language and vocabulary in reporting normalista activities. While the bloody violence takes center stage, the details of government-student negotiations and hearings are lost.

The aforementioned Associated Press article not only pinpoints the Ayotzinapa college students in 2011, but also indicates the existence of a rural teacher college network writ-large. Rural teacher colleges are united under a single student-run federation, the Federation of Socialist Farmworker Students of Mexico (FECSM for its Spanish acronym).

<sup>26</sup>Ibid.

<sup>27</sup>Autopista del Sol is a major road blocked in other instances. “Gonzalo Guerrero,” interview by author, Washington State internet communication to Mexico, April 29, 2016.

<sup>28</sup>Padilla, “Las Normales Rurales,” 92.

<sup>29</sup>Laura Poy Solano. Translation by author.

<sup>30</sup>“Hotbed,” *Dictionary.com*, accessed May 1, 2016, <http://www.dictionary.com/browse/hotbed?s=t>.

The *Federación de Estudiantes Campesinos Socialistas de México*<sup>31</sup> is a semi-clandestine student Federation. Its student-driven nature puts it outside the scope of the official public education system of *escuelas normales rurales*. FECSM has origins in 1935 and is referred to as the student organization in the country with the greatest longevity.<sup>32</sup> A *Contralinea* magazine contributor, under the title FECSM, stated that in 1969...the federal government launched a brutal campaign against rural teacher colleges (at the time, more than 30), integrated in the Federation of Socialist Farmworker Students of Mexico...In that manner, the closure of rural teacher colleges began.<sup>33</sup> Although FECSM college numbers have decreased, a vanguard of rural teachers colleges has survived.

Not all student advocacy takes place within FECSM, yet it is an undeniably important amongst rural teacher colleges for its unifying aspect. FECSM holds a utility for students to extend shared knowledge on organizing under an education model that incorporates five common axes. Upon entry as a *normalista* to a rural teacher college, a student is considered part of the membership to the national student Federation.<sup>34</sup>

While Gonzalo's serving term with the Federation has ended, he is a former member of its *Comité Central* or Central Committee. Through this position, Gonzalo demonstrated a commitment to not only the Ayotzinapa college, but also to the network of rural teacher colleges. He informed that as part of committee bodies,

<sup>31</sup>Daniel Hernandez has titled FECSM, "the Federation of Campesino Socialist Mexican Students." See Daniel Hernández, "The Lost Boys: A Mexican School Grapples with the Disappearance of 43 Students," *Vice News*, January 6, 2015, <http://www.vice.com/read/the-lost-boys-0000543-v22n1>. The author opts for the word Farmworker, rather than Campesino for an English audience. This aligns with self-identification in similar communities, including the United Farmworkers of America.

<sup>32</sup>Goche, 136.

<sup>33</sup>FECSM, "¿Movimientos o Movilizaciones Estudiantiles?" *Contralinea Revista*, October 9, 2011, <http://www.contralinea.com.mx/archivo-revista/index.php/2011/10/09/movimientos-o-movilizaciones-estudiantiles/>. Translation by author.

<sup>34</sup>"Gonzalo Guerrero," interview by author, Washington State internet communication to Mexico, October 18, 2015.

Gonzalo G: We as the Central Committee, we are in charge with seeing the problems that each of the schools face. And to help them in a manner that is within our reach.<sup>35</sup>

According to Gonzalo, the FECSM is integrated by 17 colleges. See Figure 1. Map of Rural Teacher Colleges.<sup>36</sup> In Figure 1. the Ayotzinapa college is pinpointed as number 16. Overall, the Figure 1 map demonstrates a wide geographical distribution of rural teacher colleges across Mexico. Fifteen colleges are named as rural teacher colleges (marked in dark blue). Instead of having a designation as a rural teacher college, two additional colleges are named a CREN (Centro Regional de Educación Normal) or Regional Central of Normal Education; while another is identified as an Indigenous College (on map, light blue). Despite their different titles, the two additional colleges are included as rural teacher colleges because they are integrated as members of FECSM.<sup>37</sup> With the closure of El Mexe college in Hidalgo (on map, red), this brought down the membership to seventeen.<sup>38</sup>

On the map, each number indicates a college. Normalistas employ shorthand names for the colleges, by locality.<sup>39</sup> Members of the student Federation, FECSM, are:

- 1) El Quinto, Sonora;
- 2) Saucillo, Chihuahua;
- 3) Aguilera, Durango;
- 4) El Cedral, San Luis Potosí;
- 6) San Marcos, Zacatecas;
- 7) Cañada Honda, Aguascalientes;
- 8) Atequiza, Jalisco;
- 9) Cheran, Michoacán;
- 10) Tiripetío, Michoacán;

<sup>35</sup>“Gonzalo Guerrero,” interview by author, Washington State internet communication to Mexico, February 13, 2016.

<sup>36</sup>Figure 1. All Map Markings and Legend Elaborated by author. Blank Map: Kmusser, “File:Mexico States blank map.svg,” (Wikipedia Commons, 2010).

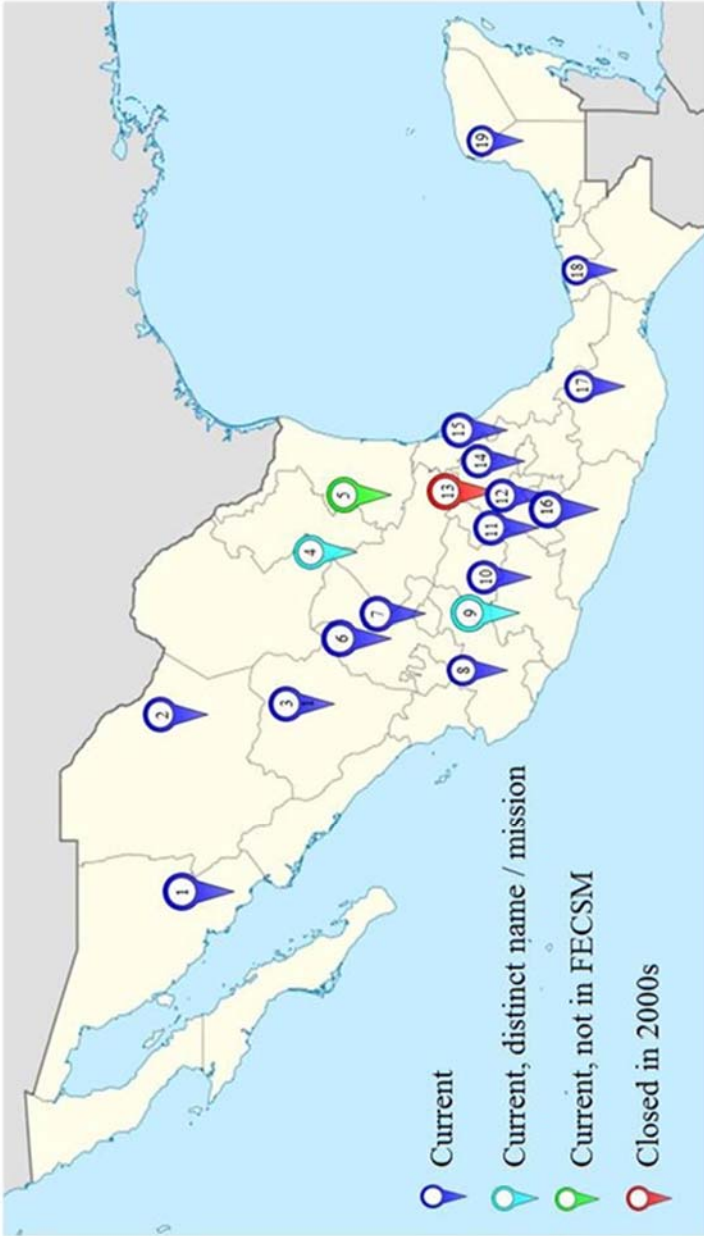
<sup>37</sup>Ibid.

<sup>38</sup>The rural teacher college in the northeastern state of Tamaulipas is not a member of FECSM (marked on the college map in green), while technically constituting a rural teacher college. While not included in the final count, one webpage was located for this college. On the college map by the author, this college is demarcated as number 5) for Güemez, Tamaulipas.

<sup>39</sup>“Gonzalo Guerrero,” written message to author, October 2015.

- 11) Tenería, State of Mexico;
- 12) Amilcingo, Morelos;
- 13) El Mexe, Hidalgo (closed at present);
- 14) Panotla, Tlaxcala;
- 15) Teteles, Puebla;
- 16) Ayotzinapa, Guerrero;
- 17) Tamazulapan, Oaxaca;
- 18) Mactumactzá, Chiapas;
- 19) Hecelchakán, Campeche.<sup>40</sup>

<sup>40</sup>Ibid.



Each number indicates a college. Normalistas employ shorthand names for the colleges, by locality. 1) El Quinto, Sonora; 2) Saucillo, Chihuahua; 3) Aguilera, Durango; 4) El Cedral, San Luis Potosí; 5) Güemez, Tamaulipas (not in FECSM); 6) San Marcos, Zacatecas; 7) Cañada Honda, Aguascalientes; 8) Atequiza, Jalisco; 9) Cheran, Michoacán; 10) Tiripetío, Michoacán; 11) Tenebría, State of Mexico; 12) Amilcingo, Morelos; 13) El Mexe, Hidalgo (closed at present); 14) Panotla, Tlaxcala; 15) Teteles, Puebla; 16) Ayotzinapa, Guerrero; 17) Tamazulapan, Oaxaca; 18) Mactumactzá, Chiapas; and 19) Heceichakán, Campeche. [See Footnote of Figure 1. All Map Markings and Legend Elaborated by author.]



## Methodology

Research analysis includes the author's interviews with a Mexican rural teacher college student, under the pseudonym "Gonzalo Guerrero," and a consultation of online social media materials. Five semi-structured interview sessions took place with one Mexican normalista who is a current Ayotzinapa college student. Gonzalo also survived the attacks of the 26 and 27 of September 2014 that led to the disappearance of 43 students. Research interviews took place via webcam video with conversation themes decided ahead of time. The interviews were semi-structured with overarching themes that permitted conversations to evolve and change organically. Interviews typically lasted one hour. Original transcripts were made of the interviews in Spanish before translation into English. All quotations of "Gonzalo Guerrero" are translations by the author from their original Spanish. Interviews with Gonzalo and subsequent analysis were enriched by gathering a historical context of escuelas normales rurales.

Online document analysis included Facebook webpage tracking. According to the article, "Internet Users in Mexico Prefer Mobile Access and Social Media," Facebook is highly popular as "the primary social platform used by social media users (74.2%) in Mexico"<sup>41</sup> Facebook webpages were tracked based on self-identified affiliation to a rural teacher college, yet precise affiliation cannot be confirmed, due to the nature of the source. The entities tracked were the 17 rural teacher colleges that form part of the national normalista Federation, FECSM, as well as the El Mexe college,<sup>42</sup> for a total of eighteen colleges. A total of eighty-five (85) webpages were tracked for rural teacher colleges under Facebook Profiles, Pages, and Groups. Facebook webpages were

<sup>41</sup> "Internet Users in Mexico Prefer Mobile Access and Social Media," *eMarketer*, October 23, 2015, accessed May 16, 2016 <http://www.emarketer.com/Article/Internet-Users-Mexico-Prefer-Mobile-Access-Social-Media/1013145#sthash.TDKQEvAM.dpuf>.

<sup>42</sup> The currently closed El Mexe college in Hidalgo was found to have active Facebook webpages with posts in 2016. Although the actual El Mexe rural teacher college was closed in 2008, it was added to the list of seventeen colleges.

located for each rural teacher college and compiled into a spreadsheet.<sup>43</sup> The number of webpages for each college ranged from two (2) to ten (10) distinct Facebook webpages. In aggregate, the pages revealed trends and patterns, particularly in personalized student connections to their colleges. Students define, in their own terms and stylistic usage, highlights at their colleges. Rural teacher college webpages revealed an abundance of student advocacy material and ordinary student posts, such as memes and photos. Pages held visible commentary from former students, graduates, and alumni from rural teacher colleges.

Online webpage tracking served as a springboard to understanding current issues in interviews and reinforced views expressed by Gonzalo. Amongst Facebook student advocacy materials, one case study was chosen for further analysis, given its relevance to an interview discussion for securing enrollment terms. The selected document was published as a Communications Release for Saucillo College in the state of Chihuahua. For detailed information on the process of searching Facebook Pages, Profiles, and Groups, see Appendix A.

Within ethical procedures for this work, an informed consent form was created in English and then translated into Spanish for the interview participant. This work was filed with the University of Washington Human Subjects Division.

To establish rapport, the author's identity within the project played a role in interviews. As a young woman raised in a *familia campesina* or farmworking family, the author holds personal experiences such as working in agricultural fields. This family background augmented background knowledge of life in rural areas of Mexico. The author considered the implications of normalista work as inextricably tied to the future of younger student populations.

## Results

Since September 2014, student advocacy has encompassed the fight for justice for the missing 43 students. This case forms part of a larger battle for the sustainability of a historical model of education. Often under the radar of international attention, normalistas are part of

<sup>43</sup> Webpages indicated that rural teacher college students and alumni have shared and posted on college-named Facebook Pages, Profiles, and Groups. A common title for a Page or Profile was "Rural School X..." "Normal Rural X..." or "*Escuela Rural X...*" y "*Normal Rural X...*"

an extraordinary undertaking for their educational futures and for the generations of students after them. In researching social media advocacy and through interviews with Gonzalo, it became evident multiple strategies are incorporated in student advocacy. Results are divided in two parts. Part One answers “what are rural teacher college students advocating for?” while Part Two expands on the issues identified to address, “what are the strategies students engage in to promote advocacy issues?”

In response to the research question, “what are rural teacher college students advocating for?,” five advocacy issues were identified. These issues are defined as: agency over their portrayal and image; keeping the doors of the colleges open; rejection of Mexican education reform projects; securing new enrollment terms, and responding to abuse or use of force. These issues are by no means exhaustive of the issues prompting student advocacy. Further, some issues are solved and short-lived while others form part of prolonged efforts. Amongst other advocacy issues, these issues were selected given their prevalence amongst different rural teacher colleges.

Amongst the swirling news of corruption, organized crime, and scandals, international (and national) media have a tendency to pinpoint violence in the Mexican context. It becomes crucial to outline the intertwining structural issues in education, such as reform and funding. By grouping the five student advocacy issues, they fall under the following: 1) structural issues related to education and funding mechanisms 2) responses to media and government discredit and 3) reactions to abuse or use of force.

## **Part One: What are Rural Teacher College Students Advocating for?**

### **A: Agency over their Portrayal and Image**

While engaged in student advocacy, normalistas have weathered attempts to criminalize or discredit their efforts as evidenced in media, government, and public opinion portrayals. Decades-old commentary of rural teacher colleges as communist nests<sup>44</sup> is a reminder that discredit of rural teacher colleges is not something new. In 2010, former national teacher union leader, Elba Esther Gordillo was quoted,

<sup>44</sup> Padilla, “Las Normales Rurales,” 92.

“[w]e have raised many times to the authorities that if there is a closure of some *normales rurales* there will be a lot of commotion from the youth. Do not forget that *normales rurales* have been seedbeds of guerrillas, but if we don’t it [close them] they will continue on with the same.”<sup>45</sup> Gordillo’s use of “seedbeds of guerrillas,” in 2010 has become a symbolic phrase of the derisive view of some parties directed at escuelas normales rurales.

In response to discredit and smear campaigns directed at students, normalistas aim to exert agency in their portrayal. Smear campaigns include the dissemination of disapproving vocabulary directed at students or their institutions, including the suggestion of normalista links to organized crime. One of the most resounding examples of the criminalization efforts of normalistas came in the aftermath of the September 2014 attacks leading to the missing 43 student case. Gonzalo explains in the context of the 2014 attacks,

Gonzalo G: We find no justification for such acts but it is true that in the moment that they said we belong to the cartel of Los Rojos and Guerreros Unidos, it gave me a lot of rage, because I knew the guys. I knew their roots. As students, we go to their homes to do the socio economic evaluation, and you see the humility with which they live. The poverty of their homes, their families. And for the PGR [Mexican Attorney General of the Republic] to say they belonged to a cartel is a total derision of their families, their origins.<sup>46</sup>

The Facebook page, Escuela Normal Rural Raúl Isidro Burgos de Ayotzinapa Guerrero, singles out existing commentary proclaiming student and families of the missing 43 as “hooligans, thieves, and other things,”<sup>47</sup> further emphasizing the forms of discredit faced by normalistas. Beyond authorities, Gonzalo also identified the Mexican television as another culprit of discrediting normalistas.<sup>48</sup>

Social media leverages a platform where students indicate

<sup>45</sup> Laura Poy Solano. Translation by author.

<sup>46</sup> “Gonzalo Guerrero,” July 28, 2015.

<sup>47</sup> Escuela Normal Rural ‘Raul Isidro Burgos’ de Ayotzinapa Guerrero’s Facebook Page, accessed April 22, 2016, <https://www.facebook.com/Escuela-Normal-Rural-Raul-Isidro-Burgos-de-Ayotzinapa-Guerrero-629959897134366/?fref=nf>. Translation by author.

<sup>48</sup> “Gonzalo Guerrero,” February 13, 2016.

instances of discredit and have the opportunity to respond. Another response to discredit is hosting socio-political events with performances of student talent, detailed in Part Two. International media or even national media outlets may not report on these smaller-scale events. Yet Gonzalo argues that normalistas are well aware of local perceptions of rural teacher colleges. By advocating for themselves, students execute agency in fair representation.

## B. Keeping the College Doors Open

Gonzalo is attentive to the struggles at other rural teacher colleges beyond his own institution, the Ayotzinapa college. Keeping the distinct rural teacher colleges alive and functioning becomes a student advocacy issue due to recent and drastic changes at two rural teacher colleges, in particular. In 2004, the Escuela Normal Rural de Mactumactzá, in the state of Chiapas, had some of its buildings demolished. In 2008, the Normal Rural Luis Villarreal located in Mexe, state of Hidalgo was lost when it was shut down as an escuela normal rural. Normalista concerns for school closures and alterations are well founded and acute given these two instances. The author posited to Gonzalo the outcome if students became inactive to resolving student advocacy issues:

Elizabeth C<sup>49</sup>: Have there been times when, flat out, students did not go to movement? Has there been an instance that for not acting, something didn't turn out?

Gonzalo G: Well, there you have the ones from Mactumactzá [college]. Although they mobilized in that year. They lost the dormitories. Because they did not have their *petitorio* [petition demands] resolved.<sup>50</sup>

Gonzalo signaled pointedly to the Ayotzinapa college's sibling institution, the Mactumactzá college in the state of Chiapas. In the latter discussion, he referenced the film, *Granito de Arena*. Jill Freidberg narrates in *Granito de Arena* the struggle that enveloped the Mactumactzá rural teacher college, with the ultimate demolition of buildings at the

<sup>49</sup> All references to Elizabeth C indicates the author, abbreviated thereafter as EC.

<sup>50</sup> "Gonzalo Guerrero," interview by author, Washington State internet communication to Mexico, April 29, 2016.

escuela normal rural.<sup>51</sup> Freidberg's narration begins in 2002, when the World Bank offered a loan to the state of Chiapas, under recommendations of transforming its rural teacher college into a semi-private technical school. The Governor imposed a new exam on students who were graduating, claiming insufficient teaching positions in the region.<sup>52</sup>

Freidberg details that after advocates for the Mactumactzá college demanded negotiations with authorities, they faced the response of having classes at the college cancelled for the semester. This led to a student occupation of the school. Depicted in the film, the retaliation by authorities that followed included violent beatings, gunshots being fired, and attacks with tear gas on advocates for the Mactumactzá college and community members. Advocacy response continued to escalate toward the creation of a caravan tour to raise awareness and demand justice.<sup>53</sup>

By spring of 2004, Freidberg describes that the World Bank's concept to privatize had prevailed, leading to only a few classroom being spared by a demolition.<sup>54</sup> Transforming the Mactumactzá college into a semi-private technical school risks simply crowding out the five Axes (Academics, Production Modules, Athletics, Cultural and Political), which define rural teacher colleges. If left to outside forces, a rural teacher college could be stripped of its defining characteristics and alterations to its history, purpose, and access.

Friedberg states that after building demolitions, low-income students had the options of locating their own housing or dropping out.<sup>55</sup> Since the housing component of rural teacher colleges is integral to student life, the loss of these buildings affects the entire school structure and student culture. For students from humble backgrounds from faraway rural communities, housing at a rural teacher college is an assurance for them to focus on their studies.

In the early 2000s when the demolitions were happening at the Mactumactzá college, Gonzalo was in elementary school. He was years away from becoming a normalista. Years later, Gonzalo exhibited a

<sup>51</sup> *Granito De Arena*, directed by Jill Freidberg and Corrugated Films (2005; Seattle, WA: Corrugated Films), DVD.

<sup>52</sup> Ibid.

<sup>53</sup> Ibid.

<sup>54</sup> Ibid.

<sup>55</sup> Ibid.

clear awareness of strikes within the rural teacher college network by referencing the *Granito de Arena* film. Gonzalo has the opportunity to connect the experience of generations of normalistas before him as he adds his own grain of sand to student advocacy. It creates a tremendous purpose for student advocacy strategies if students sense that a rural teacher college can be destroyed, broken up, or at worst, shut down.

While the Mactumactzá college was not closed, the El Mexe college in Hidalgo was shut down as a rural teacher college in 2008. The Normal Rural Luis Villarreal, or El Mexe, in the state of Hidalgo is the latest in the history of school closures. Reporting indicates dormitories were closed in 2003 while the last class went out in 2008.<sup>56</sup> In late 2015, a petition via Change.org garnered 453 of its 500 proposed signatures regarding the reopening of the college. In December 26, 2015, graduates from rural teacher colleges came together and put forth a Declaration of the Third National Meeting of Graduates from Normales Rurales for the reopening of El Mexe.<sup>57</sup> The cited location was in the Carlos Marx (Karl Marx) auditorium of the ex-normal. The petition is undersigned with graduates from five sibling institutions in the rural teacher college network. These rural teacher colleges include the Panotla college in Tlaxcala; the Amilcingo college in Morelos; the Tiripetío college in Michoacan; the Mactumactzá college in Chiapas; and the student committee of the Tenería college in the state of Mexico. Undersigned graduates from the El Mexe college stem from a total of nine states and Mexico City.<sup>58</sup>

Given the likelihood of friendships with El Mexe's last graduating students, rural teacher college graduates would support the reopening of El Mexe. Perhaps graduates engage in alumni advocacy by viewing El Mexe within their own normalista experience and network. Further, the Change.org petition to reopen the El Mexe college has

<sup>56</sup> "El desmantelamiento de la Normal Rural de El Mexe, por Osorio Chong," *Centro Medios Libres*, October 4, 2014, <https://www.centromedioslibres.org/2014/10/04/el-desmantelamiento-de-la-normal-rural-de-el-mexe-por-osorio-chong/>. Translation by author.

<sup>57</sup> Encuentro Nacional de Egresados de Escuelas Normales, "Petición Por La Reapertura De La Escuela Normal Rural 'Luis Villarreal' De El Mexe, Hgo.," *Change.org*, accessed January 12, 2016. <https://www.change.org/p/lic-enrique-pe%C3%B1a-nieto-presidente-constitucional-de-los-estados-unidos-mexicanos-aurelio-nu%C3%B1o-mayer-secretario-de-educaci%C3%B3n-p%C3%BAblica-por-la-reapertura-de-la-escuela-normal-rural-luis-villarreal-de-el-mexe-hgo>. Translation by author.

<sup>58</sup> Ibid

embedded demands for justice for the missing 43 Ayotzinapa normalistas.<sup>59</sup> Reflected in demands to reopen the individual school is a broader context of solidarity amongst rural teacher colleges. The struggle continues to revive the latest shut down college. If another rural teacher college closed its doors, this would immediately concern all of its sibling institutions.

### C. Student Rejection of Mexican Education Reform Projects

In the onset of the education reform, student advocacy emerges in rejection to reform projects, such as the Integral Plan for Diagnostics, Redesign, and Strengthening of Escuelas Normales [PIDIRFEN for its Spanish acronym].<sup>60</sup> Padilla has commented that in previous eras, the impressions of communism were utilized to close rural teacher colleges, while contemporary arguments employ standards, quality, and efficiency rhetoric.<sup>61</sup> While PIDIRFEN is not an explicit closure of rural teacher colleges, students are dissatisfied with the current reform project that includes technicalities and bureaucratic shifts. Understandably, a college that becomes unrecognizable to students is as equally troubling as a closed one. On the one hand, the PIDIRFEN project is heralded as improving education programs through reform, according to authorities. On the other hand, Gonzalo highlights that rural teacher colleges are amongst the multiple teaching-training institutions affected by the PIDIRFEN project. Gonzalo describes the impacts from his perspective,

GG: The project is PIDIRFEN, which has to disappear all the *normales*...Not only the rural ones, this comes at the hand of the education reform, which is a principal risk that we have had now with Sauchi [Saucillo college].

Elizabeth C: The government has come up with a plan. Saucillo [college] in particular, wants to mobilize....already mobilized, so it didn't pass.

GG: So that it does not pass in other states. For example, around October, November, the normal in San Marcos, Zacatecas, also mobilized for the PIDIRFEN. It was at the

<sup>59</sup> Ibid

<sup>60</sup> The *Plan Integral de Diagnóstico, Rediseño y Fortalecimiento de las Escuelas Normales*.

<sup>61</sup> Padilla, "Las Normales Rurales," 92.



door. And it was going to enter into effect. And for their new enrollment, it was going to affect them. Well, at least in their delegation, it did not enter. In Saucillo it did not either. And the ones that continue...All the *normales*, not only the ones in FECSM (national student Federation), they see that it will also affect them, and they mobilize.<sup>62</sup>

Gonzalo outlines his two main concerns with the education reform project.

Gonzalo G: The PIDIRFEN project implicates that there is two bachelor's degrees only, which are Inclusive Education and *Pedagógica* [Teacher] Education. It comes to disappear the specialties, which are preschool, primary, secondary, *telesecundaria* [television secondary school], physical education, indigenous education. All these disappear. It leaves you to get these two degrees only.

GG: Another thing, is they change the term, "normal," and they are going to put *escuelas de educación pedagógica regional* [regional pedagogical education schools]. They are no longer going to be called *normales*.

EC: Those are significant changes.

GG: And PIDIRFEN only assures us that if the school conforms, we still get *internado* [housing] and the food rations. It is not secured there in the PIDIRFEN. Because it is contemplated for *escuelas normales*: for urban and rural *normales*, indigenous *normales*, superior schools for physical education, *escuelas normales* for preschool, special education colleges. Those are all involved.

EC: The effect is in the bachelor's degrees, in the ones you can receive.

GG: Aha [affirmative].

So why is the PIDIRFEN problematic for the Ayotzinapa college, in particular? The Ayotzinapa college offers two degrees, one a Bachelor's degree in "Primary Education" and another in "Primary Education with a Bilingual Intercultural Focus," for students who speak indigenous languages. Based on Gonzalo's description, PIDIRFEN would have Ayotzinapa college degree programs replaced by two other degrees options. In effect, dramatic alternations to degree programs

<sup>62</sup> "Gonzalo Guerrero," February 13, 2016.

could shut students out who are traditionally served at rural teacher colleges.

Renaming the colleges perhaps is elaborated as mere technicalities. However, the term rural teacher college, or *escuela normal rural*, holds decades of history. From a student perspective, what is in the name of the college is also a question of identity. Complying to the PIDIRFEN project was detailed as compulsory to secure food rations and the college dormitory funding. These two securements are vital to students from low-income backgrounds and are, again, two of the features that define rural teacher colleges.

Gonzalo's concern over the entry of the PIDIRFEN aligns with statements of his peers at other rural teacher colleges. After *escuelas normales rurales* hosted a National Congress,<sup>63</sup> students posted a Declaration, including a rejection of PIDIRFEN project propositions on a Facebook webpage.<sup>64</sup> Even more telling is that this National Congress Declaration is housed under a Facebook student advocacy webpage titled PIDIRFEN. The webpage is exclusively dedicated to informing and halting the PIDIRFEN project developments.<sup>65</sup> Mexican authorities have identified reform-driven changes concerning rural teacher colleges, amongst a myriad of educational institutions. As public institutions, rural teacher college students are caught between funding needs and preserving their defining characteristics. The rural teacher college network, at least, strives to mitigate the entry terms of the reform.

#### **D. Securing New Enrollment Terms**

Student advocacy can only live on if rural teacher colleges sustain their numbers. In the chapter, "Ayotzinapa: La Resistencia Que Se Impone," Flor Goche signals that the subsistence of rural teacher colleges is a point of negotiation.<sup>66</sup> Student petition (*pliego petitorio*) items up for negotiation have included maintenance of tortilla-making machines and laundry centers, and essentials such as lighting, blankets,

<sup>63</sup> A National Congress would convene rural teacher college students in one place.

<sup>64</sup> PIDIRFEN's Facebook Post, last modified January 29, 2016, accessed April 24, 2016, <https://www.facebook.com/Pidirfen-480011678870277/?fref=ts>. Translation by author.

<sup>65</sup> Ibid

<sup>66</sup> Goche 138.

and medications.<sup>67</sup>

By extension, securing the new enrollment terms is one of the most time sensitive and critical issues for normalistas. The *matricula de nuevo ingreso*, or enrollment terms, is the securement for the new generation of students through the budget allotment. The annual enrollment terms are critical for the arrival of incoming students. The new enrollment budget includes the food rations, the dormitory scholarship,<sup>68</sup> and a uniform. Upon reviewing the major *problematicas*, or issues at rural teacher colleges, Gonzalo relays:

GG: I will tell you, most of the time, it is the new enrollment. They [the authorities] don't want to. They do not want to give the enrollment. That's always a problem that the *normales* have, and so there are steps to follow...<sup>69</sup>

Each rural teacher college may have a different student capacity, yet the enrollment terms secured for the Ayotzinapa college is 140 students for the freshman class. Gonzalo presents the issue that government authorities have wanted to take away 20 seats and give them 120 seats in their new enrollment terms.

Gonzalo justifies: We cannot accept 120, it has to be the 140.

Twenty first-year students are critical recruits for the school. If the Ayotzinapa college suddenly decreased its enrollment capacity, a first-year student could find himself at the cut off line, where he would be denied admissions at the college. If a new generation is only 85% as large as the previous one, it could spark a domino effect to continue to cut the number of seats funded in future years. At the Ayotzinapa college, enrollment terms specify 40 seats to be offered for the Bachelor's in Primary Education with an Intercultural Bilingual Focus.<sup>70</sup>

<sup>67</sup> Ibid.

<sup>68</sup> The dormitory scholarship is the securement of a dormitory space at the college, and not necessarily a scholarship, or financial award, directly to the student.

<sup>69</sup> "Gonzalo Guerrero," February 13, 2016.

<sup>70</sup> The designated number for the new generation at the Ayotzinapa college is 140 incoming students. See Ayotzinapa's Facebook Page, "Convocatoria para el Ciclo Escolar, Escuela Normal Rural "Raúl Isidro Burgos de Ayotzinapa, GRO," last modified May 14, 2016, accessed May 20, 2016, <https://www.facebook.com/151321948310408/photos/pcb.886590131450249/886590108116918/?type=3&theater>. Translation by author.

Meanwhile, the remaining 100 students are part of the Primary Education Bachelor's pool. A cut in twenty seats slashes the capacity of both degree programs and can adversely affect the already small pool of Spanish-indigenous language bilingual students. Furthermore, during a student's career at the rural teacher college, the new 140 students fill classrooms and keep traditions alive, such as the sports teams and cultural clubs. Students also take care of animals, cultivate crops, manage the cafeteria, form committees, and fill all the other roles that facilitate running the college. The confidence with which Gonzalo says that the Ayotzinapa college needs a full generation of 140 students, and no less, is an assurance that the college needs to maintain strong numbers.

A Communications Release is instrumental toward visualizing enrollment negotiations in the Saucillo College, Chihuahua, in one of Mexico's northernly states.<sup>71</sup> In February 2016, a Communications Release emerged by normalistas from the Saucillo rural teacher college.<sup>72</sup> See Appendix B for a full translation of the original text. While the Communications Release circulated on various webpages, the Release contains inclusive terms such as "we" and "us," from a direct student perspective. The Communications post can be summarized as follows:

1. Defining students' attempts to settle the enrollment budget in an environment where education authorities are dismissive.
2. Addressing the way students are discredited and called criminals.
3. Affirming that the Mexican Constitution and other international forums are fundamental to student demands.

Looking at the Communications document in depth, paragraph 1, outlines how the Saucillo college demands align with the necessities identified by Gonzalo, which include the securing of the new enrollment budget, food, and infrastructure. These are the essentials. Paragraphs 2 and 3 report that bringing in the new generations of students relies on the ability to secure an incoming budget. Paragraph 4 affirms

<sup>71</sup> The text title translates to Communication Release by the Saucillo Rural Teacher College.

<sup>72</sup> The Communication Release circulated on various Webpages. See Redacción Desinformémonos, "Normalistas de Saucillo: '¿Pueblo, crees que un estudiante que sólo lucha por sus derechos, merece este desprestigio?'" *Desinformémonos*, February 8, 2016, <http://desinformemonos.org.mx/normalistas-de-saucillo-pueblo-crees-que-un-estudiante-que-solo-lucha-por-sus-derechos-merece-este-desprestigio/>.

that Constitutional rights protect student access to education and are reinforced by international forums. Paragraph 5 brings forth the unique term of how normalistas have been called “pseudo-students.” The concept of pseudo-students has connotations of disapproval. Rather than discrediting the Political axis of the rural teacher colleges, the pseudo-student terminology is an affront to the Academic axis of teacher formation. In response, the Communications Release argues that normalistas dedicate tremendous parts of their day to their studies. Together paragraph 5 and 6 express how authorities view normalistas as criminals putting on a façade as students. The post ends with the question : “Community, do you think a student who only fights for his or her rights, deserves this discredit?”

In all its features, the Communication Release is framed in terms of rights and opportunity. In the absence of wide media coverage on the negotiations, students self-generate their own publicity. The intended audience is naturally other normalistas and individuals implicated in the outcome of events at the Saucillo college. The Communications Release could even serve as a text template for other student releases, as securing new enrollment terms is an issue faced by students constantly. The release has a community utility for sharing across the network of normalistas. While a government keeps public records, the Communication Release is time stamped with its own upload date, making it an independent public document tracker. In the body of the release, there are clear signposts and dates showing how long negotiations have been ongoing, perhaps a nod to other colleges about Saucillo’s timeline. What may seem like the ordinary task of posting on Facebook becomes an act of student advocacy that the newer generation of normalistas is well versed in using.

In the absence of negotiations and student advocacy evident in the Communications Release, students run the risk of not securing their enrollment terms. Gonzalo worries what would occur if normalistas did not have a political formation and cites the Saucillo college as a hypothetical example,

Gonzalo emphasizes: If one does not have a political formation, easily, when going to put in the petition, in the negotiations, they can lie to you easily. And you don’t know where to go.

EC: In what way can they [authorities] fool you? By not knowing the information?

GG: For example, the peers from Saucillo, they might have

fooled them. They [authorities] could have said to them, “there aren’t any resources, and I am not giving any.” And they, could have just stayed with that, “there isn’t any, oh well.” But they wouldn’t know how to organize: an activity, an attention, so they could take up the petition again. Because it has already happened in other *normales*. And each time they are going down more. And that is what I fear, too.<sup>73</sup>

Gonzalo can step back and assess the outcome at a sibling institution, should students not know procedures to handle a negotiation. By pointing to “political formation,” Gonzalo alludes to a student’s ability to conduct student advocacy negotiations or request a hearing with authorities. This advocacy requires learned skills from the Political axis of the college and shared knowledge from students to students.

Student advocacy to secure enrollment terms runs the risk of oversight when skimmed into mere funding technicalities. Yet the Communications Release by the Saucillo college is a reminder that nestled in securing enrollment terms are broader discussions of student discredit and college recognition.

### **E. Reactions to Abuse or Use of Force Directed At Students**

While the case of the missing 43 students included severe human rights violations, there are instances of police brutality that students respond to as part of commission work. As part of the student Federation, FECSM’s Central Committee, Gonzalo explained one commission that supported Tiripetío college students, from the state of Michoacán, after they were beaten up in 2015.

Gonzalo G: On September 25, when comrades from Tiripetío Michoacán, were doing activities to go to the march of September 26, for the first anniversary. When they took buses, police grabbed them inside the buses, and beat them up real bad. They threw tear gas on them. And the ones they got, they took them in patrol cars and they did not take them to the headquarters. They simply beat them up real bad, and they went along throwing them on the road, the comrades.

<sup>73</sup> “Gonzalo Guerrero,” February 13, 2016.

Elizabeth C: Oh man.

GG: And we went to see the *problemática* [issue] they had. How many guys were beaten. Start to lift a complaint. That's why we were in the human rights commission too. That was another *problemática*.

EC: The CNDH? [Nacional Human Rights Commission of Mexico / *Comisión Nacional de los Derechos Humanos*]

GG: No, no , no CNDH no. Centroprodh, Tlachinollan. Non-governmental institutions.

EC: ...In the end, how was that issue resolved, what ended up there? Or is it still in process?

GG: They had to cover the costs; if [police] arrested them, well they had to take them to the guardrail. And not throw them on the road when the pickup was moving. They would throw them out the pickup, yep.

EC: So, no apology, none of that? Just the financial reparations? For what they did.

GG: No, well, they only covered the costs, the doctors, that is it...just the medical bills there at the hospital.<sup>74</sup>

A more extensive report would clarify the details of the beating of the students in Michoacán. The national student Federation, FECSM, has systems in place to respond to use of force and abuse directed at students. As a FECSM Central Committee member, Gonzalo was on response team who supported the Tiripetío college on behalf of a sibling rural teacher college. Maintaining the student-run Federation means normalistas retain an organizational platform.

While new instances of abuse toward Ayotzinapa college students would prompt a sharp focus on the college given its global exposure, it is dubious to conjecture that sibling rural teacher colleges would garner the same level of international attention. For someone like Gonzalo who supports sibling rural teacher colleges, the Ayotzinapa college becomes one actor in its network. Occurrences of abuse directed at normalistas are reminders that these students operate under abuse and use of force, collectively.

Summarily, the five advocacy issues identified in Part One are student agency over their portrayal and image; keeping the doors of their

<sup>74</sup> "Gonzalo Guerrero," February 13, 2016.

colleges open; responding to incoming changes in Mexican education reform; securing new enrollment terms, and responding to use of force or abuse. Before delving into student advocacy strategies, it is worthwhile to revisit the student advocacy issues which were categorized into 1) structural issues related to education and funding mechanisms, 2) responses to media discredit, and 3) reactions to physical force.

## **Part Two: What are the Strategies Students Engage in to Promote Advocacy Issues?**

Identified student advocacy issues call for an in-depth exploration of student reactions, responses, and mobilizations. In answering the second research questions, “what are the student advocacy strategies student engage in to promote advocacy issues?,” strategies were chosen due to their likelihood in being employed by multiple rural teacher colleges. That students have such diverse strategies speaks of their ability to be innovative, often in the absence of resources. Part Two highlights six advocacy strategies employed by normalistas. The strategies are categorized as follows: hosting socio-political events; utilizing community transportation; going on a commission; moving on the escalating ladder from negotiations to last resort activities; responding to both food ration cuts and college occupations; and directing a student radio station.

Given limitations, not all strategies were addressed in this study. Additional student advocacy strategies include: community meetings or *mitins*;<sup>75</sup> marches and protests;<sup>76</sup> occupation of public or government facilities; labor strike or lockout;<sup>77</sup> national congress meetings of rural teacher colleges,<sup>78</sup> and traveling caravans to other regions and advocacy tours. Naturally, social media posts are considered a student advocacy strategy due to their ability to circulate news and act as public records.

<sup>75</sup> Reunions where political or social issues are publicly discussed. See “*Mitin*,” The Free Dictionary, accessed May 5, 2016, <http://es.thefreedictionary.com/mitin>.

<sup>76</sup> Marches include ongoing events for the Global Action for Ayotzinapa.

<sup>77</sup> A Labor Strike or Lockout is when students take the schools, close them, and put a labor strike or lockout for perhaps a month or an indefinite amount of time until a petition is resolved. “Gonzalo Guerrero,” February 13, 2016.

<sup>78</sup> Multiple rural teacher colleges, with possible inclusion of other teacher-training institutions, convene a National Congress meeting. Online analysis revealed multiple declarations and statements released from these meetings.



The list of strategies was generated from interviews with Gonzalo and, for some, due to their visibility on social media webpages.

### A. Hosting Socio-Political Events

As part of student advocacy, normalistas host socio-political events. These events are vital in local community representation and recognition. The events address the portrayal of rural teacher college students in the media, frequently a topic of misperception. In a discussion of socio-political events, Gonzalo shared how these events showcase the Cultural axis of rural teacher colleges, and how he has witnessed their ability to change community perceptions of normalistas.

Gonzalo G: In the socio-political events, dances, the band, are used to get the attention of people. To a certain point, on the *problematica* [issue] and for people to learn about our Cultural axis.

Elizabeth C: The Cultural axis. So you go to a plaza, or what does that look like?

GG: A public square, *un zocalo*, anywhere. We assemble a stage. The guys they do, the band plays, the dance club, dances. The people, the community, the towns sees that we are not only dedicated to marching. To win the support of the people.

EC: ...to demonstrate the different axes of the *normales*. After that, you have a little hearing.

GG: A *mitin*, a little meeting.

EC: And how do you involve the community in that? Like, by microphone, you start talking? What is that like?

GG: We share so they have awareness. To not believe the lies the television says, well, that the television here in Mexico says. So they know in reality how things come to affect us. Because public opinion is very important.

GG adds: aaah, for example, on one occasion we got to go play in Acapulco, in the public square. People, they received us. At first, people were surprised because they have seen us on the newscasts that we march and we block. And everything. We go dance and things like that. They looked at us with fear. And then after they saw that the guys perform well in their dance roles, they began to clap for them. "You guys have a lot of talent. Word hard. Forgive us for

the way we had reacted.” That is what a lady said to us.<sup>79</sup>

In Gonzalo’s example, a socio-political and cultural event was effective in shifting public perceptions of the Ayotzinapa college, demonstrating the power of community engagement. As a form of student advocacy, socio-political events have the ability to counter narrow portrayals of rural teacher colleges in the media. When asked how many of these events he has taken part of, Gonzalo replied chuckling that he’s been part of quite a few.<sup>80</sup>

Socio-political events are organized by individual *escuelas normales rurales* or by the national student-run Federation, FECSM, in a wider initiative.<sup>81</sup> While Gonzalo devotes his time as a politically active student at the Ayotzinapa college, his fellow peers can specifically practice for public exposition. Students who take part in cultural clubs will likely retain these performing skills and talents for years to come, possibly even incorporating them in their teaching or future careers. Online analysis identified webpages specifically devoted to the cultural clubs; one page highlighted cultural clubs in the Mactumactzá college in Chiapas while a second page was titled for a musical band from the Tiripetío college in Michoacán, the latter page active in 2013.<sup>83</sup> Online webpages with cultural club elements illuminate the way student roles weave together. By expounding the different axes of these colleges, cultural events serve as socio-political spaces and enrich community understanding of this model of education.

## **B. Community Transportation: Asking for *Raite***

When students borrow buses for transporting large numbers of students, they typically ride commercial buses from the region. International media has tended to emphasize the borrowed bus process because Ayotzinapa normalistas were riding on buses on September 26, 2014 when they were attacked. In the media, the terms used to describe the

<sup>79</sup> “Gonzalo Guerrero,” February 13, 2016.

<sup>80</sup> *Ibid.*

<sup>81</sup> *Ibid.*

<sup>82</sup> Clubes Culturales Escuela Normal Rural Mactumactzá’s *Facebook* Page, accessed May 19, 2016, [https://www.facebook.com/Clubes-culturales-escuela-normal-rural-mactumactz%C3%A1-496935037031211/?ref=timeline\\_chaining](https://www.facebook.com/Clubes-culturales-escuela-normal-rural-mactumactz%C3%A1-496935037031211/?ref=timeline_chaining).

<sup>83</sup> Banda Banda De Tiripetío’s *Facebook* Profile, accessed May 19, 2016, <https://www.facebook.com/banda.bandadetiripetio>.

student command of buses range from “hijacking” to “borrowing,” each with its own connotations attached in the minds of readers. Gonzalo elaborated on the strategies when normalistas literally stop a bus on the road. At the time of the last interview, bus companies informally acknowledged the student practice. Additionally, students need diesel for the buses which is informally managed. Gonzalo conveyed a hypothetical dialogue when normalistas have set terms that they would not take a bus, yet instead ask for diesel to fuel the vehicle they are already riding on.<sup>84</sup> That students do continue to borrow buses is reflective of financial limitations to carry out normalista activities.

While bus-riding practices are one mode of transportation, it should not be oversimplified as the only alternative students have to travel. In a distinct transportation practice, students go to great lengths to request rides when they are traveling in smaller numbers. To avoid costs or toll expenses, students move about the country by asking for rides from the side of the roads to travel to other colleges. This distinct practice might appear similar to hitchhiking, from a United States perspective, yet the terminology employed by normalistas for asking for a ride is *pedir raite*, used from this point forward. The Spanish phrase relays the sentiment of request and exchange from community members to normalistas.

Gonzalo explained the process of requesting rides to carry a Central Committee commission under FECSM, the national student Federation. Gonzalo’s role in FECSM’s Central Committee is a particular normalista experience meaning he likely traveled more than his peers did. Gonzalo shared how he could be in Guerrero one day, then the next day going to Tlaxcala and then heading to the state of Durango, to demonstrate the movements he would make across Mexico. A journey by *raite* alone can make up half a journey and take hours of a student advocacy activity.

Gonzalo G: It will seem strange to you what I am going to tell you. You know the FECSM [national student Federation], and this about the *normales*, and it makes the country small...We talk about these schools as if they were around the corner, or twenty minutes out, something like that. We aren’t, like, “man, it’s so far!” Not at all.

Gonzalo roleplays a dialogue with a fellow normalista :

<sup>84</sup> “Gonzalo Guerrero,” April 29, 2016.

“Hey where you at? I am over in Chakán, in Campeche. And you? Where you at? Here at El Quinto, here to see...” Like that.<sup>85</sup>

Gonzalo’s hypothetical example of calling his peers by telephone was intended to give the author a sense of how students are accustomed to reaching out to each other. Gonzalo’s examples included the Hecelchakán college, in Campeche and the El Quinto college, in Sonora. A purposeful choice by Gonzalo as he selected the two colleges located on complete opposite sides of the country. Despite the distance, normalistas hold an assurance that somehow, even if it takes a long time, they will find themselves from one far way college to another. Inquiring more about asking for *raite*:

Elizabeth C: Do you go alone out to the schools?

GG: Oh, no, I go with a commission, always. Another person for commission. Because traveling alone, no no no. Being a man too, it’s even more difficult. For the students who are women, they can get a *raite* a lot faster. For us it takes a while. There have been times we are asking for *raite* for up to 18 hours, and we don’t get it...

EC: That’s an entire day!

GG: Yep, it’s complicated.

Yet waiting for long stretches of time is one of the several caveats that can befall normalistas on the road.

GG: “We are told, where to ask and where not to ask. We know that, by order, we can ask for a *raite* at the end or beginning of a tollbooth. If you start walking you are less likely to get picked up. In order to go to Tlaxcala, we get the booth going to Puebla. The worst mistake we can make in a *raite* is to start walking.”

In improving their chances, students wear their normalista jackets. The community reaction to student attire has prompted drivers to be willing to pick up them up on the side of the road.

Gonzalo describes how drivers tell him: “In general, I don’t pick up, but a person can see in your presentation, that you have the look of a student.”

EC: Ahhh, so it’s the uniform. Have you gotten good rides, as in, good people who pick you up?

<sup>85</sup> “Gonzalo Guerrero,” February 13, 2016.

GG: I'll tell you what, I have not gotten any that go really bad. There are colleagues who have had bad experiences.<sup>86</sup>

Gonzalo adds that on some occasions, he has even been invited to eat or something of that nature. Considering limited perceptions of normalistas in the media, the author asked Gonzalo if someone had ever said anything offensive to him while asking for *raite*. This line of inquiry resulted in Gonzalo explaining two cases in which peers had serious and dangerous experiences. He recounted how normalistas from a Michoacán delegation, Tiripetío, on one occasion, had a driver who went on frenzy.

Gonzalo outlines: The truck drivers, sometimes they do drugs to stay awake and so this one driver started attacking them with an icepick...The guys, they got off of there, off the truck.

In a second example of a rural teacher college delegation on the move, Gonzalo detailed how students were almost ran over by a trailer. Normalistas were beaten up by the incident, where a trailer grazed them while going at a high speed. When the author inquired if Gonzalo worried about his safety, or his family, he reverted to an upbeat tone, switched on in an instant.

GG: Always with a positive mind. .... yes. We are always in the positive. We say, "things will go well for us." Because if you despair... because, apart from being stressful, time just slows down.

EC: Do you get on those little packing trucks?

GG: Yep. Anything. Sometimes a personal car, family, It doesn't matter if it's an old turtle. Garbage truck, doesn't matter. Wherever they give us a ride, we'll go on it. The point is getting there.<sup>87</sup>

Clearly, students are determined to support each other through distances bridged through a shared normalista experience. Online analysis tracked a webpage directed specifically at student movements and transportation. As part of the network of rural teacher colleges, the webpage is titled: *Normalistas Somos y en El Camino Andamos*, or "We are Normalistas and We ar

<sup>86</sup> "Gonzalo Guerrero," February 13, 2016.

<sup>87</sup> Ibid.

e on the Road.”<sup>88</sup> One webpage post highlights a picture of the back of a trailer with a caption outlining that a normalista is recognizable when he or she smiles when a trailer stops.<sup>89</sup> Along with Gonzalo’s experience, the webpage highlights a broader permeation of normalistas asking for *raite*.

Under financial limitations, students asking for *raite* manage to work around lack of transport vehicles and fuel purchases. Despite the dangers students have faced in the past when travelling, Gonzalo is upbeat about asking for a *raite*. He and his peers are undeterred in a transportation maneuver that exhibits tremendous courage in order to engage in student advocacy.

### C. Going on a Commission

One of the purposes of asking for *raite*, or ride, is to go on a commission to a sibling rural teacher college. When applied to a trip, going on a commission means normalistas travel to another college to address an issue of concern.<sup>90</sup> While not always the case, issues that prompt a student-led commission include responding to abuse or use of force by authorities. Yet an array of issues can lead normalistas on a commission. Oftentimes, commissions form part of information collection trips and extensions of support on behalf of FECSM, the national student Federation. Gonzalo detailed one of his visits to the Tamazulapan rural teacher college, in Oaxaca, to describe how students go on a commission. Gonzalo takes a college peer on the commission with him, as he previously mentioned not traveling alone. When students arrive, they speak with student representatives, such as Secretary Generals, or delegates for the college.

Elizabeth C: When you arrive to see a problem, what is the process that you do?

Gonzalo G: When we went to the Tamazulapan *normal* in Oaxaca, I went with another person. We arrive outside the

<sup>88</sup> Normalistas Somos Y En El Camino Andamos’*Facebook* Page, accessed May 19, 2016. [https://www.facebook.com/Normalistas-somos-y-en-el-camino-andamos-495230930622631/?ref=timeline\\_chaining](https://www.facebook.com/Normalistas-somos-y-en-el-camino-andamos-495230930622631/?ref=timeline_chaining). Translation by author.

<sup>89</sup> Normalistas Somos Y En El Camino Andamos’*Facebook* Page, last modified April 27, 2016.

<sup>90</sup> Commission is *una comisión*.

school. We never go inside, always from the outside. We call the delegate [male or female]. And [say] “we’re here outside the school, we’re from the Central Committee, we came to see the *problemáticas* [issues].” And they go get us. They bring us inside their school. They take us to an assigned area, a visiting room, or something of that the sort. They leave us there. We request a meeting with their Secretary or their Secretary Generals. Then they give us, the breakdown of information, of the current situation at their school. Then after, we ask them how we can be of help. What help is needed? What information do you know? Then they tell us, say, they tell us they want a press conference. So we convene it. They want us to call the other *normales*, we convene them too. Like that.<sup>91</sup>

Students who go on commission facilitate the resolution of student advocacy issues, acting as a form of intermediary from a sibling rural teacher college. Under Gonzalo’s example of convening a press conference for peers in Oaxaca, this type of activity would, by design, gather community support, restart negotiations, or ensure fair coverage of an issue. The commission can kick-start the dissemination of issues across the student network of rural teacher colleges. That Gonzalo represents a designated committee in the national student Federation, FECSM, shows the linkages across campuses and the coordinated student-run systems.

The commissions are not end goals but spur future activities. Upon closer analysis, normalista commissions form one rung of an escalating ladder of student advocacy.

#### **D. The Escalating Ladder: From Negotiations to Last Resort Activities**

Viewing student advocacy as a ladder, student activities escalate based on government or community responses. As students assess authority and media reactions to mobilizations, a student advocacy issue would plateau through resolution. When an advocacy issue is not resolved, it may move to higher steps on the ladder in student organizing.

<sup>91</sup> “Gonzalo Guerrero,” February 13, 2016.

Elizabeth C: What is an example of an issue? And the follow up you did in respect?

Gonzalo G: ...[the new enrollment] is always a problem the *normales* have, and so there are steps to follow. First, there are the negotiations, the negotiations with the Secretariat. When this negotiation is broken, they begin the mobilization. First, it starts with a diffusion of the issue. And it creates the conditions. You begin to *botear* [to raise funds / economic collective<sup>92</sup>], to take trucks of products. When we start a movement, each school has its rations cut. The state cuts the cafeteria. They say, "Ah, you will not go to class. Okay. We will not feed you." They cut the rations. So you, do *boteo* [raise funds]. You disseminate the issue. You begin to coordinate conditions for us to go to a movement. Then the movement starts, there you have the marches, some blockages. *Depending on the answer from the state, is how the activities go intensifying*. Until, as a last resort, occupying facilities or something of that sort. That is the very last thing, to call attention.<sup>93</sup> [emphasis added]

In a follow up interview, the process of an escalating ladder in student advocacy was affirmed. One interview reviewed the 2011 road blockage by Ayotzinapa college students, when two students were killed. Gonzalo outlined that normalistas, at the time, were calling for a hearing with the then-Governor Aguirre. For the 2011 blockages, Gonzalo noted the student advocacy issue was, once again, *la matricula*, or securing the new enrollment terms.

GG: They had their demands since September [a couple of months prior]. They went out in reference to then-Governor Aguirre. He cancelled on three occasions the hearings with the guys. And because the holidays were coming, the guys saw themselves obligated. To block the road.<sup>94</sup>

Gonzalo accentuated how students were collaborative with government authorities in the early stages of the escalating ladder.

GG: While holding hearings, it is in a good manner. They canceled one time, that's fine. There was an unforeseen

<sup>92</sup> Goche, 137.

<sup>93</sup> "Gonzalo Guerrero," February 13, 2016.

<sup>94</sup> "Gonzalo Guerrero," April 29, 2016.



circumstance. Canceled twice, you start notifying the [student] base. It's probably going to movement. So you start the diffusion of everything, right. You take to the radio. You start to tell the community what is happening. If they cancel the hearing again, then the response is stronger. Like occupying units or road blockages. Until they listen to us. Otherwise, they don't listen to us.<sup>95</sup>

When the author asked Gonzalo how the community reacts during road blockages he stated:

GG: Yes. Unfortunately. Many people support. Others are in opposition because, yes, it is bothersome. We understand. I have been in the middle of other blockages. It's bothersome. But it was the only way to call attention.<sup>96</sup>

The escalating ladder, used in decades past, remains visible today. Writing in a historiographical lens, Padilla reports how rural teacher colleges take part in a range of activities from peaceful demands to intensified efforts. Padilla examines official reporting that framed the government representation of normalistas and student activism in the era of 1960 to 1980.<sup>97</sup> Padilla emphasizes one series of efforts from September 23, 1965, that included normalista involvement in assaulting military barracks in Ciudad Madera. Padilla addresses the "...long process of peaceful organising that culminated in the assault of the military barracks..."<sup>98</sup>

Ultimately, she reviews, "[d]econtextualised from the long history of peaceful mobilisations, this attack would confirm official narratives about *normalistas* as misguided adventurers who coaxed peasants into a suicidal mission against the government. Yet, the state's own records reveal a different picture—one in which the government was unwilling to enforce the Constitution and met peaceful appeals with force."<sup>99</sup>

<sup>95</sup> Ibid.

<sup>96</sup> Ibid.

<sup>97</sup> Tanalis Padilla, "Espionage and Education: Reporting on Student Protest in Mexico's Normales Rurales, 1960–1980." *Journal of Iberian and Latin American Research* 19, no.1 (2013): 22. doi:DOI: 10.1080/13260219.2013.805717.

<sup>98</sup> Ibid, 22.

<sup>99</sup> Ibid.

While today's Ayotzinapa college students are not assaulting military barracks, Gonzalo reinforced that blockages are a last resort effort. Compared to Padilla's case from 1965, the escalating ladder of advocacy still stands.

In the face of inadequate (or a lack) of response from authorities, students engage in activities they feel compelled to undertake, simply to be heard. In the examples he provided, Gonzalo situated blockages and facilities occupations toward the end of the escalating ladder, in a progression of strategies to garner resolution to student demands. Student advocacy begins with petition demands (*pliego petitorio*) in negotiations and by sitting down to a hearing, actions that begin peacefully. While media can hone in on student blockages and more intensified acts, these are not the first strategies students employ for recognition.

### **E. Responding to Food Ration Cuts and College Occupations**

A common response by authorities to student advocacy is cutting food rations when normalistas mobilize. The cut of food rations prompts even more student reaction. Illuminating barriers in 1965 faced by normalistas, Padilla outlines, "...various strategies employed by local, state and federal authorities against *normalista* activity. These tactics included withholding students' food at the *normales*' cafeteria... even shutting down the schools' dormitories."<sup>100</sup> Padilla's account regarding the 1960s era aligns closely with the actions taken by the government and police today to shut down or deflect student demands. In a dialogue about the escalating ladder in student advocacy strategies, the author posed:

Elizabeth C: So you guys do the activities. Their reactions to them can be, as you said, cutting food rations, do they cut something else?

Gonzalo G: For the students only. The food rations. Because that is what affects us.<sup>101</sup>

At the Ayotzinapa college, students are allotted 50 Mexican pesos a day. If student rations are cut, then the director's office no longer gets resources, which arrive monthly. While administration is in

<sup>100</sup> Ibid.

<sup>101</sup> "Gonzalo Guerrero," February 13, 2016.

charge of purchasing food, normalistas ensure students get three meals per day.<sup>102</sup> When rations are cut, it reveals how a secondary advocacy issue emerges within a primary advocacy activity. As students may use strategies of their predecessors, the authorities follow suit in their own precedent of cutting food rations. In analyzing the escalating ladder, it was noted previously how students raise funds, or do *boteo*, to offset the food rations cuts. What's more, a cut of food rations can become one component of a facility occupation, or strike by students. Gonzalo adds:

GG: And, if we occupy the school, it is at the ready for an eviction order. Because they say "if you're not studying, what are you doing within that school, no?" They are always on ready, for the eviction order.

EC: They have policemen, or who comes to tell you that?

GG: Riot police, riot police arrives. They come and say, "well, you have so long, or have such and such minutes to leave the school. Or reopen it. Or we will come in." Obviously, we never give it.<sup>103</sup>

When students occupy their rural teacher college, one of the highest rungs in the escalating ladder is reached. Earlier, Gonzalo noted that occupying facilities<sup>104</sup> was a "last resort" which is understandable given the government's utility of riot police. In particular, the occupation at an escuela normal rural holds multi-dimensional significance. Not only is an occupation part of a ladder in student demands, it can be identified as a protective act and one of ownership. Occupying one's own school indicates it could be a safer place than most and a home. Over the course of interviews, it became evident that Gonzalo understands the Ayotzinapa college as a student-run place, as an academic space and an organizationally managed place, with its clubs, committees, and distinct student roles. Thus, the act of occupying an escuela normal rural, especially demonstrates student commitment to the college. Even if students were evicted after an occupation, it would not necessarily break ties a normalista holds with his or her rural teacher college.

<sup>102</sup> Ibid.

<sup>103</sup> Ibid.

<sup>104</sup> Occupation could include a college or building of significance to negotiations. 10.1080/13260219.2013.805717.

## F. Directing a Student Radio Station

The Ayotzinapa college has its own radio station, *Voces Nuestras, Voz de Todos*.<sup>105</sup> or Our Voices, Voice of All Radio. In 2012, a former Ayotzinapa college student leader, Pablo, corroborated the news of the student-driven radio station inauguration. Pablo, reiterated in February 2012 that the generation at the time had made the dream of the station a reality, available under an FM radio frequency and via internet streaming.<sup>106</sup> The radio station was designed as an alternative to commercial radio access and for the defense of the Ayotzinapa college and student causes, amongst other programming, outlined Pablo.<sup>107</sup> In September 2014, when Ayotzinapa college students were attacked and 43 of them were victims of enforced disappearance, the student radio was running. On the night of the attacks, students were receiving messages from peers, and they would share information live via the radio.<sup>108</sup>

The radio is a student advocacy strategy as it is student-driven. Perhaps it is not surprising that the radio station would have a connection to the national student federation, the Federation of Socialist Farmworker Students of Mexico, or FECSM. As declared by student broadcaster, Pablo, FECSM was involved in promoting the project. The Tamazulapan rural teacher college, in Oaxaca, also has a station with emissions by teachers, and sometimes female normalistas, making the Ayotzinapa college station the first station directed by students, Pablo outlined to *La Jornada*.<sup>109</sup>

During the span of interviews with Gonzalo, the topic of student radio surfaced multiple times. In one of the interviews with the author, Gonzalo stationed himself inside the radio broadcasting room, at the Ayotzinapa college. Toward the end of the interview, the author

<sup>105</sup> Voces Nuestras Voz de Todos, "Voces Nuestras Voz de Todos. Ayotzinapa Rural Teacher College. Tixtla, Guerrero, Mexico," accessed January 12, 2016, <http://espora.org:8000/vocesnuestras.ogg>.

<sup>106</sup> Sergio Ocampo Arista, "Normalistas de Ayotzinapa Inauguran Emisora Radial," *La Jornada*, February 4, 2012, <http://www.jornada.unam.mx/2012/02/04/sociedad/035n2soc>. Translation by author.

<sup>107</sup> Ibid.

<sup>108</sup> Maria Arce, "La 90.1, La Radio Que Narró En Vivo La Masacre de Iguala," *Univision*, October 17, 2014, <http://www.univision.com/noticias/noticias-de-mexico/la-901-la-radio-que-narro-en-vivo-la-masacre-de-iguala>. Translation by author.

<sup>109</sup> Sergio Ocampo Arista. Translation by author.

on air. The students in the radio broadcast room worked in anticipation for the programming that evening.<sup>110</sup> Separately, a video was released in July 2015 about the radio station's current work. A "Meeting of Free Press for Ayotzinapa, Guerrero" video displayed, Sergio at work, who is now one of the individuals in charge of running the station.<sup>111</sup> As a broadcaster, Sergio emphasizes the radio is a community station "by the people, for the people." He underscores that the radio at the rural teacher college is important to inform the community about the issues, *la problemática*, at the college, including updating progress on the missing 43 student investigation.<sup>112</sup> The ability to host an independent radio station is a pillar for students to not only share news, but also leave a public record trail. Placing the platform on the internet means virtually any onlooker can tune in.

With an internet link to the radio streaming platform, it was possible for the author to turn to the radio station a few times, listening to an array of Mexican music, and a DJ voice periodically announcing the time in Guerrero.<sup>113</sup> As page errors began to surface on the station internet platform, the author referenced this to Gonzalo in a follow up interview in February 2016. He outlined that he wanted to check with the person who ran the station before confirming the news.<sup>114</sup> By April 2016, Gonzalo affirmed that the radio station was down for the time being. He had more information and explained the Ayotzinapa college's radio transmitter had been damaged and it required funding to get it fixed.<sup>115</sup> For the time being, the radio was down.

In the "Meeting of Free Press" video, Sergio, the student broadcaster, undertakes an ordinary assignment, as he fulfills a song request for a community member.<sup>116</sup> However, students can only connect to community members so long as they are able to broadcast. In the absence of the tools or equipment to run the radio station effectively, students and committee members are left on hold. The radio's transition from fully operational to off-air means one of the windows to learn

<sup>110</sup> "Gonzalo Guerrero," July 28, 2015.

<sup>111</sup> Los Tejemedios, "Radio Voces nuestras, Voz de Todos. Ayotzinapa," *Youtube*, July 26, 2015, <https://www.youtube.com/watch?v=hgOFovtSsd8>. Translation by author

<sup>112</sup> *Ibid.*

<sup>113</sup> Voces Nuestras Voz de Todos.

<sup>114</sup> "Gonzalo Guerrero," February 13, 2016.

<sup>115</sup> "Gonzalo Guerrero," April 29, 2016.

<sup>116</sup> Los Tejemedios.

about the college had shut. This progression of the radio was a reminder of how student advocacy strategies are readily available for periods, and nonexistent in others. Nonetheless, that fact that students were able to mount a radio station speaks to normalista innovation.

Connecting back to socio-political events, the radio station is similarly designed for local community engagement. Both radio and cultural events embody music and other types of entertainment that highlights normalistas in distinct ways to inform public perceptions. In sum, when students ask for a *raite*, or ride, to another rural teacher college, they often set out to conduct commission work embedded in the escalating ladder. As issues advance in negotiations and hearings, multiple student advocacy strategies must be collaborative with authorities. Yet as Gonzalo affirms repeatedly, students feel compelled to undertake more intensified actions to get their demands recognized. When entities such as the national student Federation, FECSM, are involved consistently in advocacy strategies, it signifies deeper integration amongst the rural teacher college network.

## Conclusion

Normalistas continue to advocate for securing their enrollment terms, respond to discredit, and react in the face of abuse or use of force. These young women and men are family members, teachers-in-training, peers, activists, and students who facilitate running and taking care of their colleges. It is vital to recognize and highlight the tremendous undertaking that normalistas engage in as part of their college years. Enveloped in student advocacy, normalistas aim to secure the future of the rural teacher college model and their own opportunity. Gonzalo shared his thoughts about the September 2014 attacks:

Gonzalo G: Personally, I think this is to plant fear in the new generation of the normal. *Because the only way to close this school would be if it no longer had any aspiring students, that it didn't have students who wanted to be here.* They have attacked us. First this great discredit and now this huge fear shock to the future students of Ayotzinapa.

<sup>117</sup>[emphasis add]

The 2014 attacks on Ayotzinapa students brought global

<sup>117</sup> “Gonzalo Guerrero,” July 28, 2015.

awareness to one rural teacher college, yet it also prompted fear amongst normalistas-to-be. Never forgetting the crimes from September 2014 means addressing how these attacks are embedded in rural teacher college sustainability.

If one can picture a day in the future when the missing 43 students filled their chairs at the Ayotzinapa college, it would be a long-awaited day for the entire international community. Having the students return alive has been the mission of parents, families, and survivors from the beginning. The September 2014 attacks on students are emblematic of human rights abuse across Mexico. Seeing this case brought to justice could prompt a revival of hope and a push to investigate other human rights investigations.

However, the discussion about Mexican rural education must continue to evolve. This discussion must be inclusive of the missing 43 students, their peers, and families. What would supporting the missing 43 students look like? What needs to be done for their peers across the rural teacher college network? For aspiring normalistas from low-income and farmworking backgrounds?

Student advocacy by normalistas has been pointing to structural barriers stemming from the government and media outlets and descending from historical patterns. Student advocacy strategies are the signposts directing issues of educational opportunity, access, and recognition. There is space for national, and international, solidarity in supporting and protecting education, which is in itself a human right.

### References

- Agencias. "2 de Octubre, 46 Años Después de La Matanza de Tlatelolco." *Vanguardia*, October 2, 2014.
- Aguilar Mora, Manuel and Claudio Albertani, eds. *La Noche De Iguala Y El Despertar De México : Textos, Imágenes Y Poemas Contra La Barbarie*. Mexico: Juan Pablos Editor, 2015.
- Arce, Maria. "La 90.1, La Radio Que Narró En Vivo La Masacre de Iguala." *Univision*, October 17, 2014.
- Archibold, Randal C. "43 Missing Students, a Mass Grave and a Suspect: Mexico's Police." *The New York Times*. October 6, 2014.
- Associated Press. "Students lie dead in a Mexican street after clash with government officers 'over education standards.'" *Daily Mail*, December 13, 2013.
- Blacker-Hanson, O'Neill. "La Lucha Sigue! = The Struggle Conti-

nues! : Teacher Activism in Guerrero and the Continuum of Democratic Struggle in Mexico.” Doctoral dissertation, University of Washington, 2005.

Dictionary. “Hotbed.” *Dictionary.com*. Accessed May 1, 2016. <http://www.dictionary.com/browse/hotbed?s=t>.

“El desmantelamiento de la Normal Rural de El Mexe, por Osorio Chong.” *Centro Medios Libres*, October 4, 2014. <https://www.centrodemedioslibres.org/2014/10/04/el-desmantelamiento-de-la-normal-rural-de-el-mexe-por-osorio-chong/>.

Encuentro Nacional de Egresados de Escuelas Normales. “Petición Por La Reapertura De La Escuela Normal Rural ‘Luis Villarreal’ De El Mexe, Hgo.” *Change.org*. Accessed January 12, 2016.

Facebook Inc. “Ayotzinapa’s Facebook Page.” Convocatoria para el Ciclo Escolar, Escuela Normal Rural “Raúl Isidro Burgos de Ayotzinapa, GRO.” Last modified May 14, 2016. Accessed May 20, 2016. <https://www.facebook.com/151321948310408/photos/pcb.886590131450249/886590108116918/?type=3&theater>.

Facebook Inc. “Banda Banda De Tiripetío’s Facebook Profile.” Accessed May 19, 2016. <https://www.facebook.com/banda.bandadetiripetio>.

Facebook Inc. “Clubes Culturales Escuela Normal Rural Mactumactzá’s Facebook Page.” Accessed May 19, 2016. [https://www.facebook.com/Clubes-culturales-escuela-normal-rural-mactumactz%C3%A1-496935037031211/?ref=timeline\\_chaining](https://www.facebook.com/Clubes-culturales-escuela-normal-rural-mactumactz%C3%A1-496935037031211/?ref=timeline_chaining).

Facebook Inc. “Escuela Normal Rural ‘Raul Isidro Burgos’ de Ayotzinapa Guerrero’s Facebook Page.” Last modified April 22, 2016. Accessed April 22, 2016. <https://www.facebook.com/Escuela-Normal-Rural-Raul-Isidro-Burgos-de-Ayotzinapa-Guerrero-629959897134366/?fref=nf>.

Facebook Inc. “Normalistas Somos Y En El Camino Andamos’ Facebook Page.” Accessed May 19, 2016. [https://www.facebook.com/Normalistas-somos-y-en-el-camino-andamos-495230930622631/?ref=timeline\\_chaining](https://www.facebook.com/Normalistas-somos-y-en-el-camino-andamos-495230930622631/?ref=timeline_chaining).

Facebook Inc. “PIDIRFEN’s Facebook Post.” Last modified January 29, 2016. Accessed April 24, 2016. <https://www.facebook.com/Pidirfen-480011678870277/?fref=ts>.

FECSM. “¿Movimientos O Movilizaciones Estudiantiles?” *Contralinea*



- Revista*. Last modified October 9, 2011. <http://www.contralinea.com.mx/archivo-revista/index.php/2011/10/09/movimientos-o-movilizaciones-estudiantiles/>.
- Goche, Flor. "Ayotzinapa: La Resistencia Que Se Impone." In *La Noche De Iguala Y El Despertar De México : Textos, Imágenes Y Poemas Contra La Barbarie*, Edited by Manuel Aguilar Mora and Claudio Albertani. Mexico: Juan Pablos Editor, 2015.
- Gorbea, Gabriela and Noel, Andrea. "Mexico Quietly Placed Archives Related to Its 'Dirty War' Under Lock and Key." *Vice News*, April 1, 2015.
- Granito De Arena*. Directed by Jill Freidberg and Corrugated Films. 2005. Seattle, WA: Corrugated Films. DVD.
- Grupo Interdisciplinario de Expertos Independientes (GIEI). "Informe Ayotzinapa II." Inter-American Commission on Human Rights.
- Hernández, Daniel. "The Lost Boys: A Mexican School Grapples with the Disappearance of 43 Students." *Vice News*, January 6, 2015.
- "Internet Users in Mexico Prefer Mobile Access and Social Media." *eMarketer*, October 23, 2015. Accessed May 16, 2016.
- Kmusser. File:Mexico States blank map.svg. Wikipedia Commons, 2010.
- Los Tejemedios. "Radio Voces nuestras, voz de Todos. Ayotzinapa – YouTube." *Youtube*. July 26, 2015. <https://www.youtube.com/watch?v=hgOFovtSsd8>.
- Ocampo Arista, Sergio. "Normalistas de Ayotzinapa Inauguran Emisora Radial." *La Jornada*, February 4, 2012. <http://www.jornada.unam.mx/2012/02/04/sociedad/035n2soc>.
- Padilla, Tanalis. "Espionage and Education: Reporting on Student Protest in Mexico's Normales Rurales, 1960–1980." *Journal of Iberian and Latin American Research* 19, no.1 (2013): 20–29. doi:DOI: 10.1080/13260219.2013.805717.
- Padilla, Tanalis. Las Normales Rurales: Historia Y Proyecto De Nación. *El Cotidiano*, no. 154, 2009.
- Poy Solano, Laura. "La Jornada: Las normales rurales, semillero de guerrilleros, afirma Gordillo." *La Jornada*, August 6, 2010. <http://www.jornada.unam.mx/2010/08/06/sociedad/035n1soc>.
- Redacción Desinformémonos. "Normalistas de Saucillo: '¿Pueblo, crees que un estudiante que sólo lucha por sus derechos, merece

este desprestigio?”” *Desinformémonos*, February 8, 2016. <http://desinformemonos.org.mx/normalistas-de-saucillo-pueblo-crees-que-un-estudiante-que-solo-lucha-por-sus-derechos-merece-este-desprestigio/>.

Rivera, Jose Antonio. “Mexican investigators fear mass grave might hold 43 missing students.” *The Globe and Mail* (Canada), October 5, 2014.

Roldán, Nayeli. “La travesía de las tortugas, el rostro de los 43 estudiantes de Ayotzinapa.” *Animal Politico*, September 24, 2015.

The Free Dictionary. “Mitin.” *The Free Dictionary*. Accessed May 5, 2016, <http://es.thefreedictionary.com/mitin>.

Voces Nuestras Voz de Todos. *Voces Nuestras Voz de Todos. Ayotzinapa Rural Teacher College. Tixtla, Guerrero, Mexico*. Accessed January 12, 2016. <http://espora.org:8000/vocesnuestras.ogg>.

Washington Office on Latin America. “Analysis and Information on Mexico’s Ayotzinapa Case.” Accessed April 29, 2016.

## Appendix A

### Methodology of Facebook Tracking Pages and Profiles

Eighty-five (85) webpages were tracked on Facebook for an analysis of current content from rural teacher colleges. Within Facebook, Pages, Profiles, and two Groups were tracked. Facebook Pages are public profiles that do not have Facebook “friends,” like individuals, yet collect “likes” from persons who follow their content. Pages are created to represent entities with descriptors labels including Education, School, and Community. Thanks to the “Check-In” feature, it was easy to see individual Facebook users associate themselves to the Facebook Page or Profile related to a rural teacher college. In some cases, students posted a rural teacher college as their “Location.” Unlike Pages, Profiles are individually managed and require approval for access to further content. For Facebook Profiles related to rural teacher colleges, friend requests were not sent. Nonetheless, locating Profiles was useful for a review of its public postings available to the general Facebook community. For college-named Profiles, the author, again, assumed teacher college students were utilizing the Profiles. As if they were a human entity or a participant, Profiles names were “tagged” in content by Facebook users, as if they were people. For example, a Facebook user might “tag” a Facebook Profile of a rural teacher college in a picture, making it clear that the user was doing something related to the school in the photos. A Facebook user might announce “Here with --- *Rural Normal Benito Juarez*” denoting the school as if it were a person. This allowed the college Profile to be *linked* to an array of content beyond what the Profile produced on its own. Facebook Groups allow a select number of individuals to post shared content in a common space. Groups posts may be Open for public review or Closed. Two Groups were located and included in the count.

The interweaving of rural teacher college network made it was possible to track webpages via their online relationships to other colleges. A webpage was more likely to be legitimate when it had an array of affiliations to other rural teacher college webpages, particularly visible when one college Profile was “friends” with another college Profile. Two of the most common features of webpage Profile photos were 1) images of Che Guevara and 2) images of one of the 43 disappeared Ayotzinapa students. Webpages frequently positioned themselves within a social justice dialogue. Posts on student actions gave rural teacher

college webpages a particular identity. Overwhelmingly, pages displayed solidarity and awareness regarding the disappearance of the 43 missing students and the attacks from September 2014.

A pattern was detected with self-reported connections to the national student Federation, Federation of Socialist Farmworker Students of Mexico (FECSM for its Spanish acronym). At least three webpages stated their job description as “Worked at FECSM,” making their affiliation at the forefront of their shared information. Alternatively, the acronym FECSM was located in the names of webpages, indicating a pan-normal audience.

## **Appendix B**

### **Communication Release by the Saucillo Rural Teacher College**

*Note: Translation by the Author*

To the public

1. Since the month of October last year, the *pliego petitorio*, or petition demands, was handed to the education authorities for their analysis. The negotiations began more than 15 days ago, the importance of this document is fundamental, in which we model each of the necessities we have as an institution; the new enrollment, food, infrastructure, school supplies, scholarships and basing ourselves in article 6 of the constitution, which establishes the right to information shall be guaranteed by the state, we demand transparency of the state and federal budget that is given to the normal.

2. We still do not have a response due to the lack of interest and commitment on the part of the state. The Ministry of Education, Culture, and Sport together with the education authorities, have the power to make decisions and solve our petitions, we are not asking for anything that is not just to continue with the decent and free education that we have obtained for 85 years. Young people of low economic resources from the state of Durango, Sonora, Sinaloa, Coahuila, and from all over the state of Chihuahua will benefit with [this education] and who could hardly continue their studies without this great opportunity.

3. Up until today, the negotiations have not been resolved because the education authorities refuse to ensure access to the selection exam, to all the students who count on the approved grade point average. It is worth mentioning that the CENEVAL exam will be what determines enrollment, independent of the high school grade point average, presented by each candidate.

4. When making this petition, we have based ourselves in the third article of the Constitution, which states in its first paragraph, "every individual has the right to receive education", the rights of young people and the fundamental principles of education issued by UNESCO.

5. In addition, we would like to express our profound indignation, before the discredit that we have been subjected to, we have been called pseudoestudiantes, or pseudo-students, when we dedicate more than 8 hours daily to our classes. Disoriented? [feminine conjugation]. Knowing that we have a critical vision of the situation the country is going through, poverty, and the need for our children to receive a decent education.

6. On top of that they treat us like criminals, for having the school watched by "civilians," it not enough for different corporate police elements, violating Article 16, which refers to police harassment.

7. Community, do you think a student who only fights for his or her rights, deserves this discredit?

8. "Here we are, we are the rebel dignity, the forgotten heart of the motherland, our fight is to have us be heard, while the bad government offers lies, our fight is for justice, roof, work, and liberty"

8. *"Aquí estamos, somos la dignidad rebelde, el corazón olvidado de la patria, nuestra lucha es por hacernos escuchar, mientras el mal gobierno oferta mentira, nuestra lucha es por justicia, techo, trabajo y libertad"* (Original quote)

## Acknowledgements

This study was conducted by a student who once had a desk in a Mexican classroom, tucked into a small rural community. I am part of a legacy of campesinos. With the change of the seasons, my father would trade Washington apples for Mexican limes in his calloused hands as our family criss-crossed the U.S.-Mexico border. My parents, brother and sister planted the seeds that inspire this chapter. I express my gratitude to “Gonzalo,” for his generosity in extending time for interviews, amongst all the activities that normalistas as engaged in. The invaluable feedback from Dr. Angelina Godoy, Professor and the Director of the UW Center for Human Rights was indispensable in completing this project. Thank you to Dr. Todd Sperry and our outstanding GSAs Cynthia Simekha and Cyndi Lopez. A warm thank you to the Ronald E. McNair Scholar program for their support throughout my senior undergraduate year.

Elizabeth Castro,  
UW Jackson School of International Studies, Angelina Godoy  
ecastro@uw.edu

Elizabeth will serve as a Fulbright English Teaching Assistant in 2016. She hopes her Fulbright experience in Mexico subsequently enriches her studies at the Harvard Graduate School of Education where she will pursue a master’s degree in Education Policy & Management. She intends to pursue a Ph.D. program in Education Policy with a focus on serving low-income Latinx and Latin American youth and exploring the intersections between civic engagement, student identity, immigration law, and education rights.



# Toxic Stress, Development, and Internalizing Disorders

Victoria Chambers

## Abstract

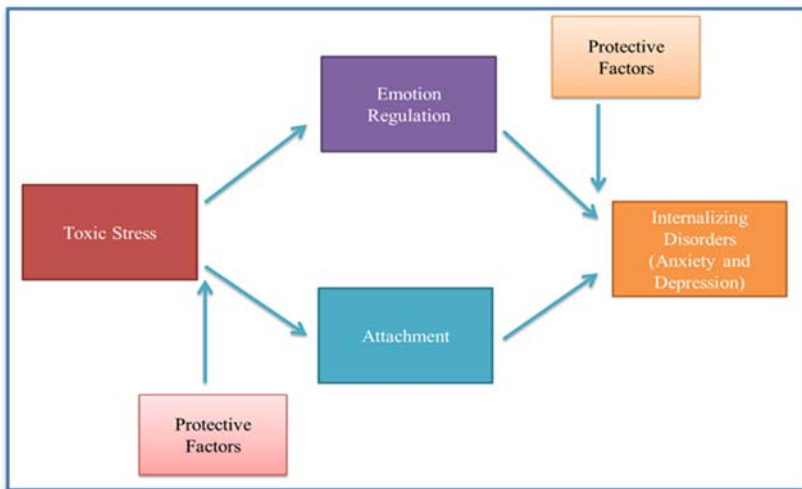
*In recent years there has been much speculation about how events that occur during childhood can have a lasting impact on a child's development. There have been many recent studies that attempt to look at how the impact of child stress affects different parts of development, from physical development (e.g., growth, and body health), psychological development (e.g., neural pathways and memory) and social-emotional development (e.g., relationships and emotion regulation). The purpose of this research was to observe and learn how stress affects emotional and social development and consequently impacts the child's risk for mental health issues. Although stress is a multidimensional concept encompassing the presence of challenging environmental situations, psychological and biological responses to those situations, and perceptions of stress, for the purpose of this research stress was defined as the presence of adverse environmental factors. For emotional social development I specifically examined attachment and emotional regulation. My focus on mental health was internalizing psychopathology, especially anxiety and depression. To gain a better understanding of the emotional social development of a child suffering from toxic stress, I looked at multiple studies already done that observed the effects of stress on a child's social-emotional development. I also used conclusions drawn from experience gained while working at the Stress and Development Lab at the University of Washington directed by Dr. Katie McLaughlin. For this approach I reviewed papers that demonstrated a connection between stress and mental health, between stress and emotional-social development, and between emotional-social development and mental health. I also looked for and identified any factors that showed evidence of mitigating the effects of stress on mental health and social emotional development. These factors were referred to as protective factors. Identifying the aspects of development influenced by toxic stress and the mitigating factors is crucial to creating and implementing intervention techniques to promote healthy development and decreasing the risk of internalizing psychopathology.*



**Introduction**

A report of child abuse happens every 10 seconds, how often child abuse happens can only be speculated. Evidence suggests that about 1 in 10 children suffer from exposure to some sort of environmental adversity. Research has shown evidence of three types of stress: positive, everyone needs a little stress in life; it can be a motivating factor. Tolerable stress, it doesn't have any benefits but is bearable because it doesn't last long and proper protective factors are in place to mitigate the harmful effects. Finally there is toxic stress, which has long lasting consequences. This type of stress has been shown to influence children's development of emotion regulation and attachment styles.

Healthy development of emotion regulation and attachment are critical to mental health. When developed normally these areas of development can provide protection against the onset of anxiety and depression, but when development is disrupted they can create a vulnerability to mental disorders. Protective factors are conditions in the child, family, or society that allow the child to deal more effectively with stressful factors. Protective factors can interrupt the dysregulation of emotion and attachment or protect against the onset of internalizing pathology.



## **Toxic Stress and Emotion Regulation**

Emotion Regulation is defined as how individuals influence the emotions they have, when they have them, and how they experience and express them (Gross, 1998). According to a process model of emotion regulation there are 5 opportunities to regulate emotions: 1) realization of the situation, 2) modification of the situation, 3) deployment of attention, 4) change of cognitions and 5) modulation of responses (Gross, 1998). The ability to regulate one's emotions is an important aspect of development that is crucial to school readiness, success, social competency, and the flourishing development of mental health. Emotion regulation research has looked at the way stressed children experience emotion, their coping strategies, and the response that emotions trigger. Developmental theory posits that emotion regulation begins to develop in infancy and toxic stress might influence the way traumatized children learn to manage their emotions throughout development. Research has found three ways that people commonly use to cope with their emotions: cognitive reappraisal, emotional suppression, and rumination. Cognitive reappraisal is defined as a strategy that involves redirecting a response by reevaluating the emotional stimuli. Emotional suppression is defined as avoiding or ignoring the emotion inducing stimuli and/or the response it may invoke (Kullkarni, 2010). Rumination is defined as the uncontrollable repetition of thinking about one's emotions and problems. Emotional suppression is categorized as an unhealthy coping mechanism because of the impossibility and corrosiveness of the goal. Trying to cope with emotions by pretending they don't exist has been perceived to express greater negative emotion, worse interpersonal functioning, and related negatively to well-being (Gross, 1998). Emotional Rumination has been shown to be a primary response among victims of abuse and has been shown to increase negative cognitive styles (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008).

Studies found that sexually maltreated children were more likely than their non-maltreated peers to use maladaptive techniques of emotion regulation (Kullkarni, 2010). A study that focused on child maltreatment and emotion regulation deposited that this difference in development can be attributed to the theory that children who experience toxic stress are never properly taught how to control their emotions, this can include reasons like: their models at home do not demonstrate a healthy model of coping with emotions and stress, bad coping techniques are reinforced and/or they may be punished unfairly for ex-

pressing emotions. These reinforcements and punishments can be in the form of peer rejection, school expulsion, parent rejections, and neglect. Children exposed to community violence both as victims and witnesses have shown high rates of rejection by their peers. This rejection and the low self-esteem that has been correlated with growing up in these environments have shown an increase in the dysregulation of emotional development and have indicated the emergence of maladaptive social techniques. Social maladjustment is important to study in regards to emotion regulation because social support can be a protective factor to further dysregulation and also shows both concurrent and predictive effects for child psychopathology (Carey, 2012). A tendency to respond to emotions with rumination has been shown to arise when emotions are met with dismissal or punishment; this influences the child to not express their emotions and to avoid asking for help, eluding important adaptive techniques that are critical for success in school and positive social adjustment (Heleniak, Jenness, Vander Stoep, McCauley, & McLaughlin, 2015).

A study done comparing the emotion coping strategies of sexually maltreated girls and non-maltreated girls demonstrated that the maltreated girls had decreased emotional understanding, expected less support and more conflict from relationships, and decreased ability to control their emotions to meet cultural standards. To measure this they conducted interviews around pictures showing other people going through different emotions, how they relate to that emotion, and the behavior they express when they feel that way. They also asked their mothers about the behaviors they witnessed in their daughters. The study found that both maltreated and non-maltreated girls displayed the knowledge of healthy coping techniques to stressful situations. However, in behavioral reports from their mothers, maltreated girls were much less likely to implement those techniques despite the knowledge. It was hypothesized that this disparity can be attributed to healthy coping techniques being maladaptive to the stressful environment (Shipman, Zeman, Penza, & Champion, 2000). In cases of sexual abuse rumination can lead to prolonged distress. When rumination is the primary method of emotion regulation it is more likely that the negative thoughts and mood will be applied to other circumstances, increasing stress levels in what may be ordinary circumstances (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Constantly reappraising and feeling the negative emotions induced in toxic environments can be detrimental to sanity. Emotion suppression may be the only viable way to survive the

toxic stress that permeates their environment. However just surviving doesn't mean the promotion of healthy techniques to thrive in society. Emotional suppression can fuel higher levels of rumination. Another theory is that while maltreated girls know the correct way to handle a situation when they are able to take the time to think about it, when they are faced with the situation in reality they don't have the control to react with positive coping strategies. This disparity in thought and action can create cognitive dissonance, which can add to the tension and stress already prevalent in their environments (Shipman, Zeman, Penza, & Champion, 2000).

Without proper intervention strategies and in the absence of protective factors the influence of toxic stress on emotion regulation development can be felt throughout the child's life. The ability to self-regulate emotions is itself a protective factor. Self-regulation allows the child to openly explore their environment and gain a better understanding of how to react in a myriad of situations. Children with little control over themselves often don't take opportunities further stunting their development (Laurent, 2014). There is accumulating data that shows that dysregulation of emotions in childhood can lead to the tendency to engage in rash actions and risky behavior when experiencing intense emotions when those children grow to be adolescents. These behaviors can be anywhere from difficulty in completing a goal oriented activity like chores to substance abuse and risky sexual behavior (Heleniak, Jenness, Vander Stoep, McCauley, & McLaughlin, 2015).

### **Toxic Stress and Attachment**

Attachment is defined as the "deep and enduring connection established between a child and a caregiver in the first few years of life." This early attachment influences every aspect of development. When the development and strength of this attachment is threatened there can be devastating consequences for the child (Perry, 2001). Relationships are important to the human experience. Early relationships are the foundation of how kids learn how to interact with others and the people around them. Kids with secure attachment trust their caregivers to protect them, which give them the confidence to freely interact with and explore their environment. Children with insecure-resistant attachment styles become extremely distressed upon separation and are difficult to soothe upon return. These children often show signs of wanting both comfort but also wanting to punish the caregiver for leaving. The

third attachment style observed is referred to as insecure-avoidant. In this style the children don't seem to be bothered by the separation and don't care or seem to avoid the caregivers when they return. These early patterns of behavior in regards to attachment style can predict the trajectory of later development (Fraley, 2004).

According to Bowlby's attachment theory the caregiver is the sole haven of safety in early years. Frightening behaviors in attachment figures activate competing tendencies. The fear stimulus will urge the infant to seek the safe haven, the attachment figure. However the same stimulus will activate the fear response and urge the infant to flee from the source of danger, the attachment figure. These competing tendencies result in the disorganized behavior and reflect the impossibility of their situation. These children face fear with no hope of a solution (Fritton, 2012)

Attachment development can be disrupted in a variety of ways. In early life simply meeting basic needs and comforting the infant is enough to build a secure bond. Neglect can severely impair this development. In an extreme case in Bucharest where thousands of children were institutionalized early in life without enough caregivers development was severely impaired when compared to children who had never been institutionalized. A study done with children in foster care showed that attachment security predicted mental health outcomes (Nelson, Zeanah, Fox, Marshall, Smyke, & Guthrie, 2007). 136 children from the institution in Bucharest were randomly assigned to foster care or to care as usual. The foster parents were trained to provide optimal care. Attachment was tested using the strange situation paradigm over 3 years after the placement and then the presence of internalizing disorders was tested over 2 years later. The girls placed in foster care were more likely to have secure attachment styles and less likely to show signs of internalizing disorders. Attachment security was a mediating factor between the onsets of internalizing disorders (McLaughlin, Zeanah, Fox, & Nelson, 2012)

A major factor in the disruption of secure attachment is fear. If an infant is chronically afraid due to pain, pervasive threat, or a chaotic environment even a supportive caregiver-child attachment won't be able to maintain a secure attachment. Three primary themes have been observed in children who are victims of child abuse and neglect. The most common effect is that the maltreated children are, essentially rejected. This rejection is sometimes transgenerational, meaning that a neglected/abused child becomes a neglectful/abused parent. Victims

can also have difficulty developing emotional intimacy. The third theme is the parentification of the child. Parentification is commonly observed as the child needing to mature much faster than their peers and as a result missing those peer-to-peer, age appropriate interactions (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). A study of war affected children in Palestine sought to observe differences in the children's recovery trajectories. A majority of the children were in the recovery trajectory meaning they had symptoms of trauma (PTSD, anxiety, etc.) at first than those symptoms steadily declined after being removed from the environment. The minority of children were either part of the resilient-resistant track or the increasing symptom track. Children on the resilient-resistant track had consistently low levels of trauma symptoms, while the increasing symptoms children had consistently high levels of symptoms. A major factor for this disparity in the resilient-resistant track was the reports of attachment security in these children. They reported that they felt safe with their father figure and their father seemed to be coping with the environment rather than frightened by it. This secure attachment was a mitigating factor when exposed to trauma (Punamäki, Palosaari, Diab, Peltonen, & Qouta, 2015).

In Harlow's monkey experiment the importance of a comforting caregiver has been shown to be even more important than just a caregiver who feeds you. In this experiment baby monkeys were caged with two wire monkeys. One wire monkey had food, while the other was covered in a soothing terry cloth. When the monkeys were then placed in a strange situation (a new person in the room, etc.) the baby monkey would look to the terry cloth wire monkey for comfort. However the wire monkey was never able to reciprocate behaviors with the baby monkey or actually comfort them. When the experiment was over these baby monkeys grew up unable to properly deal with other monkeys or even their own children. One monkey killed their young when simply because they didn't know how to comfort them besides their presence.

A study done in 1991 found that early separation from parents was a risk factor for developing a chronic vs acute response to traumatic stressors (Cassidy & Mohr, 2001). Building off Bowlby's attachment theory researchers found that many maltreated children were unclassifiable in the strange situation experiment. During the strange situation experiment the caregiver and child are brought into the lab in a room that the infant has never been in before. The lab has toys and things to occupy the child. The caregiver stays with the child then leaves the

room for a few minutes. The infant's behavior is observed upon first entering the room, when the caregiver leaves, and upon the caregivers return. Maltreated children exhibited fear and distress even in the caregiver's presence and showed no organized strategies for coping with the stress. They termed this disorganized attachment. This attachment style has been correlated with controlling behavior in young children. Controlling behavior can take two forms: hostile and punitive control or solicitous and caregiving control. Multiple findings from different studies on children with disorganized attachment styles show that these children have chaotic and frightening mental representations of the world they live in. In one study children were shown pictures of increasingly stressful separations of a caregiver and child. Children with secure attachment showed empathy saying the child would be sad, and then proceeded to describe coping strategies that the child could use to handle the situation. Disorganized attachment children would freeze and speak in whispers, if at all. In another study the children were asked to create a story using a family of dolls. Children with disorganized attachment would describe situations that were dark and dangerous and the child protagonist was unable to get help. The stories usually ended in chaos and destruction, the child never being helped. Parents and other adults were often portrayed as unavailable, frightened, or abusive in these stories. (Main & Solomon, 1990)

### **Stress and Internalizing Disorders**

Mental illness produces some of the biggest health challenges faced by society. Mental illness accounts for a majority of the immense hospitalizations, disabilities that result in losses of billions due to losses in productivity, and escalated risk of suicide. New epistemology suggests that mental health is increasingly correlated with environmental factors. Science has often defined environmental factors broadly; in this paper environmental factors will be defined as the presence of child abuse, neglect, exposure to violence, parental mental illness, parental substance abuse, criminality, family economic adversity, parental separation, parental divorce, separation from parents, and life threatening illness. These factors can create feelings in the victim that leave them more susceptible to the influence of mental illness. "Feelings of pure loss might lead to depressive disorders, while feelings of pure danger might lead to anxiety disorders," explains Ronald Kessler, a professor of health care policy at Harvard Medical School. "And feelings of loss

*and* danger might lead to both simultaneously,” (Schmidt, 2007).

Another study found that childhood adversities are associated with 44.6% of all childhood onset disorders and between 25.9% of adult onset disorders. They also found that associations increased with length of recall. It was found that childhood adversities are often clustered, meaning a child may suffer from multiple chronic stressors like physical abuse may also suffer from economic adversity. On average people with one chronic stressor present had two others as well. They also found that some associations of stressors and early onset disorders persisted into adulthood (Green et al., 2010).

Researchers found that chronic stressors associated with maladaptive family functioning (child abuse, neglect, parent mental illness, etc.) were the strongest predictors of mental illness. World mental health surveys deduced that 29.8% of all disorders across countries and cultures are associated with childhood adversity. Childhood stress was reported at similar rates around the world regardless of the income level of the country. All 12 childhood adversities examined by this study were significantly associated with elevated risk of mental illness. Population-attributable risk proportions suggest that eradicating childhood adversities would lead to a 22.9% reduction in mood disorders and a 31% reduction in anxiety disorders (Kessler et al., 2010). A study done with 6,483 adolescent and parent pairs in the US found similar results indicating that childhood adversity is common, comorbid, and strongly associated with early onset of psychiatric disorders (McLaughlin, Green, Gruber, Sampson, Zaslavsky, & Kessler, 2012). With targeted interventions to reduce exposure and mitigating the harmful effects the mental health of the world can be better.

### **Emotion Regulation and Internalizing Disorders**

Emotion Dysregulation is seen at the core of most forms of psychopathology. It is the link between internal physiology and the social environment. Children with poor emotion regulation strategies are less socially competent, have lower peer status, lower quality relationships, and engage in lower levels of prosocial behavior than youths with better emotion regulation skills (McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011). From early on in life interactions with caregivers contribute to the child’s understanding of emotions. They are the primary models that the child looks to, establish the beliefs about appropriate behavior, and reinforce behaviors that are conducive to a healthy bal-



ance of arousal and safety. Disrupting the development of emotion regulation may also contribute to the onset and maintenance of psychopathology.

Emotion dysregulation has long thought to be linked to an increase in symptomatology of internalizing disorders. One study observed three components of emotion dysregulation; emotion understanding, dysregulation of expressions of sadness and anger, and ruminative responses to stress, in a sample of 1065 adolescents. The study found evidence to support the idea that emotion regulation disruption is associated with a wide range of psychopathological issues in children. Deficits in emotion regulation could predict changes in symptomology in the development of anxiety. However, psychopathology did not predict changes in emotion regulation, suggesting that emotion regulation is a risk factor for the onset of internalizing disorders (McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011)

Several theorists argue that the inability to regulate emotions in everyday situations leads to experiencing longer and more severe periods of distress that may evolve to diagnosable depression and/or anxiety. A meta-analysis looking at how the different emotion regulation strategies influence the onset of internalizing psychopathology found that among the 114 studies examined, rumination had the largest relationship to onset of internalizing psychopathology. A medium to large relationship was found for suppression and a small to medium relationship for reappraisal strategies. Adverse childhood experiences that result in toxic stress were shown to increase the strength of the relationship between emotion regulation and internalizing psychopathology. (Aldao, Nolen-Hoeksema, & Schweizer, 2010).

The disruption of emotion regulation hinders a child's ability to interact with the world productively. The child may instead attempt to withdraw from the world or overthink the negative events rather than trying to solve the problem at hand. Approaching stressful situations with a problem solving stance, a component central to reappraisal strategies has been linked to a decrease in risk of internalizing psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010).

Being unaware of one's emotional state may result in being unable to access social support, not having the knowledge to change the situation, or alter the emotional experience. These inability change the way stressed children experience emotions. Negative emotional states may intensify and persist for longer time periods resulting in diagnosable internalizing disorders. One study tested 121 boys and 106 girls in

the fourth and fifth grade. Children showing symptomology of anxiety and depression had a harder time identifying negative emotions and showed confusion on how to cope with them. The researchers found that the inability to identify emotional states and the dysregulation of anger and sadness predicted internalizing symptoms later in time. Conversely constructive coping with anger lessened the risk of internalizing psychopathology (Zeman, Shipman, & Suveg, 2002)

### **Attachment and Internalizing Disorders**

Internalizing behavior refers to distress that is inner-directed rather than directed towards others. The most common manifestations of internalizing behavior are depression and anxiety. Depression involves persistent overwhelming feelings of despondency and loss of interest. Depression influences the way a person thinks, feels, and the way they behave making daily life difficult. Anxiety involves feelings of tension, worried thoughts, and the reoccurrence of obtrusive unwanted thoughts. Anxiety disorders are characterized by persistent fear and worry about everyday situations and can reach the peak of terror in minutes. Anxiety disorders are hard to control and interfere with daily activities. The path to developing an internalizing disorder typically involves many interacting factors. Secure attachment is often a factor that protects against the development of internalizing disorders, however insecure attachment can make a child more vulnerable to obtaining internalizing disorders. Once obtained, these disorders tend to be chronic, placing the child at risk for various negative outcomes (National Scientific Council on the Developing Child, 2005/2014).

Attachment style reflects the child's expectations of the caregiver. Children with a secure attachment style know they are safe with their caregiver, so are able to build off that strong foundation and explore their environment and other relationships. In contrast children with insecure attachment styles don't have that safe foundation with which to explore. These kids tend to adopt one of two ways of coping: avoidant attachment styles, meaning they avoid relationships or exaggerated attachment styles, meaning they cling to anyone they can find. Children that develop the exaggerated relationship style may develop chronic anxiety and an overly dependent attitude toward their caregiver. Their preoccupation with getting their caregivers attention often comes at the expense of exploring the world. As a result the world becomes a frightening unknown putting them at a greater risk to develop anxiety.

Children that develop avoidant attachment styles are also at risk of internalizing disorders. Children with this attachment style were monitored during the strange situation task. When their mother left the room they seemed to be indifferent to the departure. However in actuality studies showed that these children are at increased risk for developing anxiety (Madigan, Atkinson, Laurin, & Benoit, 2013)

Caregivers repeated inability to respond to the child's needs and failure to protect them in strange situations might lead to children being in an extreme state of fear with no knowledge of how to self-regulate. The knowledge that their caregiver is not a safe haven may prevent them from developing functional coping strategies and leads to higher risk of internalizing psychopathology. The energy expended on maintaining this high level of a stress response leaves little room for the children to grow accustomed to and explore their environment, which also leads to a higher risk of internalizing disorders. A meta-analysis of the literature on the relationship of attachment with anxiety and depression found that children with insecure attachment styles were twice as likely to develop an internalizing disorder as children with secure attachment styles. It was also found that concurrent externalizing behaviors strengthened the relationship between insecure attachment and internalizing disorders. Avoidant styles of attachment were also at greater risk of developing internalizing disorders than any other attachment style examined. It is hypothesized that this is a result of exaggerated attachment styles eliciting some attention from caregivers while avoidant styles have no such remedy. The attachment style a child develops colors the way children see the world and the people in it. Rejection by the caregiver's leads to the child expecting rejection and their way to cope is to reject the world first. This social isolation and withdrawal from their environment puts them at greater risk for harmful internalizing disorders (Madigan, Atkinson, Laurin, & Benoit, 2013)

## **Conclusion**

Toxic stress can heavily influence the development of emotion regulation and attachment styles. This interruption in development does a great disservice to the child and to society. In one study 80% of 21 year olds that reported experiencing toxic environments could be diagnosed with a psychological disorder. Estimates of money lost on the productivity and expenditures of these children added up to 500 billion dollars in the U.S. (Child's defense fund, 2015). The presence of inter-

nalizing disorders also creates a lot of harm in the victim. They are more likely to commit suicide and their quality of life can be greatly reduced. Toxic stress does a great disservice to society and the person who has to experience it. Yet the influence of toxic stress can be mitigated with more research.

Support is one of the biggest mediating factors and building effective intervention strategies with support at the core has shown to improve the outcomes of chronically stressed children. Knowing this is helpful, but more research needs to be done to discover more protective factors that can be used in intervention models.

Toxic child stress impacts more than just the development of emotion regulation and attachment. It impacts every aspect of development from physical to mental and can harm the child in every aspect of life from relationships to school readiness. Toxic stress harms the child and the society that the child is a part of. Toxic stress has the power to harm so many, but with more knowledge on how it operates the consequences can become negligible. Research on how society suffers from toxic child stress would go a long way in both getting more people interested in helping child abuse victims and also in forcing policy makers to see it as an issue that shouldn't be protected by the right to privacy. More research with these children can help understand exactly how these core areas of development are influenced; so more effective preventative and intervention strategies can be created and implemented. Further research on risk and protective factors that contribute to resilience is important to undertake because it can further understanding about how to help children who face a variety of risk factors not only survive but to thrive. Information derived from future research will not only benefit the children that are helped, but also everyone in the child's proximity according to the ecological theory. As seen in the research already done trauma and stress stunts the development of positive affects, which can influence all the people in the child's environment from the microsystem to the macrosystem.

A child not able to participate productively in society will also be unable to hold a job and will be a drain on society. It seems that society first writes off the troubled child as a problem then ignores them until they become a drain on resources. Society as a whole would be more productive if instead of writing off the angry child researchers could create intervention techniques that could promote the healthy stimulation of emotion regulation or even a healthy way to release the negative emotions. Something that affects a child has the capacity to

affect everyone that comes into contact with the child through their lifetime. Severe child stress and trauma is currently seen as a private matter that should be solved in the home, not many people are willing to comprehend the connection between child trauma/stress and what we label as the problem child. Society can't continue the neglect that has already fostered in these children then expect them to overcome the consequences without help. More research needs to be done on intervention techniques that can be used to help create more successful adults.

## References

- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical psychology review, 30*(2), 217-237.
- Blalock, J. A., & Joiner Jr, T. E. (2000). Interaction of cognitive avoidance coping and stress in predicting depression/anxiety. *Cognitive therapy and research, 24*(1), 47-65.
- Boyd, R. C., Wooden, T. D., Munro, M. A., Liu, T., & Ten Have, T. (2008). The impact of community violence exposure on anxiety in children of mothers with depression. *Journal of child & adolescent trauma, 1*(4), 287-299.
- Braungart-Rieker, J. M., Zentall, S., Lickenbrock, D. M., Ekas, N. V., Oshio, T., & Planalp, E. (2014). Attachment in the making: Mother and father sensitivity and infants' responses during the Still-Face Paradigm. *Journal of experimental child psychology, 125*, 63-84.
- Browne, A., & Finkelhor, D. (1986). Impact of child sexual abuse: a review of the research. *Psychological bulletin, 99*(1), 66.
- Brumariu, L. E., & Kerns, K. A. (2008). Mother-child attachment and social anxiety symptoms in middle childhood. *Journal of Applied Developmental Psychology, 29*(5), 393-402.
- Carey, D. C. (2012). Exposure to Community Violence and Social Maladjustment Among Urban African American Youth: The Role of Emotion Dysregulation.
- Cassidy, J., & Mohr, J. J. (2001). Unsolvability, fear, trauma, and psychopathology: Theory, research, and clinical considerations related to disorganized attachment across the life span. *Clinical Psychology: Science and Practice, 8*(3), 275-298.
- Center on the Developing Child at Harvard University (2012). *The Science of Neglect: The Persistent Absence of Responsive Care*

- Disrupts the Developing Brain: Working Paper No. 12.* Retrieved from [www.developingchild.harvard.edu](http://www.developingchild.harvard.edu).
- Cole, P. M., & Deater-Deckard, K. (2009). Emotion regulation, risk, and psychopathology. *Journal of Child Psychology and Psychiatry, 50*(11), 1327-1330.
- Children's Defense Fund, Ending Child Poverty Now, Doc., at 40 (2015).
- Eisenberg, N., Spinrad, T. L., & Eggum, N. D. (2010). Emotion-related self-regulation and its relation to children's maladjustment. *Annual review of clinical psychology, 6*, 495.
- Fitton, V. A. (2012). Attachment theory: History, research, and practice. *Psychoanalytic Social Work, 19*(1-2), 121-143.
- Fraley, R. C. (2004). A brief overview of adult attachment theory and research.
- Green, J. G., McLaughlin, K. A., Berglund, P. A., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2010). Childhood adversities and adult psychiatric disorders in the national comorbidity survey replication I: associations with first onset of DSM-IV disorders. *Archives of general psychiatry, 67* (2), 113-123.
- Goodman, G., Stroh, M., & Valdez, A. (2012). Do attachment representations predict depression and anxiety in psychiatrically hospitalized prepubertal children?. *Bulletin of the Menninger Clinic, 76*(3), 260.
- Gross, J. J. (1998). The emerging field of emotion regulation: an integrative review. *Review of general psychology, 2*(3), 271.
- Heleniak, C., Jenness, J. L., Vander Stoep, A., McCauley, E., & McLaughlin, K. A. (2015). Childhood Maltreatment Exposure and Disruptions in Emotion Regulation: A Transdiagnostic Pathway to Adolescent Internalizing and Externalizing Psychopathology. *Cognitive Therapy and Research, 1*-22.
- Kerns, K. A., & Brumariu, L. E. (2014). Is insecure parent-child attachment a risk factor for the development of anxiety in childhood or adolescence?. *Child development perspectives, 8*(1), 12-17.
- Kessler, R. C., McLaughlin, K. A., Green, J. G., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., ... & Benjet, C. (2010). Childhood adversities and adult psychopathology in the WHO World Mental Health Surveys. *The British Journal of Psychiatry, 197*(5), 378-385.

- Kulkarni, M. R. (2010). *Childhood Violence Exposure on Emotion Regulation and PTSD in Adult Survivors* (Doctoral dissertation, Smith College).
- Laurent, H. K. (2014). Clarifying the Contours of Emotion Regulation: Insights From Parent–Child Stress Research. *Child Development Perspectives*, 8(1), 30-35.
- Madigan, S., Atkinson, L., Laurin, K., & Benoit, D. (2013). Attachment and internalizing behavior in early childhood: A meta-analysis. *Developmental Psychology*, 49(4), 672.
- Main, M., & Solomon, J. (1990). Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation. *Attachment in the preschool years: Theory, research, and intervention*, 1, 121-160.
- Mcquaid, N. E. (2011). *Exploring the foundations of attachment: relations between mother-infant interaction at 4-5 months and attachment security at 12 months* (Doctoral dissertation, Arts & Social Sciences: Department of Psychology).
- McLaughlin, K. A., Zeanah, C. H., Fox, N. A., & Nelson, C. A. (2012). Attachment security as a mechanism linking foster care placement to improved mental health outcomes in previously institutionalized children. *Journal of child psychology and psychiatry*, 53(1), 46-55.
- McLaughlin, K. A., Green, J. G., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2012). Childhood adversities and first onset of psychiatric disorders in a national sample of US adolescents. *Archives of general psychiatry*, 69(11), 1151-1160.
- McLaughlin, K. A., & Hatzenbuehler, M. L. (2009). Mechanisms linking stressful life events and mental health problems in a prospective, community-based sample of adolescents. *Journal of Adolescent Health*, 44(2), 153-160.
- McLaughlin, K. A., Hatzenbuehler, M. L., & Hilt, L. M. (2009). Emotion dysregulation as a mechanism linking peer victimization to internalizing symptoms in adolescents. *Journal of consulting and clinical psychology*, 77(5), 894.
- McLaughlin, K. A., Hatzenbuehler, M. L., Mennin, D. S., & Nolen-Hoeksema, S. (2011). Emotion dysregulation and adolescent psychopathology: A prospective study. *Behaviour research and therapy*, 49(9), 544-554.

- Morris, A. S., Silk, J. S., Steinberg, L., Myers, S. S., & Robinson, L. R. (2007). The role of the family context in the development of emotion regulation. *Social development, 16*(2), 361-388.
- Nelson, C. A., Zeanah, C. H., Fox, N. A., Marshall, P. J., Smyke, A. T., & Guthrie, D. (2007). Cognitive recovery in socially deprived young children: The Bucharest Early Intervention Project. *Science, 318*(5858), 1937-1940.
- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on psychological science, 3* (5), 400-424.
- Perry, B. D. (2001). Bonding and attachment in maltreated children. *The Child Trauma Center, 3*, 1-17.
- Perry, B. D. (2001). Bonding and attachment in maltreated children. *The Child Trauma Center, 3*, 1-17.
- Provenzi, L., Casini, E., de Simone, P., Reni, G., Borgatti, R., & Montirosso, R. (2015). Mother–infant dyadic reparation and individual differences in vagal tone affect 4-month-old infants’ social stress regulation. *Journal of Experimental Child Psychology, 140*, 158-170.
- Punamäki, R. L., Palosaari, E., Diab, M., Peltonen, K., & Qouta, S. R. (2015). Trajectories of posttraumatic stress symptoms (PTSS) after major war among Palestinian children: Trauma, family- and child-related predictors. *Journal of affective disorders, 172*, 133-140.
- Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: family social environments and the mental and physical health of offspring. *Psychological bulletin, 128*(2), 330.
- Sanchez, M. M., McCormack, K. M., & Howell, B. R. (2015). Social buffering of stress responses in nonhuman primates: Maternal regulation of the development of emotional regulatory brain circuits. *Social neuroscience, 10*(5), 512-526.
- Schmidt, C. W. (2007). Environmental Connections: A Deeper Look into Mental Illness. *Environmental Health Perspectives, 115*(8), A404–A410.
- Seymour, K. E., Chronis-Tuscano, A., Iwamoto, D. K., Kurdziel, G., & MacPherson, L. (2014). Emotion regulation mediates the association between ADHD and depressive symptoms in a community sample of youth. *Journal of abnormal child psychology, 42* (4), 611-621.
- Shipman, K., Zeman, J., Penza, S., & Champion, K. (2000). Emotion



- management skills in sexually maltreated and nonmaltreated girls: A developmental psychopathology perspective. *Development and Psychopathology*, 12(01), 47-62.
- Shonkoff, J. P., Boyce, W. T., Cameron, J., Duncan, G. J., Fox, N. A., Gunnar, M. R., & Thompson, R. A. (2009). *Excessive stress disrupts the architecture of the developing brain*. Working Paper 3. Retrieved from [www.developingchild.harvard.edu](http://www.developingchild.harvard.edu).
- Shonkoff, J. P., Boyce, W. T., Cameron, J., Duncan, G. J., Fox, N. A., & Greenough, W. T. (2004). Children's emotional development is built into the architecture of their brains (National Scientific Council on the Developing Child)[PDF Document].
- Shonkoff, J. P., Levitt, P., Boyce, W. T., Cameron, J., Duncan, G., Fox, N. A., & Gunnar, M. (2004). Young children develop in an environment of relationship. *National Scientific Council on the Developing Child. Summer*, 1-13.
- Sümer, N., & Harma, M. (2015). Parental Attachment Anxiety and Avoidance Predicting Child's Anxiety and Academic Efficacy in Middle Childhood. *Psychological Topics*, 24(1), 113.
- Vela, R. M. (2014). The effect of severe stress on early brain development, attachment, and emotions: a psychoanatomical formulation. *Psychiatric Clinics of North America*, 37(4), 519-534.
- Williams, S. R., & Woodruff-Borden, J. (2015). Parent emotion socialization practices and child self-regulation as predictors of child anxiety: the mediating role of cardiac variability. *Child Psychiatry & Human Development*, 46(4), 512-522.
- Zajicek-Farber, M. L., Mayer, L. M., Daughtery, L. G., & Rodkey, E. (2014). The Buffering Effect of Childhood Routines: Longitudinal Connections Between Early Parenting and Prekindergarten Learning Readiness of Children in Low-Income Families. *Journal of Social Service Research*, 40(5), 699-720.
- Zeman, J., Shipman, K., & Suveg, C. (2002). Anger and sadness regulation: Predictions to internalizing and externalizing symptoms in children. *Journal of Clinical Child and Adolescent Psychology*, 31(3), 393-398

## **Acknowledgements**

Thank you to the McNair program for helping me refine my interests and allowing me the freedom to explore.

Thank you to the UW Mary Gates and Commotion program for introducing me to research and showing me the different ways research can affect children and families.

Thank you to my mentor Dr. Kate McLaughlin for guiding me through this research and being a sounding board for any questions that arose.

Victoria Chambers

UW Psychology Department, Dr. Kate McLaughlin

[Vjchambers24@gmail.com](mailto:Vjchambers24@gmail.com)

I am interested in how trauma and stress alter a child's development and how that alteration can decrease their success in school. I am looking for a PhD program that combines research with implementation.



# Physical and microbial drivers of oxygen dynamics and hypoxia in Bellingham Bay, WA

Natasha Christman

## Abstract

*Bottom water hypoxia is a feature of many coastal embayments and fjords in the Salish Sea. Ongoing research in Bellingham Bay (Bellingham, WA, USA) identified a seasonally recurring area of low dissolved oxygen near the center of the bay. Similar to other regions of the Salish Sea, hypoxia in Bellingham Bay may be a naturally occurring phenomenon, yet the extent of eutrophication and influence of microbial processes on patterns of regional hypoxia is poorly understood. The present study continued an established monitoring program documenting the range, duration, and severity of low dissolved oxygen in Bellingham Bay in the summers of 2013-15, while adding an experimental component investigating factors that regulate respiration in the water column. Results suggest the displacement and recovery of an oxygen-depleted layer of bottom water in the bay strongly correlates with spring-neap tidal cycling. In 2015, anomalously low river discharge and high temperatures may have also contributed to the lowest and most persistent observed oxygen concentrations in our record (including an absolute minimum 1.2 mg/L O<sub>2</sub>). In addition, manipulative experiments were conducted to investigate factors regulating oxygen consumption in bottom waters. Organic matter availability appears to be a prominent limiting factor to Bellingham Bay oxygen consumption, and ongoing research investigates whether shifts in the resident phytoplankton community may affect the quality of carbon available for respiration. The study's findings broaden our knowledge of factors regulating the consumption of oxygen in bottom waters of the Pacific Northwest and provide insight into the effects of organic carbon delivery and anthropogenic stressors.*

## Introduction

Dissolved oxygen (DO) is a vital parameter in evaluating oceanographic processes and assessing the water quality of marine systems. Coastal hypoxia is an increasingly paramount threat to the health of global ocean ecosystems and occurs when dissolved oxygen concen-

trations fall below  $2 \text{ mg O}_2 \text{ L}^{-1}$ . Under this threshold, marine life may be adversely affected through physiological stress associated with the lack of sufficient oxygen available. This effect sometimes manifests as the expression of aberrant behaviors and growth rates, decreases in biodiversity, and/or mortality (Keister 2000; Rabalais 2001; Breitberg 2002).

Though dissolved oxygen is important in understanding the function and condition of aquatic systems, DO itself is a complex junction between physical and biological processes (Kemp 1980). In eutrophication, communities of phytoplankton in the surface of the water column may be stimulated by nutrients and sunlight, enabling a rapid increase in population called a bloom. Eventually, when the nutrient resources have become exhausted or the system otherwise inhibits sustained community growth, these microbes will die in a collapse of the population. This organic matter will then sink lower in the water column where it is subsequently respired by heterotrophic plankton in which the microbes, primarily bacteria, consume dissolved oxygen while processing the organic matter. The magnitude of organic matter delivery is vital to the amount of oxygen drawdown – 90% of local heterotrophic respiration relies on the dissolved oxygen matter produced by phytoplankton in the overlying water column (Duarte & Cebrian 1996). Consequently, in highly productive systems, excess primary production in the surface water column may lead to significant depletion of much of the available dissolved oxygen, promoting the development of hypoxia.

Physical factors such as stratification also play a key role in enabling the low-oxygen conditions. Stratification of the water column is observed when the density of a lower water layer differs significantly in density versus that of an overlying layer. These conflicting physical properties inhibit the process of mixing. Subsequently, regions of low-DO water under the density interface are restricted from oxygen replenishment. Strong stratification is often present in estuaries where lower-density freshwater from river or stream outflow tops cold, salty marine waters of high density. These physical dynamics combined with heterotrophic microbial activity and the primary production/respiration coupling may enable the onset of hypoxia (Diaz 2001).

While hypoxia may be a natural phenomenon in some systems across the world, the frequency, severity, and extent of occurrence may be increasing. Indeed, the average dissolved oxygen concentration of many marine systems has declined since the beginning of oceanographic oxygen records often in the mid-20<sup>th</sup> century (Diaz & Rosenberg

## Physical and microbial drivers of oxygen dynamics and hypoxia in Bellingham Bay, WA

1995). Within the Salish Sea, observations of dissolved oxygen over the past fifty years similarly indicate historical DO concentrations were higher than those of today (Newton 1995). However, while general oxygen trends may be consistent across many regions of the Puget Sound estuary, it is important to investigate the factors contributing to low oxygen on a local scale. Due to urbanization, some areas of the Salish Sea may be more vulnerable and sensitive to anthropogenic eutrophication. Combined with variation in flushing and fjord-based bathymetry, the individual assessment of these regions is crucial to understanding the true oceanographic behavior of the systems and its relationship with oxygen.

Bellingham Bay is a large estuarine embayment in the Central Salish Sea. The bay is bordered on the east by the city of Bellingham, a metropolitan area composed of over eighty-thousand residents. Directly to the west of the bay, the islands of Lummi and Portage restrict the body of water from direct connection to the Strait of Georgia. A significant source of freshwater, the Nooksack River, drains into the bay along the north. Dispersed throughout the bay's shoreline, several additional inputs - including Padden, Chuckanut, Whatcom, and Squalicum creek - contribute minor freshwater input to the system. In the center of the bay, a region of seasonally-recurring hypoxia and low dissolved oxygen has been identified (Apple 2012).

Bellingham Bay's own capacity for mixing is relatively limited (Collias & Clifford 1962). Because of poor exchange with the adjacent Strait of Georgia, the bay relies primarily on Rosario Strait as the most significant mechanism for water exchange. Differences in the relative densities of the freshwater input contributed by the Nooksack and the underlying marine input has resulted in the stratification of the water column at a depth of generally five meters. This occurs year-round, but is most pronounced during the rainy seasons and snow-melting periods when the Nooksack river discharge is at its peak. Tidal cycling is the major force within the system promoting mixing (Wang et al. 2010), particularly during periods of spring tides (Christman 2015).

Though the Nooksack River acquires significant concentrations of phosphorus and nitrogen through a prominent agricultural watershed and several municipalities, the most prominent contributor of nutrients to the system is by marine intrusion from Rosario Strait.

The expansion of an environment in which it is difficult to sustain life poses a significant challenge to the global ocean in the decades to come. With its recurring hypoxia and low dissolve oxygen issues,

Bellingham Bay is a prime example of a vital coastal ecosystem requiring investigation into the oceanographic processes at work.

## **Methods**

### *Study Site*

The study was conducted in the Bellingham Bay, WA at three stations running north to south: NS10, BB6, and Eliza (Figure 1). Summer sampling cruises were performed on June 24th; July 1st, 9th, 15th, 22th, & 29th; and August 5th, 12th, & 19th aboard the R/V Magister. Additional cruises were performed on October 22nd and the following March 31st using the R/V Edna to facilitate sample collection for carbon addition experiments. In these latter cruises, profiles were only taken at the central station, BB6.

# Physical and microbial drivers of oxygen dynamics and hypoxia in Bellingham Bay, WA

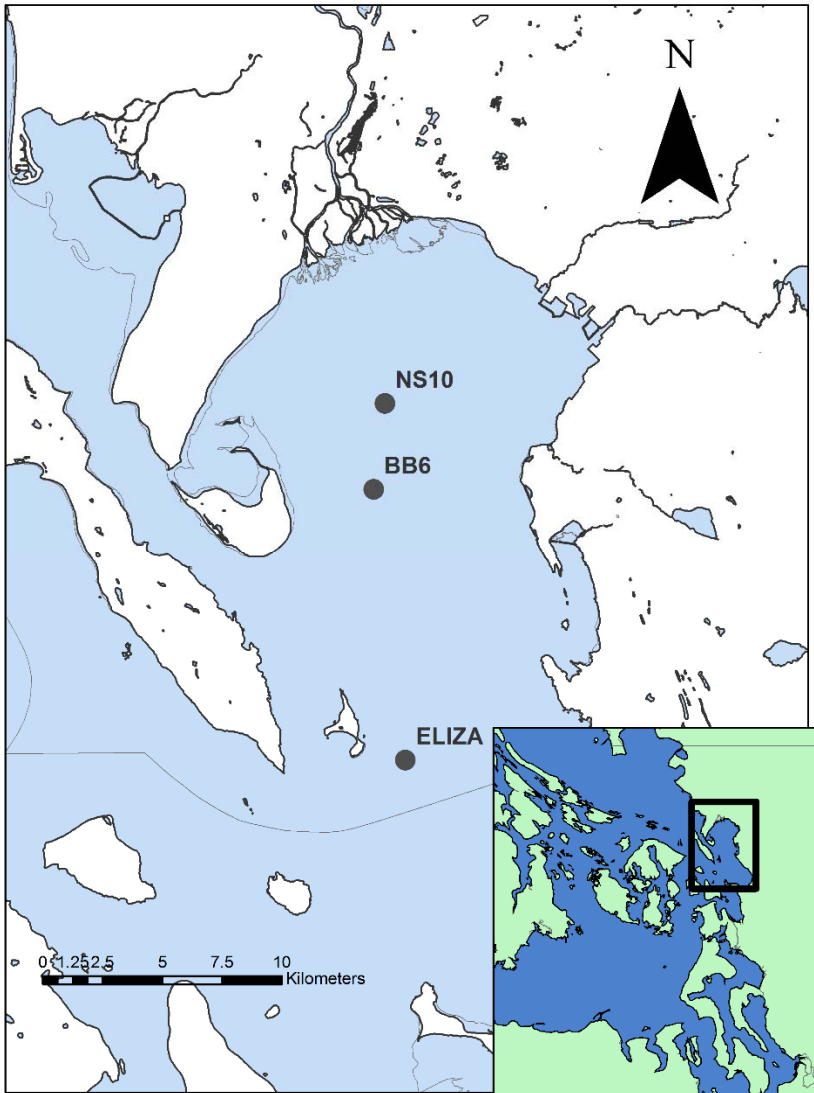


Figure 1. Map of Bellingham Bay with research stations.

## CTD Measurements

Using a Sea-Bird Electronics CTD, hydrographic data including temperature, salinity, dissolved oxygen, and fluorescence at the three stations. The CTD was deployed to near-bottom depth (about 4-5 meters above maximum depth) after a two minute soak at the surface of



the water column. Throughout the cast, the hydrographic sensors continuously recorded data while six discrete Niskin bottles were sampled at the surface (0.5m) and the variable-depth chlorophyll maximum. Near-bottom water was also sampled but variable depending on the maximum depth of the site and the specific tidal phase during the cruise, usually between 70-80 m for Eliza Station, 25-30 m for BB6, and 20-25 m for NS10. To obtain an uninterrupted profile, the CTD data from the downcast was utilized in analysis; in contrast, Niskin bottles were tripped on the upcast.

#### *Ambient Respiration Incubations*

Niskin water from the near-bottom was subsampled into 60 ml BOD bottles. Each of these bottles was equipped with a sensor spot sensitive to ambient oxygen concentration. Using optic transmission, a PreSens Fibox 4 sensor read each of these spots and converted the reading to the sample's approximate dissolved oxygen concentration. These samples were kept cool and stored in a dark container until transport to a water bath incubator kept at 11°C. The samples were maintained in total darkness for approximately 72 hours, with oxygen sensor readings occurring on a regular 3-hour basis.

#### *Carbon Limitation Experiments*

Experimental respiration incubations with organic carbon additions were performed on October 22nd, 2015, and March 31st, 2016, using fresh 25 m water samples from station BB6. The additions consisted of two parts. First, natural dissolved organic matter assemblages were extracted from eight weeks of 20  $\mu\text{m}$  plankton tow samples collected during the 2015 summer sampling at stations BB6 and Eliza. These extracts were sonicated and frozen to lyse the cell membranes, then filtered to remove particulates. 2 $\mu\text{M}$  of each final solution was then injected into the 60 ml BOD bottles containing fresh BB6 near-bottom sample. Second, a stock of dissolved dextrose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) was added to another subset of the BB6 water samples to reach 10, 27, 50, 100, 250, 500, 1000, and 1500  $\mu\text{M}$  final concentration. All samples were routinely measured every three hours for a 96-hour duration using the PreSens Fibox 4 optical oxygen sensor.

## **Results**

In five out of nine weeks of sampling in the summer 2015, hypoxia ( $\leq 2$  mg/L DO) or low dissolved oxygen ( $\leq 4$  mg/L DO) was observed. This included the lowest concentration of DO in our record

## Physical and microbial drivers of oxygen dynamics and hypoxia in Bellingham Bay, WA

(2013-2015), a measurement of 1.2 mg/L made on July 8th (Figure 2).

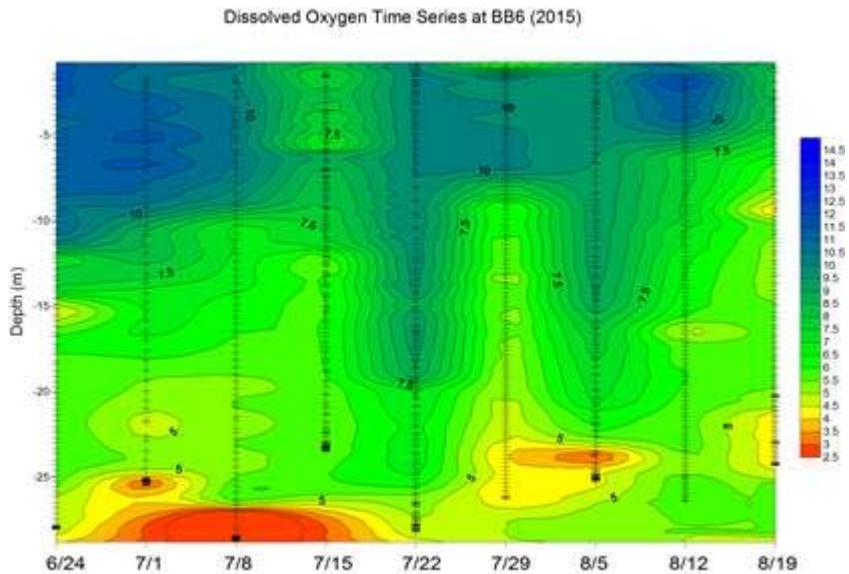


Figure 2. Dissolved oxygen time series at BB6 in 2015 summer sampling season (figure from Jude Apple).

Respiration rates measured between 8 - 11  $\mu\text{g DO/L/hr}$  in the first three weeks of sampling (Figure 3). Following this data, oxygen drawdown sharply declined, reaching a summer minimum of less than 2  $\mu\text{g DO/L/hr}$ . In the weeks thereafter, respiration rates began increasing.

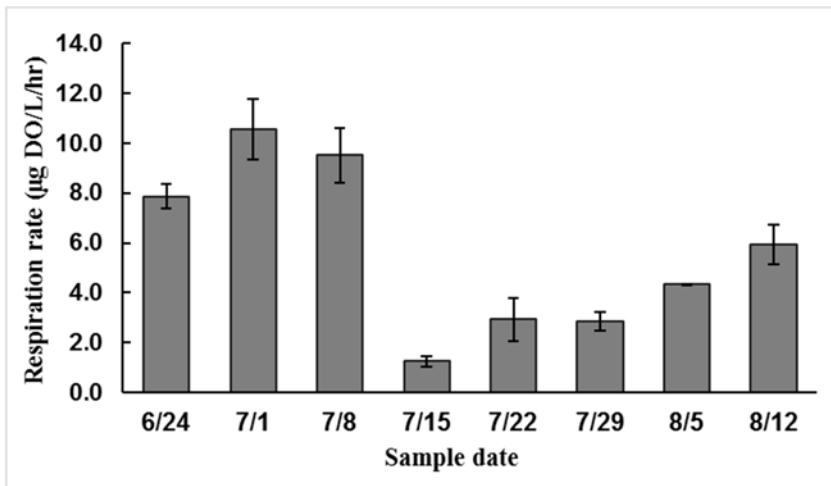


Figure 3. Summer 2015 BB6 25m respiration rates.

A comparison of respiration rate and local oxygen minimums at BB6 25 m depth indicates a negative correlation ( $R^2 = 0.463$ ). As respiration increased, the surrounding oxygen minimum declined (Figure 4).

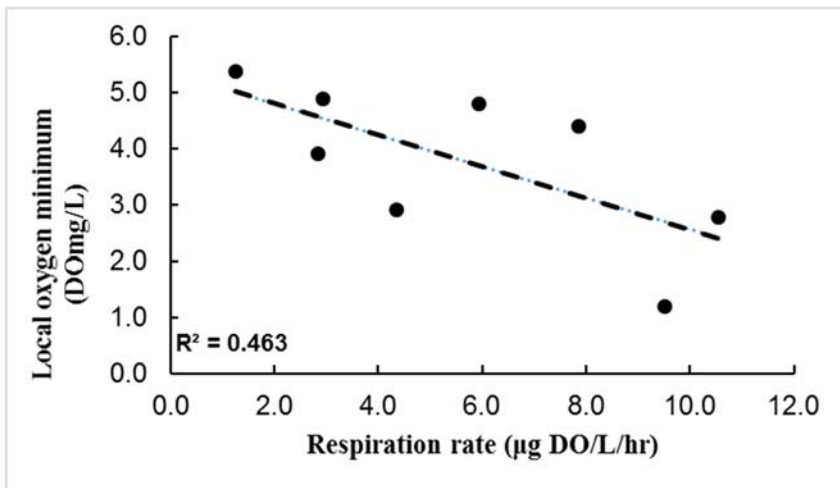


Figure 4. Comparison of respiration rate and local oxygen minimum at BB6 25m depth.

In the carbon addition experiments of October 2015 and March 2016, dextrose treatments of BB6 25 m sample water revealed that oxygen drawdown was more rapid in October than in March (Figure 5). The leveling off of rate at about 250µM indicates the approximate car-

# Physical and microbial drivers of oxygen dynamics and hypoxia in Bellingham Bay, WA

bon saturation point of the community.

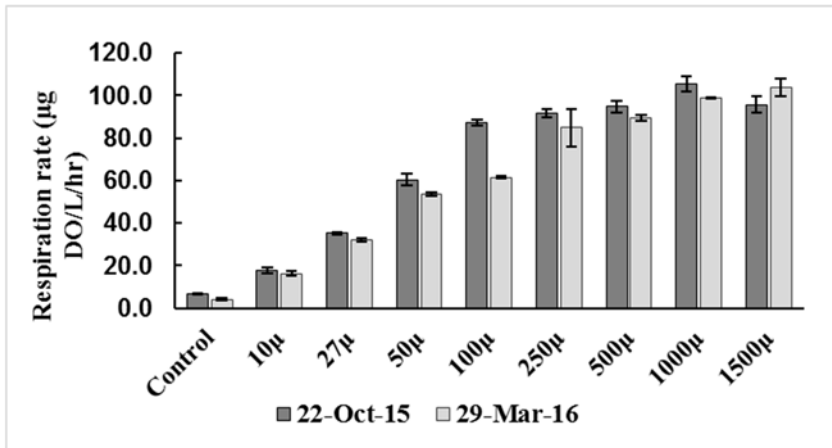


Figure 5. October 2015 & March 2016 carbon addition experiments - dextrose treatment.

2015 Nooksack river discharge was about half of 2015 levels throughout the same summer sampling period.

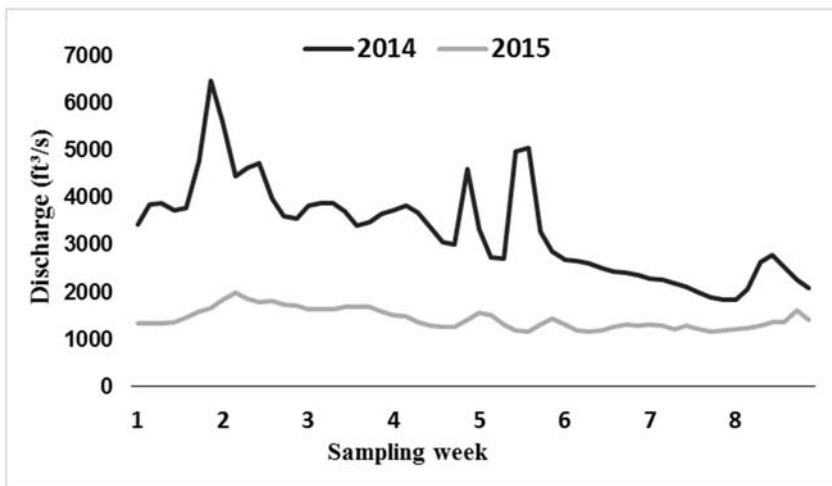


Figure 6. Nooksack river discharge during the 8-week summer sampling period.

## Discussion

In 2015, low dissolved oxygen and hypoxia were most persistent and severe than observed in the preceding years (Figure 2). Howev-

er, the dynamic behavior of the low oxygen regions within the water column was similar to years previously; namely, the suspension of the low oxygen layer to mid-depth occurred following the spring tides, suggesting that marine intrusions may play a role in displacing the hypoxia from the very bottom of the water column. This is in contrast to many other well studied estuaries where hypoxia is generally thought of as a very static body.

Respiration was high early in the summer following a period of excess productivity in the surface of the water column (Figure 3). In the fourth week, the respiration rate of the samples dramatically dropped. This happened concurrently with an increase in ambient dissolved oxygen at depth, indicating there may have been vertical mixing associated with the tides and oxygen replenishment which temporarily reduced local microbial respiration (Figure 3). After this apparent event, respiration slowly picked up again in pace signaling the continued supply availability of organic matter needed for heterotrophic consumption.

The negative correlation of respiration rates and local oxygen minimums suggested that the benthic microbes may have a significant impact in determining the dissolved oxygen concentration at depth (Figure 4). As the process of respiration consumes oxygen while concurrently breaking down organic matter, it follows that the surrounding water would subsequently decline in oxygen. At BB6, we seem to see this effect coupling. In experimental data, samples at the same depth where observed to respond readily to inputs of organic matter, increasing several fold when a carbon solution is added. This indicates that the bottom waters are sensitive to the magnitude of organic matter transported to depth, which in turn plays a role in the seasonal onset of hypoxia.

2015 was also an anomalous year in both temperature and river discharges. Indeed, Nooksack river discharge was about half that of the year previously during the summer sampling period. Due to the importance of physical factors such as stratification promoting the onset of hypoxia, it is possible that the aberrant discharge of the river may have influenced the severity of the low oxygen conditions. However, more analysis must be done in order to understand the potential impacts of the decreased freshwater inputs.

# Physical and microbial drivers of oxygen dynamics and hypoxia in Bellingham Bay, WA

## Conclusion

The oceanographic and climatic conditions of 2015 made for an unusual year in the issues of low dissolved oxygen and hypoxia in Bellingham Bay. While the duration and general dynamic behavior of the hypoxia within the water column was similar to previous years, it seemed that the issue was more frequent and more severe. The carbon addition experiments suggested that the benthic microbial communities are very sensitive to the magnitude of organic carbon delivery, emphasizing the coupling of respiration to the overlying primary production in the surface. This result opens the issue to concern over exacerbating eutrophication due to anthropogenic nutrient loading, however. In the future, if the Nooksack is polluted with excess nitrogen and phosphorus, it is possible the hypoxia in the bay may get worse as a consequence due to the biological implications of increased availability of nutrients.

More investigation must be done into the effects of changes in phytoplankton biomass and community structure in mediating heterotrophic processes. Previously, it was seen that microbes in the surface may take approximately seven days to sink down to the bay's depth. This may be further looked into in the 2015 data, especially as the unusual conditions of stratification may have influenced vertical transport.

## References

- Breitburg, D. (2002). Effects of hypoxia, and the balance between hypoxia and enrichment, on coastal fishes and fisheries. *Estuaries*, 25(4), 767-781.
- Christman, N. (2015) Physical and microbial drives of hypoxia in Bellingham Bay, Pacific Estuarine Research Society.
- Del Giorgio, P. A., & Duarte, C. M. (2002). Respiration in the open ocean. *Nature*, 420 (6914), 379-384.
- Duarte, C. M., & Cebrian, J. (1996). The fate of marine autotrophic production. *Limnology and Oceanography*, 41(8), 1758-1766.
- Griffin, D. A., & LeBlond, P. H. (1990). Estuary/ocean exchange controlled by spring-neap tidal mixing. *Estuarine, Coastal and Shelf Science*, 30(3), 275-297.
- Diaz, R. J. (2001). Overview of Hypoxia around the World. *Journal of Environment Quality*, 30(2), 275

- Keister, J. E., Houde, E. D., & Breitburg, D. L. (2000). Effects of bottom-layer hypoxia on abundances and depth distributions of organisms in Patuxent River, Chesapeake Bay. *Marine Ecology Progress Series*, 205, 43-59.
- Kemp, W. M., & Boynton, W. R. (1980). Influence of biological and physical processes on dissolved oxygen dynamics in an estuarine system: Implications for measurement of community metabolism. *Estuarine and Coastal Marine Science*, 11(4), 407-431.
- Malone, T. C., Crocker, L. H., Pike, S. E., and Wendler, B. W (1988). Influence of river flow on the dynamics of phytoplankton production in a partially stratified estuary. *Marine Ecology Progress Series*, 48: 235-24.
- McLaughlin, R (2009). Inter-annual variation in temperature, salinity, and dissolved oxygen in San Juan Channel: patterns and external driving forces. Friday Harbor Laboratories, University of Washington.
- Rabalais, N. N., & Turner, R. E. (2001). Coastal hypoxia: consequences for living resources and ecosystems.
- Williams, P. J. L. (1981). Microbial contribution to overall marine plankton metabolism-direct measurements of respiration. *Oceanologica Acta*, 4(3), 359-364.

### **Acknowledgements**

I would like to thank Dr. Jude Apple and Dr. Jan Newton for being the very best mentors I could possibly ask for! Another thanks to Dr. Robin Kodner and Ciara Asamoto for their great contributions to the Bellingham Bay project. Also, thanks to the McNair Scholar's program for being a fantastic resource and constant pool of support. Funding for this research was provided by Washington Research Foundation.

Natasha Christman

School of Oceanography; mentors: Dr. Jude Apple & Dr. Jan Newton

[nrchri10@uw.edu](mailto:nrchri10@uw.edu)

I am interested in the effects of anthropogenic stressors on marine microbial communities, and I will be continuing work on the Bellingham Bay research project in the near future. After this, I intend to pursue

Physical and microbial drivers of oxygen dynamics and hypoxia in  
Bellingham Bay, WA

graduate studies in Biological Oceanography.





## The relationship between trait anxiety, heart rate, and intrusive memories

Martina Fruhbauerova

UW Center for Anxiety and Traumatic Stress

### Abstract

*Some physiological markers, such as heart rate, may be related to the development of later intrusive memories following a distressing event (e.g., Blanchard et al., 1996; Metzger et al., 1999). Several analogue experimental studies have found a relationship between lower heart rate and an increased number of subsequent intrusions as well as increases in heart rate and trait anxiety. However, the potential interplay between trait anxiety, heart rate, and subsequent intrusive memories is yet to be established. The aim of this study is to explore the relationship between heart rate and intrusions by examining how trait anxiety may mediate this relationship. We predict that there will be a strong negative correlation between heart rate during intrusive memory sequences and number of subsequent intrusions, a positive correlation between heart rate during intrusive memory sequences and trait anxiety, and that trait anxiety will mediate this relationship. We collected data from 33 undergraduate students who viewed a 10-minute video clip to elicit distress and later film-related intrusive memories. Participants' heart rates were monitored using Microsoft<sup>®</sup> wrist bands, and we specifically looked at heart rate during film sequences most commonly reported as later intrusive memory content. Participants were assessed for intrusions (frequency, distress, and content) 24-hr after film viewing. We found no relationship between trait anxiety and later intrusions as well as no relationship between heart rate during the intrusions sequence and later intrusive memories. The implications are discussed.*

*Keywords:* trait anxiety, heart rate, intrusive memories

The etiology and maintenance of posttraumatic stress disorder (PTSD) has been an important aspect of psychological research. Not all individuals who experience a traumatic event will develop PTSD, and in fact the vast majority of people will recover naturally (Kilpatrick et al., 2013). However, a key component in persistent PTSD is a sense of serious current threat one feels during or after the traumatic event (Ehlers & Clark, 2000). Trauma researchers are especially interested in

factors that contribute to maintaining persistent PTSD, as PTSD is a disorder that interferes with patients' daily lives.

Intrusions, a hallmark symptom of PTSD, are brief, intense, snapshot-like intrusive memories related to the trauma (Brewin, Gregory, Lipton, & Burgess, 2010). Intrusions are mostly visual sensory recollections (Hackmann, Ehlers, Speckens, & Clark, 2004; Ehlers & Steil, 1995; Ehlers et al., 2002; Michael, Ehlers, Halligan, & Clark, 2005), and are not, perhaps counterintuitively, usually concerned with pain or other physiological sensations during the worst part of a trauma (Ehlers et al., 2002). Intrusions are a natural part of recovery after trauma (Ehlers & Steil, 1995), as intrusions are commonly identified in healthy individuals without a PTSD diagnosis (e.g., Michael et al., 2005). Accordingly, a study by Stawski, Sliwinski, and Smyth (2009) demonstrated that individuals who were experimentally presented with an acute psychosocial stressor experienced a higher percentage of intrusions and had more difficulties on immediate and delayed performance tasks, exhibiting the complications one has to deal with when faced with a stressor. Patients with persistent PTSD, however, experience a greater number of these intrusive memories (Ehlers & Clark, 2000), as they seem to be easily triggered by the perceptual cues in the environment, such as smells or shapes of people and/or objects (Halligan, Clark, & Ehlers, 2002). Thus, it is surprising that the presence and frequency of the intrusive memories following after trauma are not reliable predictors of PTSD severity (Ehlers & Steil, 1995; Michael et al., 2005).

However, perceived lack of context of these intrusions and subsequent distress caused by the intrusions have been identified as consistent predictors of PTSD severity (Ehlers & Steil, 1995; Michael et al., 2005). Clearly, not everyone experiencing intrusions renders them distressing as those who have a PTSD diagnosis (Ehlers & Steil, 1995). One plausible explanation for this phenomenon was suggested by Ehlers and Steil (1995) and Ehlers and Clark (2000), who posit that intrusive memories may be interpreted by individuals with PTSD as a sign of a threat. Consistent with this theory, Ehlers and colleagues (2002) argue that intrusive memories are representations of the stimuli that closely precede the most emotional content of the traumatic event, thus symbolizing a warning signal for imminent threat, which, if confronted with in the future, would indicate impending danger. In contrast, in their systematic study, Holmes, Grey, and Young (2005) proposed that intrusions correspond to the worst moments of the traumatic event, considered "hotspots." Whether a terrifying sign of what is about to follow or

## Trait Anxiety, Heart Rate, and Intrusive Memories

as a reminder of the scariest part of the trauma, clearly, intrusions cause significant distress to the individual suffering from PTSD and interfere with their functioning (Ehlers & Steil, 1995).

An important next practical question to be explored given what we know about intrusions is to identify their possible predictors. This area has been researched to a certain extent in the trauma literature, but most studies do not include clinical samples. In one of the studies that did use a clinical sample of motor vehicle accident (MVA) survivors who sought medical help, fear of dying at the place of MVA, degree of injury, and the presence of prior PTSD or major depressive episode were all shown to predict the development of both, PTSD and post-traumatic stress symptoms (Blanchard et al., 1996). It appears that MVA trauma survivors are affected by pre-trauma psychological states and by the possibility of dying and/or injury severity when concerned with the question who would be most likely to receive a subsequent PTSD diagnosis or suffer from its symptoms. In another clinical study by Elsesser, Sartory, and Tackenberg (2004), higher levels of trait anxiety and depression were closely correlated with the presence of chronic PTSD, suggesting that the emotional states prior to trauma play role in PTSD psychopathology.

Some research has also suggested that those pre-trauma psychological states may also play role in the development of PTSD symptomatology in a non-clinical sample. According to Regambal and Alden (2009), intrusive memories are indirect consequences of preexisting emotional states and emotional reactivity that is mediated by certain peritraumatic cognitive processes. Another study, using analogue traumatic stressors, such as a trauma film paradigm in which a distressing film clip is played to the participants to induce fear, anxiety, negative moods, intrusions, etc., suggested that preexisting emotional characteristics, such as depression, trait anxiety, or trait dissociation, could be predictive of later development of intrusive memories (Bomyea & Amir, 2012). The same study indicated that those individuals with high levels of disgust propensity were more likely to experience intrusive thoughts about a distressing film immediately after viewing it, establishing disgust, among others, as a possible preexisting emotional state related to intrusions. Other pre-existing emotional states in a non-clinical sample were discussed in a study by Laposa and Alden (2008) who demonstrated the connection between three of the vulnerability factors, including trait dissociation, depression, trait anxiety, and intrusions. In contradiction to this finding and findings by Elsesser et al.

(2004) mentioned above, however, other studies were inconsistent in demonstrating that other variables, such as trait anxiety, depression, or dissociation were related to the presence of subsequent intrusions after traumatic stressors (Davies & Clark, 1998; Halligan et al., 2002). Thus, it is yet to be established whether such vulnerability factor as trait anxiety has predictive qualities for intrusions, as the role of trait anxiety in PTSD and its effect on intrusive memories are noteworthy phenomena.

The emotions an individual experiences during a traumatic event seem to carry significance as well. Regambal and Alden (2009) presented results suggesting that intrusive memories are directly related to emotional reactivity during an analogue trauma and also related to maladaptive coping strategies (e.g., rumination, thought suppression, safety behaviors). While fear is often the first emotion that comes to mind when thinking about peritraumatic emotional experiences, studies have shown that a range of different emotions occur during trauma. In fact, it has been argued that the most intense emotional periods in trauma (“hotspots”) are accompanied not only by fear, helplessness, or horror but also by a wide range of varied emotions (Holmes et al., 2005). In line with this research, findings from Grey, Holmes, and Brewin (2001) suggest that the inability to establish habituation in some patients receiving exposure therapy was due to the therapists’ lack of attention to other emotions (rather than fear) that were associated with hotspots, signifying the importance of different peritraumatic emotions in development of PTSD symptomatology.

Having established the pre- and peritraumatic emotional states as modifiers in the development of intrusive memories, the curious researcher might wonder whether other factors, such as physiological measures, play role in evoking intrusions following traumatic event. Due to the objectivity of their assessment, physiological measures, such as heart rate, are essential tools when assessing for distress and reactivity. Blanchard et al. (1996) showed that psychophysiological data were perfectly correlated with the fluctuations in clinical states of motor vehicle accident (MVA) survivors even at one-year follow-up. This has been replicated in an experimental setting in which participants demonstrated substantial and significant physiological responding when exposed to scenes of combat memories. This responding, specifically heart rate responding, did not diminish immediately following therapy (Boudewyns & Hyer, 1990). In their study, Blanchard and colleagues (2002) presented findings in which heart rate was rendered the most sensitive physiological variable in response to trauma cues. Consistent

## Trait Anxiety, Heart Rate, and Intrusive Memories

with this idea, Graham and Clifton (1966) argued that heart rate was a particularly useful measure in psychological inquiries. In their study, heart rate was strongly associated with experimental manipulations, as increases in heart rate were linked to defense mechanisms and decreases in heart rate were linked to orientating (i.e., changes in stimulation). Clearly, heart rate appears to be a fairly precise marker for the psychophysiological processing.

The obvious question that remains, and a question we will explore here, is whether heart rate, PTSD, and its symptomatology are also related. The study by Elsesser et al. (2004) found that patients with chronic PTSD, along with victims of recent trauma, demonstrated elevated levels of heart rate when confronted with trauma-related pictures, compared to healthy controls. Similar findings were reported by Metzger et al. (1999) who investigated women with histories of child sexual abuse (CSA). Women with current PTSD exhibited significantly higher levels of heart rate than those without the PTSD diagnoses when startled by a tone. Paradoxically, a study conducted in the emergency department found that those with higher heart rate values at the time of their emergency room visit were less likely to meet criteria for PTSD at one-month and thirteen-month follow-ups (Blanchard, Hickling, Galovski, & Veazey, 2002). It appears that individuals who meet criteria for PTSD may experience a powerful elevation in heart rate when facing any future stressor stimuli. On the other hand, those without PTSD may experience a very weak elevation in heart rate in a similar situation. A possible explanation for this phenomenon is that one of the PTSD symptoms is hypervigilance, which tends to be associated with increases in heart rate in patients but not in healthy controls. When faced with analogue stressors, healthy controls will freeze in the presence of trauma in which case their heart rate slows down, stays the same, or elevates only slightly, as their body stills, muscles tense, and/or they may “forget to breathe” (Baldwin, 2012).

Providing the evidence for the importance of heart rate in psychological responding following trauma or stressors, we want to investigate whether heart rate is related to intrusive memories. In fact, several studies have found correlations between heart rate and intrusions. Heart rate suppression has been found among healthy individuals when watching a trauma film, where specifically the biggest heart rate drop has been found at the time of the intrusive sequences (i.e., the parts of the film that are most often reexperienced as intrusions); moreover, the decrease in heart rate during the stressor was associated with a higher

number of subsequent intrusions (Chou et al., 2014b; Holmes et al., 2004). It appears that healthy individuals will show a lower heart rate when experiencing trauma-like events in experimental settings and that will subsequently lead to more intrusive memories. On the other hand, survivors of a recent trauma without PTSD and individuals with PTSD appear to experience heart rate acceleration when prompted by trauma-relevant pictures, and interestingly, this acceleration was significantly and positively correlated with trait anxiety (Elsesser et al., 2004).

The role of heart rate and trait anxiety in the prediction of intrusive memories is not a simple one; their effects are variable with healthy individuals and with individuals with PTSD. When confronted with a stressor, healthy individuals will experience slower heart rate, which may lead to more intrusions, whereas PTSD patients will experience heart rate acceleration. Effects of trait anxiety on intrusions in a healthy population produced mixed findings (e.g., Laposka & Alden, 2008; Davies & Clark, 1998), additionally, trait anxiety has been shown to be correlated with chronic PTSD and with elevated levels of heart rate in PTSD patients (Elsesser et al., 2004). However, the potential interplay between trait anxiety, heart rate, and subsequent intrusive memories is yet to be established. The aim of this study is to explore the relationship between heart rate and intrusions in a healthy population by examining how trait anxiety may mediate this relationship. We predict that there will be a strong negative correlation between heart rate during intrusive memory sequences and number of subsequent intrusions, a positive correlation between heart rate during intrusive memory sequences and trait anxiety, and that trait anxiety will mediate the relationship between heart rate and number of subsequent intrusions.

## **Method**

### *Participants*

Thirty-three undergraduate students in an introductory psychology class participated in the study for an extra credit opportunity. The sample consisted of mostly female (66.7%), non-Hispanic or Latino (93.9%) individuals, with an average age of 19 years old. See Table 1 in Appendix for complete demographic information.

### *Materials*

Distressing film. A distressing film paradigm was used to simulate exposure to a traumatic event, as it has been well-established way of experimentally studying trauma in non-clinical samples (Holmes &

## Trait Anxiety, Heart Rate, and Intrusive Memories

Bourne, 2008). Our film consisted of a 10-minute segment from the film *Last King of Scotland* projected onto a white wall. This film depicted a vivid and intense scene of a mutilation of a female body and death. This same film segment has been previously used with a non-clinical sample, and elicited intrusive memories in a majority of participants, as well as mild to moderate distress (Marks & Zoellner, 2014). The most distressing part of the film clip (hotspot) which we call the ‘intrusion sequence’, as it is expected to elicit the intrusions, begun at the 7<sup>th</sup> (?) minute and lasted until the end of the clip.

Microsoft Bands. Microsoft wrist bands were used to collect HR data. The bands collect samples every second. Each participant receives their own band, and bands are connected via Bluetooth technology to one of two smartphones during sessions. The smartphones have an application specifically programmed for our study that collects heart rate data from each band and stores it automatically on a firewall-protected server.

### *Self-Report Measures*

Demographic Questionnaire. This short questionnaire inquires about gender, age, race, ethnicity, and education level.

Posttraumatic Symptom Scale (PS-SR-5; Foa et al., 2014). This is a 49-item self-report measure for assessing exposure to previous trauma and any related PTSD symptoms. It includes a trauma screen with yes/no questions and list of problems following traumatic event which is answered on a scale from 0 (‘not at all’) to 4 (‘6 or more times a week’). Higher scores indicate more severe symptoms.

Beck Depression Inventory (BDI; Beck, Steer, & Brown, 1996). This is a widely used 21-item self-report measure that assesses severity of depression. Questions are concerned with feelings during the past two weeks rated on a scale from 0 (e.g., “I don’t cry any more than I used to) to 3 (e.g., “I feel like crying, but I can’t”). Responses are question-specific, and higher scores indicate more severe depression. The BDI-II has been shown to have good reliability and validity.

State-Trait Anxiety Inventory-Trait scale (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). This 40-item self-report measures anxiety that differentiates between current and trait, or long-standing, anxiety. This measure is concerned with how an individual generally feels (e.g., “I feel nervous and restless”) with scores from 1



(‘not at all’) to 4 (‘very much so’) in which higher total score indicates more trait anxiety.

### Intrusion Assessment:

24h after the first day, intrusive memories were assessed by the research assistants over a phone. The frequency and content of the intrusions was noted, and an intrusion-related distress rating was also collected. Research assistants assured that what they noted as intrusions were in fact intrusive memories, as they had the participants describe their memories.

### *Procedure*

All study sessions were run in groups of 7 – 10 participants in a computer lab. Upon arrival, all participants read and signed a consent form before the start of the study. If participants had questions they wanted answered privately, they were given the opportunity to step out of the room with a research assistant. The study comprised of two days. The first day lasted approximately one hour. At the beginning, participants were instructed to put on the Microsoft wrist bands and asked to sit still for three minutes in order to obtain their baseline heart rate. Next, they were asked to fill out self-report questionnaires on their individual computers, which took about twenty minutes. The film segment was then projected onto a large screen at the front of the room for ten minutes, while assuring that all participants paid close attention. After the film viewing, participants filled out three more questionnaires on their computers.

Upon scheduling a specific time suitable for each subject, research assistants conducted a phone assessment the following day in order to assess intrusions. The research assistants gave a definition of intrusive memories to each of the participants at the beginning of the call; then, the participants were asked about any intrusive memories they had related to the film segment.

## **Results**

Correlational data for HR, trait anxiety, and number of intrusions are summarized in Table 2 (Appendix). None of the pairwise correlations between HR and trait anxiety or number of intrusions were significant ( $p > 0.05$ ). Comparisons of HR levels during baseline, pre-intrusion, intrusion, and post-intrusion sequences in film clip with two-tailed  $t$ -tests found significant correlations ( $p < 0.01$ ).

Figures 1 and 2 in the Appendix summarize the differences in

## Trait Anxiety, Heart Rate, and Intrusive Memories

HR between individuals who experienced subsequent intrusions and those who did not experience any intrusions at different times in the film sequences. Comparison of baseline HR with two-tailed  $t$  test showed that the difference between people with intrusions and without was not significant,  $t(31) = -0.18, p = 0.86$ . Comparison of pre-intrusion sequence HR with a two-tailed  $t$ -test showed that the difference between people with intrusions and without was not significant,  $t(31) = -1.03, p = 0.31$ . Comparison of intrusion sequence HR with a two-tailed  $t$ -test showed that the difference between people with intrusions and without was not significant,  $t(31) = -1.28, p = 0.21$ . Comparison of post-intrusion sequence HR with two-tailed  $t$ -test showed that the difference between people with intrusions and without intrusions was not significant,  $t(31) = -1.15, p = 0.26$ .

### Discussion

The present study examined the relationship between levels of heart rate (HR), trait anxiety, and their effects on intrusive memories in an analogue stressor setting. Given that our participants were all healthy undergraduate individuals, we anticipated that those who would later experience intrusions due to the distressing film clip would have lower levels of HR during this clip than those who did not experience intrusions in the next twenty-four hours. Moreover, those who experienced intrusions were expected to show a significant drop in HR at the peak of the emotional distress (“hotspot”) during the clip, which was a scene in which a mutilated body of a woman appeared on a screen. Inconsistent with previous findings (e.g., Chou et al., 2014; Holmes et al., 2004), and our hypothesis, we did not find this relationship. In fact, in our study, those who did experience subsequent intrusions had slightly higher levels of HR throughout the entire film clip, however not significantly higher. Furthermore, these individuals did not exhibit a drop in the HR during hotspot, as they essentially maintained the same levels of HR during the clip as demonstrated by the significant correlations between HR at different time points in the film. In summary then, unexpectedly, there were no differences in HR between those who experienced intrusions and those did not. Additionally, our study did not find that trait anxiety was associated with either the number of subsequent intrusions or HR during the intrusion sequence; thus, trait anxiety appears not to function as a mediator between HR and subsequent intrusions, given the lack of relationship with either variable.

There are several possible explanations for the current findings. First, it is possible that the film clip failed to elicit substantial distress in the participants and thus, they were unlikely to experience any subsequent intrusive memories. The current participants were all undergraduate students and members of a young adult generation that has possibly habituated to violence in movies, as they have been growing up in a culture in which aggression and explicit death portrayals in movies have become quite normal over the past two decades. Clearly, not every participant is expected to be accustomed to violent movies or distressing events; thus, individual differences may play role in washing out the overall effects. Therefore, it would be important in the future to evaluate these individual differences, such as assessing whether participants enjoy and seek out violent and graphic movies, whether they have experienced previous trauma (i.e., violence and death), and importantly how closely they paid attention during the violent sequence in the film clip. In addition to controlling for the possible participants' habituation to violence, future studies could enhance the ability to elicit distress by incorporating more real-world stimuli, such as simulations through virtual reality or an event that is more personally relevant and more likely to happen to undergraduates, rather than a graphic mutilation scene.

Secondly, although HR and its role in PTSD has been somewhat documented in the literature, there is still no clear-cut association between peritraumatic HR and subsequent intrusive memories. The same irregularities have been identified in cortisol release (i.e., levels of stress) and intrusive memories (Chou et al., 2014a). Apparently, physiological measures, as instrumental as they are in assessing distress and other psychological fluctuations objectively, have not been shown to be able to predict intrusive memories. Hence, the future studies would benefit from adding other measures and other levels of analysis, such as a self-reported subjective units of distress (SUD) scale or skin conductance response, and comparing them to HR to ensure a more comprehensive representation of distress.

Third, our results may be due to the small number of participants ( $N=33$ ) and their homogeneity, as mentioned above. During our study, technical challenges with the Microsoft bands hindered the collection of the data resulting in a much smaller sample size than originally planned. Thus, it would be preferable to accrue a larger number of participants who should also be from diverse age groups to ensure the stability and generalizability of our results.

Finally, the current study might be a reliable characterization of

the relationship between HR, trait anxiety, and subsequent intrusive memories in a healthy population. Findings regarding the relationships between HR and intrusions and between trait anxiety and intrusions have been mixed (e.g., Laposa & Alden, 2008; Davies & Clark, 1998; Chou et al., 2014b; Holmes et al., 2004) and more research is needed to elucidate this interplay. To our knowledge, this is the first study that examined these two parameters specifically to predict the development of intrusive memories. Since we have not presented clear evidence of HR levels and trait anxiety being related to subsequent intrusions, as HR during the film clip did not significantly change from baseline and trait anxiety was not correlated with the number of intrusions, it is possible that peritraumatic HR and trait anxiety may not be good predictors of subsequent intrusive memories; however, replication is certainly necessary and warranted.

The importance of understanding intrusive memories in trauma research, and in psychopathology more broadly, is clearly justified. Following trauma and going beyond natural recovery, persistent intrusive memories have been shown to be related to poor long-term outcome, suggesting the development of severe psychopathology, and in the maintenance of PTSD (e.g., Ehlers & Steil, 1995). However, some researchers have questioned whether the current methodology for assessing intrusions and flashbacks are appropriate (e.g., Brewin, 2015). Clearly then, the future of research focused on intrusive memories must continue building on existing studies to not only shed light on underlying mechanisms in the development of intrusions and to assist in the development of effective treatments but also to find adequate ways to elicit intrusions experimentally and to assess intrusions in both clinical and non-clinical samples. As treatment has been shown to improve diagnostic status and lower levels of intrusive symptoms (van Emmerik, Kamphuis, & Emmelkamp, 2008), we would greatly benefit from having the ability to predict who would be more likely to develop intrusive memories and thus, possibly, be able to prevent the onset of severe psychopathology, such as PTSD.

### References

- Baldwin, D. V. (2012). Primitive mechanisms of trauma response: An evolutionary perspective on trauma-related disorders. *Neuroscience and Biobehavioral Reviews*, *37*, 1549-1566.
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Beck Depression In-*

- ventory-2nd ed. manual. San Antonio, TX: Psychological Corporation.
- Blanchard, E. B., Hickling, E. J., Buckley, T. C., Taylor, A. E., Vollmer, A., & Loos, W. R. (1996). Psychophysiology of Post-traumatic Stress Disorder related to motor vehicle accidents: Replication and extension. *Journal of Consulting and Clinical Psychology, 64* (4), 742-751.
- Blanchard, E. B., Hickling, E. J., Galovski, T., & Veazey, C. (2002). Emergency room vital signs and PTSD in a treatment seeking in a sample of motor vehicle accident survivors. *Journal of Traumatic Stress, 15* (3), 199-204.
- Blanchard, E. B., Hickling, E. J., Taylor, A. E., Loos, W. R., Forneris, C. A., & Jaccard, J. (1996). Who develops PTSD from motor vehicle accidents? *Behaviour Research and Therapy, 34* (1), 1-10.
- Blanchard, E. B., Hickling, E. J., Veazey, C. H., Buckley, T. C., Freidenberg, B. M., Walsh, J. D., & Keefer, L. (2002). Treatment-related changes in cardiovascular reactivity to trauma cues in motor vehicle accident-related PTSD. *Behavior Therapy, 33*, 417-426.
- Bomyea, J., & Amir, N. (2012). Disgust propensity as a predictor of intrusive cognitions following a distressing film. *Cognitive Therapy & Research, 36*, 190-198.
- Bomyea, J., Amir, N., Lang, A. J. (2012). The relationship between cognitive control and posttraumatic stress symptoms. *Journal of Behavior Therapy and Experimental Psychiatry, 43*, 844-848.
- Boudewyns, P. A., & Hyer, L. (1990). Physiological response to combat memories and preliminary treatment outcome in Vietnam veteran PTSD patients treated with direct therapeutic exposure. *Behaviour Therapy, 21*, 63-87.
- Brewin, C. R. (2015). Re-experiencing traumatic events in PTSD: new avenues in research on intrusive memories and flashbacks. *European Journal of Psychotraumatology, 6*. doi:10.3402/ejpt.v6.27180
- Brewin, C. R., Gregory, J. D., Lipton, M., & Burgess, N. (2010). Intrusive images in psychological disorders: Characteristics, neural mechanisms, and treatment implications. *Psychological Review, 117* (1), 210-232.
- Chou, C., La Marca, R., Steptoe, A., & Brewin, C. R. (2014a). Biologi-

## Trait Anxiety, Heart Rate, and Intrusive Memories

- cal responses to trauma and the development of intrusive memories: An analogue study with the trauma film paradigm. *Biological Psychology*, *103*, 135-143.
- Chou, C., La Marca, R., Steptoe, A., & Brewin, C. R. (2014b). Heart rate, startle response, and intrusive trauma memories. *Psychophysiology*, *51*, 236-246.
- Davies, M. I., Clark, D. M. (1998). Predictors of analogue post-traumatic intrusive cognitions. *Behavioural and Cognitive Psychotherapy*, *26*, 303-314.
- Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, *38*, 319-345.
- Ehlers, A., Hackmann, A., Steil, R., Clohessy, S., Wenninger, K., & Winter, H. (2002). The nature of intrusive memories after trauma: the warning signal hypothesis. *Behaviour Research and Therapy*, *40*, 995-1002.
- Ehlers, A., & Steil, R. (1995). Maintenance of intrusive memories in posttraumatic stress disorder: A cognitive approach. *Behavioural and Cognitive Psychotherapy*, *23*, 217-249.
- Elsesser, K., Sartory, G., & Tackenberg, A. (2004). Attention, heart rate, and startle response during exposure to trauma-relevant pictures: A comparison of recent trauma victims and patients with Posttraumatic Stress Disorder. *Journal of Abnormal Psychology*, *113* (2), 289-301.
- Foa, E. B., et al. (2014). PTSD scale self-report for DSM-V (PS-SR-5)
- Graham, F. K., & Clifton, R. K. (1966). Heart-rate change as a component of the orienting response. *Psychological Bulletin*, *65* (5), 305-320.
- Grey, N., Holmes, E., & Brewin, C. R. (2001). Peritraumatic emotional “hot spots” in memory. *Behavioural and Cognitive Psychotherapy*, *29*, 367-372.
- Hackmann, A., Ehlers, A., Speckens, A., & Clark, D. M. (2004). Characteristics and content of intrusive memories in PTSD and their changes with treatment. *Journal of traumatic stress*, *17* (3), 231-240.
- Halligan, S. L., Clark, D. M., & Ehlers, A. (2002). Cognitive processing, memory, and the development of PTSD symptoms: two experimental analogue studies. *Journal of Behavior Therapy and Experimental Psychiatry*, *33*, 73-89.
- Halligan, S. L., Michael, T., Clark, D. M., & Ehlers, A. (2003). Post-

- traumatic Stress Disorder following assault: The role of cognitive processing, trauma memory, and appraisals. *Journal of Consulting and Clinical Psychology*, 71 (3), 419-431.
- Holmes, E. A., & Bourne, C. (2008). Inducing and modulating intrusive emotional memories: A review of the trauma film paradigm. *Acta Psychologica*, 127, 553-566. doi:10.1016/j.actpsy.2007.11.002
- Holmes, E. A., Brewin, C. R., & Hennessy, R. G. (2004). Trauma films, information processing, and intrusive memory development. *Journal of Experimental Psychology: General*, 133 (1), 3-22.
- Holmes, E. A., Grey, N., & Young, K. A. D. (2005). Intrusive images and “hotspots” of trauma memories in Posttraumatic Stress Disorder: an exploratory investigation of emotions and cognitive themes. *Journal of Behavior Therapy and Experimental Psychiatry*, 36, 3-17.
- Kilpatrick, D. G., Resnick, H. S., Milanak, M. E., Miller, M. W., Keyes, K. M., & Friedman, M. J. (2013). National estimates of exposure to traumatic event and PTSD prevalence using DSM-IV and DSM-5 criteria. *Journal of Traumatic Stress*, 26, 537-547.
- Laposa, J. M., & Alden, L. E. (2008). The effects of pre-existing vulnerability factors on a laboratory analogue trauma experience. *Journal of Behavior Therapy and Experimental Psychiatry*, 39, 424-435.
- Marks, E. H., & Zoellner, L. A. (2014). Attenuating fearful memories: Effect of cued extinction on incursions. *Emotion*, 14 (6), 1143-1154.
- Metzger, L. J., Orr, S. P., Berry, N. J., Ahern, C. E., Lasko, N. B., & Pitman, R. K. (1999). Physiologic reactivity to startling tones in women with Posttraumatic Stress Disorder. *Journal of Abnormal Psychology*, 108 (2), 347-352.
- Michael, T., Ehlers, A., Halligan, S. L., & Clark, D. M. (2005). Unwanted memories of assault: what intrusion characteristics are associated with PTSD? *Behaviour Research and Therapy*, 43, 613-628.
- Nijenhuis, E. R. S., Vanderlinen, J., & Spinhoven, P. (1998). Animal defense reactions as a model for trauma-induced dissociative reactions. *Journal of Traumatic Stress*, 11 (2), 243-260.
- Regambal, M. J., & Alden L. E. (2009). Pathways to intrusive memories in a trauma analogue paradigm: A structural equation mod-

## Trait Anxiety, Heart Rate, and Intrusive Memories

el. *Depression and Anxiety*, 26, 155-166.

- Spielberger, C. D., Gorsuch, R. L., Lushene, R. E., Vagg, P. R., & Jacobs, G. A. (1983). *STAI manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.
- Stawski, R. S., Sliwinski, M. J., Smyth, J. M. (2009). The effects of an acute psychosocial stressor on episodic memory. *European Journal of Cognitive Psychology*, 21 (6), 897-918.
- van Emmerik, A. A. P., Kamphuis, J. H., & Emmelkamp, P. M. G. (2008). Treating acute stress disorder and posttraumatic stress disorder with cognitive behavioral therapy or structured writing therapy: A randomized controlled trial. *Psychotherapy and Psychosomatics*, 77, 93- 100.



**Appendix**

*Table 1. Demographic Characteristic of Sample (N=33)*

	<i>n (%)</i>
<b>Gender</b>	
Female	22 (66.7)
Male	11 (33.3)
<b>Race</b>	
Asian	17 (51.5)
Black Or African American	2 (6.1)
White	11 (33.3)
Other Or Mixed	3 (9.1)
<b>Ethnicity</b>	
Not Hispanic Or Latino	31 (93.9)
Hispanic Or Latino	2 (6.1)
<b>Education</b>	
High School Diploma	17 (51.5)
Some College	15 (45.5)
Associate Degree	1 (3.0)
	<i>M (SD)</i>
Age (years)	19.09 (1.156)
PS-SR-5	6.50 (6.317)
BDI-II	9.6970 (8.34598)
STAI-T	41.27 (9.802)

*Note.* PS-SR-5 = Posttraumatic Symptom Scale; BDI-II = Beck Depression Inventory II; STAI-T = State-Trait Anxiety Inventory-Trait

Table 2. *Correlation matrix of variables examined to predict intrusions*

	Baseline HR Avg.	Pre-Intrusion Sequence HR Avg.	Intrusion Sequence HR Avg.	Post-Intrusion Sequence HR Avg.	Trait Anxiety Score (STAD)	Total no. of Intrusions
Baseline HR Avg.	-	0.817**	0.827**	0.813**	0.010	0.048
Pre-Intrusion Sequence HR Avg.		-	0.891**	0.933**	0.056	0.118
Intrusion Sequence HR Avg.			-	0.891**	0.008	0.145
Post-Intrusion Sequence HR Avg.				-	0.018	0.198
Trait Anxiety Score (STAD)					-	0.332
Total no. of Intrusions						-

\*\* . Correlation is significant at the 0.01 level (2-tailed)

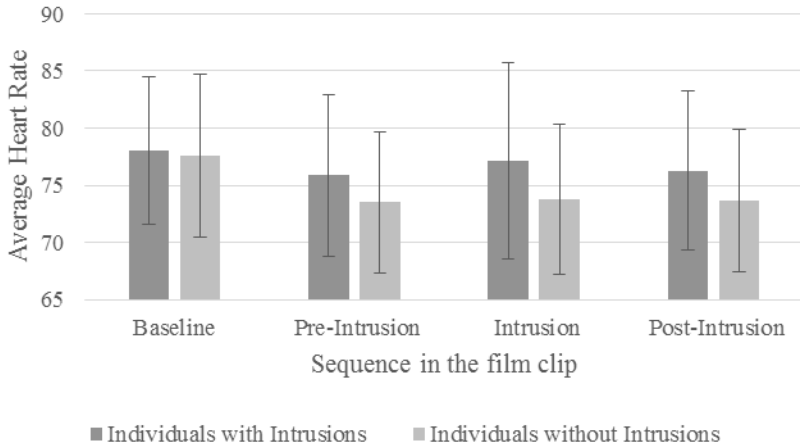


Figure 1. Mean heart rate levels across time

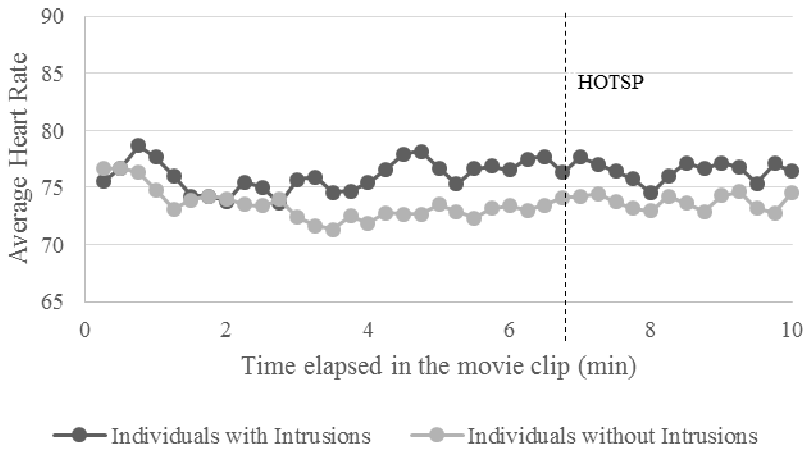


Figure 2. Changes in heart rate during the film clip

### Acknowledgments

I would like to thank Elizabeth Marks, M.S., and Lori Zoellner, PhD, for making this research possible. Their brilliance, guidance, patience, and support were vital to this process.

I would also like to thank the graduate students, staff, and vol-

## Trait Anxiety, Heart Rate, and Intrusive Memories

unteers at the UW Center for Anxiety and Traumatic Stress as well as my fellow undergraduate researchers who became my friends for facilitating outstanding learning and supportive environment.

I would also like to thank the Ronald E. McNair Program and its staff for providing a family-like environment at difficult times, for the financial support, and for guiding and supporting me through the process of research.

This project has also been supported by the Mary Gates Research Scholarship and I am greatly thankful for that.

Lastly, I would like to thank my mom for always loving me and believing in me. I would not make it where I am now without her.

Martina Fruhbauerova

Psychology Department, Mentors: Elizabeth Marks, Lori Zoellner  
[anitram@uw.edu](mailto:anitram@uw.edu)

My research interests and the intended doctoral degree in clinical psychology are with emphasis on personality disorders, specifically Borderline Personality Disorder, suicide risks and prevention, and the efficacy and implementation of Dialectical Behavior Therapy in the treatment of these domains.



# Red State verse Blue State: “Who does Better for our Kids?”

Ferdose Idris

## Abstract

*Public investments in children are thought to benefit society by producing a healthy and productive workforce. However, in the race to produce competitive workers in the new international market, differing political approaches can result in variations in expenditures and disparities amongst children. In this research I analyze how overall childhood well-being differs between red states (states that voted for the Republican presidential candidate in two out of the last three elections) and blue states (states that voted for the Democratic presidential candidate in two out of the last three elections) to see if political ideologies are related to child outcomes. I also consider whether any differences between red states and blue states vary significantly for black and white youth. I look at three dimensions of childhood wellbeing: (1) health (infant mortality, percent immunized and Medicaid expenditures), (2) educational achievement (high school dropout rate and education expenditure per pupil), and (3) economic security (percent of population below the poverty line, and state expenditure on welfare programs) to determine which political orientation is associated with better conditions for youth. I expect Blue states, or Democratic leaning states, to yield better scores of adolescent wellbeing due to their advocacy for a larger social safety net. Previous research has shown that blacks typically have worse health, lower educational attainment and less economic security than do whites.*

## Introduction

The American Dream is far from a reality today. Over the last decade, Americans have suffered from the great recession, a crisis in education and a problematic healthcare system. This is all in spite of U.S. politicians promising reform, growth and opportunity for their citizens and future generations. Public investments in youth have been shown to lead to productivity that benefits society at large (Blank 1997). However, in the race to produce a competitive workforce in today’s international market, political ideology is arguably the biggest predictor of policy platforms. Have political differences lead to growing disparities in education, economic well-being, and health, particularly

amongst the youth? In this research, I test if political ideology is associated with childhood outcomes by analyzing adolescent<sup>1</sup> well-being in “Red States” (states that voted for the Republican presidential candidate in two out of the last three elections) and “Blue States” (states that voted for the Democratic presidential candidate in two out of the last three elections). I also investigate to see if these differences vary by race.

## Literature Review

### *How does politics affect childhood outcomes?*

Understanding how variations in adolescent outcomes differ by the political leaning of the electorate is crucial in the current U.S. political context. State and local authorities are increasingly gaining autonomy in decisions regarding health, education, and economic assistance programs. These ideologies lead to policies and programs that affect every aspect of an individual’s life, from the amount of money they receive for food stamps to whether they will be able to afford a good education. The 1996 transference of welfare legislation authority from the federal level to state level and the 2012 change to the TANF (Temporary Assistance for Needy Families) program have led to increases in policy variation across states in assistance programs for the poor. This is due to the inherent bond between politics and policy; policy is essentially the physical manifestation of a political ideology. Because government institutions create programs that affect every aspect of human life, there is an inherent relationship between politics and individual outcomes. Previous studies have already found a link between these ideologies and health indicators (Bambra, Fox, and Scott-Samuel 2005; Navarro et al. 2006; Navarro and Shi 2001a).

In this paper, I look to see if a particular political ideology within American states is associated with better or worse outcomes for children within those states. The bi-partisan nature of the United States divides politics into two fundamentally opposing groups: the Democratic Party and the Republican Party. Because these parties disagree with respect to the role of the government, the country’s values, and solutions to the country’s many problems at local, state, and federal levels, it is possible that variation in the types of programs, as well as funding, across states has produced disparities in youth outcomes.

<sup>1</sup> I use children, youth, and adolescent interchangeably in this paper to define individuals up to eighteen years of age.

## Red State verse Blue State: “Who does Better for our Kids?”

### *The two dominate parties within the United States*

The Republican Party, also referred to as the GOP, adopts a more conservative approach (Foley 2007; Grigsby 2008) to social policy. Arguing for the decentralization of government and free markets, the Republican Party believes that with a larger government comes greater cost and inefficiency (Republican Platform 2008). To rectify this, they believe that the government should take on a more minimalist role to do its basic job and leave all other activities to the private sector (Republican Platform 2012). This perspective is reflected in many of the party’s decisions.

Conversely, the Democratic Party adopts a social-liberal platform that advocates for individual rights and liberties in addition to a welfare state. The Democratic Party believes that is the role of the government to ensure that citizens have access to education, healthcare, and the potential for social mobility.

### *Approach to the Economy.*

It is commonly understood that the economic structure of the nation can largely impact individual lives because it determines living standards, expenses and the level of governmental assistance individuals receive (Galí, López-Salido, and Vallés 2007; Plosila 2004). In the United States, economic policy determines the nation’s systems of taxation, budgeting, money supply, interest rates, and labor markets. Fiscal policies regarding taxation and spending influence individual financial security because they influence the amount citizens are required to pay in taxes (Hacker 2008). The amount of welfare support the government provides is also determined by fiscal policies. For this reason, it is essential to understand how variation in policies associated with different political ideologies impact citizens’ economic well-being.

The Republican Party’s economic policies uphold the fundamental idea that the government should play a minimized role and encourage privatization in order for the country to flourish. For this reason, the party emphasizes the role religious organizations and charities should play in providing economic support to the disadvantaged (Republican Platform 2012). Furthermore, the party believes that welfare reform should aim to move individuals on welfare into jobs (Republican Platform 2004) and try to accomplish this by pushing job requirements. Grounded in the supply side theory of economics, or trickle-down economics, the party believes that economic growth for people of all socio-economic backgrounds can be achieved through private sector incentives (Aghion and Bolton 1997). By reducing govern-



ment regulation and providing tax breaks for businesses, capitalists are more willing to reinvest in the economy and will spend more of their new found wealth (Niskanen 1992) and donate to the poor (Aghion and Bolton 1997). This perspective has been applied numerous times throughout American politics, the most emphasized time being during Ronald Regan's presidency. Coined Reaganomics, this outlook on economic policy has been proposed and/or applied within various right-leaning states (Dewan 2015).

On the contrary, Democrats believe an economy built to last is one that focuses on and supports the middle class (Democratic Platform 2012). A stronger middle class provides ladders of opportunity for those who work hard as well as an effective "safety net" for the poor. This ideology translates into policies that broaden social security and welfare programs, provides low and middle class businesses with tax cuts, and increase top capital gains tax and dividend tax rates (Mufson and Eilperin 2015). Contrary to Republicans, Democrats believe the government can be the solution to solving fiscal crises.

### *Approach to Healthcare.*

Similar to the way economic policies affect economic outcomes, policies that relate to health-care can influence an individual's health outcomes. Governmental health policies and programs like Medicaid and Medicare have a tremendous influence because they determine the accessibility of care for many (Peters et al. 2008). Studies have found that public health outcomes improve as governmental expenditures increase (Litaker, Koroukian, and Love 2005). However, the main difference between Republicans and Democrats is whether these health expenditures should come from the public or private sector. Democrats believe it is primarily the job of the government to fund and run these health programs, while Republicans argue that the private sector is better suited. These differences in ideology lead to different public policies that have been found to influence disparities in population indicators of health (Navarro et al. 2006; Bamba et al. 2005; Navarro and Shi 2001).

The Republican Party maintains that by decentralizing health-care, state government can better design programs to their particular state's needs (Republican Platform 2012; Republican platform 2008). This party prefers personal or employer-based insurance, as opposed to a single-payer healthcare system (Republican platform 2008) and is actively campaigning to repeal the Patient Protection and Affordable Care Act. Obamacare, they argue, is another gross expansion of govern-

## Red State verse Blue State: “Who does Better for our Kids?”

ment control on both the economy<sup>2</sup> and liberty because, among other things, it forces U.S. citizens to purchase health insurance. Rather, they argue it is better to transform Medicaid into a premium-support model that contributes to a private health-care plan.

On the contrary, the Democratic Party upholds that the Affordable Care Act provides for affordable and accessible health care. The ACA was motivated by the belief that everyone has a right to accessible health-care and the right to financial protection in the event of health complications. The program accomplished these goals by expanding the age limit for family health care plans and prohibiting insurers from refusing coverage to those with pre-existing medical conditions (Democratic Platform 2012). They also limit insurance companies’ ability to arbitrarily cap or cancel medical coverage and alter rates because of gender (Democratic Platform 2012). In opposition to the Republican Party, Democrats believe in the current Medicaid system and believe the ACA will only better it by providing more benefits, including improved patient care, addressing fraud, and saving individuals money (Democratic Platform 2012).

### *Approach to Education.*

The education system might be viewed as an extension of the political system. Education-related mandates like “No Child Left Behind” (NCLB) and “Race to the Top” are produced by politicians and implemented across all U.S. public schools. Government dictates funding programs and policies for educational institutions. Mandates like the NCLB, resulted in disadvantaged schools in high poverty communities and neighborhoods of color because they call for a one size fits all solution across a diverse nation (Darling-Hammond 2007; Kim and Sunderman 2005). When comparing wealthy and disadvantaged communities, we can find disparities in education outcomes for children resulting from grossly underfunded schools (Biddle and Berliner 2002; Filmer and Pritchett 1999; Meara, Richards, and Cutler 2008). Tasked in part with the job of upgrading and improving the quality of education, politicians acknowledge that higher education is unreasonably costly and requires large changes to the system, but can not agree on one course of action (Heck 2004).

The Republican minimalistic view of government and trust in

<sup>2</sup> The health-care field is one sixth of the US economy.

the private sector motivates their push for private higher education loans (Republican Platform 2012). Republicans believe this change should focus on new education models like private training, online universities, and work-based learning in the private sector. In addition, they maintain that families should be given more information to make informed decisions regarding higher education. They believe federal loans for higher education should be extinguished and instead take the role of an insurance sponsor for private investors offering loans to students.

Conversely, Democrats believe that it is the government's job to try and strengthen the U.S. education system. The Democratic Party believes that this can be accomplished by acquiring high quality educators who can teach high-quality content (Democratic Platform 2012). By implementing education research and listening to practitioners, the party believes our education system will significantly improve. Using better evaluation systems and protecting the livelihood of teachers is expected to improve teacher quality, which in turn improves the quality of education and student achievement (Darling-Hammond 2000). The increasing inaccessibility of both early childhood and higher education is also a main concern for Democrats. By providing children affordable early childhood education and increasing funding for afterschool and summer learning programs, all students, regardless of their parents' income, can have access to decent schooling (Biddle and Berliner 2002). In addition, Democrats advocate for reforming student loan programs by removing banks from acting as middlemen in the transactions. This has led to over \$60 billion dollars in savings that can now go directly to students (Democratic Platform 2012). The party believes in increasing federal investments in higher education (including community colleges), tax credits for students<sup>3</sup>, and capping loan payments at ten percent of monthly income. This makes it easier for citizens to achieve a college education without going into bankruptcy. In addition, the party supports bridging the gap between community colleges and business to provide students with the skills currently needed to find employment (Democratic Platform 2012).

### *Why Race.*

This study will also consider how race and politics currently

<sup>3</sup> The American Opportunity Tax Credit worth up to \$10,000 is a post secondary education tax credit. See <http://www.irs.gov/uac/American-Opportunity-Tax-Credit>.

## Red State verse Blue State: “Who does Better for our Kids?”

interact in terms of child related outcomes. The United States, a country considered to be built by immigrants, has had a long history of racial division and discrimination. Since the day America declared its independence, a racial hierarchy has existed (Omi and Winant 2014). Institutional discrimination further produces racial disparities in all avenues of life. Countless studies have found alarming disparities in educational attainment (Meara et al. 2008) and health outcomes (Sternthal, Slopen, and Williams 2011). For this reason I chose to include race in my analysis to understand whether the relationship between political climate and child well-being differs by race.

I restrict my consideration of the role of race to the differences between Blacks and Whites because of the history of de facto and de jure discrimination against Blacks in the United States. Blacks, unlike any other race in the United States, have experienced a long list of political initiatives and laws used to oppress them and maintain White supremacy. Slavery, Jim Crow laws, the Separate but Equal doctrine, all White Democratic primaries, mass incarceration and the war on drugs have lead to vast disparities between Blacks and White in health, educational attainment, and economic security (Johnson 2008).

### **Data and Methods**

This study is designed to explore a possible relationship between political leanings and differences in childhood outcomes at the state level. Political affiliations, with either the Democratic or Republican parties, inadvertently have varying political agendas that lead to differences in spending practices, taxation practices, and the framing of important issues. In this paper, I analyze how these varying political practices affect three dimensions of childhood wellbeing: economic security, health, and education to determine which political orientation is associated with better youth outcomes.

Data were collected from all 50 United States not including U.S. territories. This was done because these are the units of political voting power during a presidential election. The electoral college, a process through which selected intermediaries, or appointed electors, pledge to vote for a particular candidate consists of electors from the 50 states and the District of Columbia. Consisting of 538 electors, the number of electors per state is equivalent to the number of congress members for each states, this allows consistence with the popular vote, because the number of congress members is dependent on the state pop-

ulation. The more populous a state, the more electoral votes (and congresspersons) that state is awarded. The District of Columbia is granted three electoral votes, equivalent to the least populous state. Electors are determined on a “winner take all” biases meaning all electors are pledged to the presidential candidate that gets the most votes in a state (National Archives and Records Administration 2016). However, Maine and Nebraska use the “congressional district method” which selects a single elector per congressional district depending on the popular vote (The Electoral College - Maine and Nebraska 2009). The remaining two electors are determined by a statewide popular vote. The presidential candidate who received the absolute majority of electoral votes (270) is elected into office and becomes the President of the United States. Therefore, states is an appropriate unit of analysis because they are the unit that determines political leadership. In addition it provides a large enough sample size without being burdensome.

## **Dependent Variables**

### ***Economic Security.***

Economic security, is defined here as an individual’s ability to live without constant fear of poverty. Children’s life experiences and outcomes are greatly impacted by the economic standing of their families. Growing up in poverty has significant consequences to a child’s development, educational attainment, and life chances (Center for the Study of Social Policy 2011). They are at higher risk for social, academic, and health issues (Engle and Black 2008). Poverty experienced by children as young as two years old, has lasting effects throughout their development. This is commonly expressed in their lack of school readiness, which sets a trajectory for future academic obstacles. They are more likely to repeat a grade, less likely to complete high school, and 20% less likely to complete college than who are economically secure. This is detrimental to the future opportunities a child in poverty is awarded because education is a key mechanism for social and economic mobility. I use percent of children who are considered to be low income and the percent of children in single parent households as measures of economic security because they lack financial stability in their everyday life.

#### *Percent of Low Income Children.*

Operationalized as low-income children, my data on economic security is collected from the National Center for Children in Poverty's

## Red State verse Blue State: “Who does Better for our Kids?”

(NCCP) 50 State Demographic Wizard. The NCCP uses information on child poverty rates collected from the American Community Survey’s (ACS) 2012 estimates. As an on going survey, the ACS collects data every year to provide communities with information necessary for determining community investments and services. The survey lasts from the first of January through December 31<sup>st</sup> while sampling from all U.S. counties and county-equivalents. Contacting about 3.5 million households and 200,000 group quarters, the survey achieved response rates of 97.3 and 95.1 for each respective category.

Many low-income families are unsure of their ability to pay bills, buy groceries, and pay for transportation. These data are appropriate for my analysis because they provide information on how many children are living in financially unstable environments. State governments create numerous laws and programs around low-income families. By determining how many children are in poverty, we can see if a particular governing party (Democrats or Republicans) does better in reducing childhood financial instability.

Low-income status is determined by the NCCP if a child’s family makes less than twice the national poverty threshold for each year (for a family of four with two children: \$23,283 in 2012, \$22,811 in 2011, and \$22,113 in 2010).<sup>4</sup> The NCCP defines a child to be any individual under the age of 18 (excluding those living independently, with a spouse, in group homes) and children ages 14 and under living exclusively with unrelated adults.

### *Percent of Children in Single Parent Households.*

In addition, I use the percent of children in single parent households as a second indicator of economic security. “Children” is defined here as individuals under 18 years old and this includes those who live with two parents. Single-parent families includes cohabiting couples, but does not include children who live with married stepparents. In addition, children living in institutions, dormitories, group homes, and other group quarters are not included in these calculations.

Single parent households are used as a common indicator of economic instability. The economic instability associated with low-income families forces these individuals to emphasize work over all else (Lareau 1987). Many single parents are forced to work long hours

<sup>4</sup><http://www.nccp.org/tools/demographics/definitions.php>

and multiple jobs in order to provide financially for their family's basic needs. In addition, children in single parent families are more likely to drop out of school in order to help their families financially (Christle, Jolivet, and Nelson 2007) impacting their educational achievement. For this reason, this variable of percent of children in single parent households is a suitable measure of economic stability.

## ***Health.***

In addition to material living standards, or economic security, Health is regarded as a key dimension to understanding human well being (Stiglitz, Sen, and Fitoussi 2009). This is because the physical and socio-emotional development of a child can be greatly inhibited by poor health, both during pregnancy and postpartum (World Health Organization 2016). The exchange between a child and their environments (i.e. where they are born, live, and learn) shapes their development (WHO 2016). Safe pregnancies and childbirth as well as preventative interventions like vaccines are widely considered to be safeguards in promoting positive health and increasing a child's overall wellbeing as well as life expectancy (WHO 2016). For this reason, I use infant mortality rates and immunization rates since they are widely regarded as traditional measures of health and well-being.

## ***Infant Mortality Rate.***

I collected 2008-2010 infant mortality rates for all 50 U.S. states using data from The Henry J. Kaiser Family Foundation (KFF). Compiled from the Center for Disease Control's (CDC) Linked infant birth and death records, the data set collects all registered birth and infant death certificates for infants under the age of one for all U.S. States.<sup>5</sup> States are required to provide these matching certificates to the National Center for Health Statistics (NCHS). If the birth and death occurred in different states, the state of death was required to contact the state of birth. The NCHS used the matching birth and death certificate numbers to extract natality and mortality statistical files and compile them into a single statistical record.

The KFF uses these linked files and defines infant mortality rates as the number of infant deaths per 1,000 live births for children under the age of one. Following established precedent, I choose to use infant mortality rates as a measure of state health because it has been

<sup>5</sup> Whole data set include all U.S. States, D.C., Puerto Rico, the Virgin Islands, and Guam.

## Red State verse Blue State: “Who does Better for our Kids?”

used to evaluate both state and country level population health (CDC 2014).

### *Immunization.*

Immunization rates amongst adolescents 13-17 were used as a second indicator of adolescent health. A sample of 18,264 of youth born between January 11, 1995 and February 13, 2001 was taken from the National Immunization Survey for teens in 2013. NIS data are collected through a list-assisted random-digit-dialing telephone survey throughout all 50 states and the District of Columbia. It is then followed by a mailed survey to children’s immunization provider. Estimated vaccination coverage for selected vaccines and doses were categorized by U.S. Department of Health and Human Services (HHS) regions and by State. Vaccination estimates were done for various diseases, however in my study I focus on the estimates for Measles, Mumps, and Rubella (MMR).

The percent of adolescents immunized per state is used as an indicator of adolescent health and provides a comparable measure of health across states. Higher immunization rates mean decreases in youth morbidity and mortality from fatal, yet preventable diseases; decreasing the youth and overall State mortality rate. Preventable diseases like tuberculosis (TB), influenza, and hepatitis persist as prominent causes of illness and death in the United States (Health and Welfare Idaho 2015). Immunization rates are widely regarded as an appropriate proxy for the overall capacity of a government’s public health system and permit us to impartially measure States’ invest in the well-being and health of their citizens (MCC 2015).

### *Education.*

Education is a key dimension to understanding children’s well being because it is viewed as the ultimate mechanism for social mobility, opportunity, and development. Used as a proxy for the quality of an individual’s life and their well being, education is traditionally used as an objective indicator of wellbeing (Heckman and LaFontaine 2010; Stiglitz et al. 2009). For this reason I use on time four-year high school graduation rates and educational expenditure per child as two measures of educational well being.

#### *High School Graduation Rate.*

My measures of educational well being include graduation rates taken from the National Center for Education Statistics’ Common Core of Data (CCD). Published in April 2014, the Public High School Four-Year On-Time Graduation rates and Event Dropout Rates: School



Years 2010-11 and 2011-12 provide adjusted high school graduation rates for public schools in all 50 states and the District of Columbia. From this publication, I use the public high school 4-year cohort adjusted graduation rate (ACGR) by race/ethnicity and selected demographics. ACGR is considered the most accurate measure available that reports on-time graduation rates (Seastrom et al. 2006b). The ACGR is calculated by taking the number of students that successfully receive a regular high school diploma in a span of four years and dividing it by the number of students in the adjusted cohort for that graduating class. This information is provided for 47 of the 50 states; Idaho, Kentucky, and Oklahoma received timeline extensions in reporting 4-year ACGR rates, resulting in missing information for the 2010-2011 and 2011-2012 school years.

### *Education Expenditure.*

Educational expenditure per child by state was used as a second indicator of education wellbeing. Previous studies have shown a significant positive impact on student achievement when per-pupil educational expenditures increase (Haynes and Burtless 1997). By increasing funding for education, conditions and resources that directly impact student academic achievement can be made widely available. Smaller classrooms, better infrastructure, and better teaching material greatly improve academic achievement (Case and Deaton 1999, Duran-Narucki 2008). For this reason I use educational expenditure as a means of measuring the educational well-being of children.

### **Race**

Furthermore, I explore the effect race has on the relationship between political orientation and childhood wellbeing. An abundance of academic literature has amassed on the racial disparities between Blacks and Whites. Racial disparities in socioeconomic status, health, and education are represented across every dimension of well-being. Blacks have poorer overall health, 2.5 times higher infant mortality rates, higher death rates, and lower life expectancy rates than their White counterparts (MacDorman and Mathews 2011; Williams and Mohammed 2008)). This trend of disadvantage is intertwined and further exacerbated in the economic and educational spheres. Blacks experience unemployment at higher rates and are paid less for similar jobs (Farley 1987; Huffman 2004). The Black-White wage gap is worsened by the fact that Blacks graduate from high school at lower rates than

## Red State verse Blue State: “Who does Better for our Kids?”

their White equivalent, lack access to advanced courses (compared 57% access for Blacks to 71% White students), and are less likely to be ready for college (Greene and Winters 2005; US Department of Education 2014). Moreover, Black students educational experience is more turbulent as they are suspended at a higher rate (Black preschoolers represent only 18% of the pre-K population but are suspended at a rate of 42%).

All three of these dimensions (i.e. economic status, health, and education) are strongly patterned along the same lines which suggests links between “hierarchies of social advantage” and well being (Braveman et al. 2010). For this reason I aim to see if a particular political orientation provides a better environment to promote Black or White achievement and success. I did this by taking race information, when available.

Infant mortality rates, high school graduation rates, percent of low income children, and percent of children in single parent families were the only variables to provide race information. However that information was collected differently between all data sources.

### *Infant mortality.*

The race and Hispanic origin of infants are determined by the race/ethnicity of the mothers’ reported on the infant’s birth certificate. Women are considered Hispanic depending on their place of origin and can be of any racial group. However, non-Hispanic women are categorized solely by race. 38 states in 2010 and 33 states in 2009 reported multiple-race data; to compare across states these multiple-race groups were bridged to the single-categories of the 1977 standards.<sup>6</sup> I focus exclusively on Blacks and Whites because they are the only racial categories that do not include ethnicity in addition to the racial groups.

### *High school graduation.*

All individuals within the study are divided into four racial groups and a single ethnic category: Blacks and African American, White, Asian/Pacific Islander<sup>7</sup>, American Indian/Alaska Native and the Hispanic ethnicity. Race categories do not include Hispanic origin unless specified.<sup>8</sup>

### *Percent low income.*

<sup>6</sup> For more information on methodology visit: [http://www.cdc.gov/nchs/data/nvsr/nvsr62/nvsr62\\_08.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr62/nvsr62_08.pdf).

<sup>7</sup> Asian, Pacific Islander, Native Hawaiian, and other Pacific Islanders are all grouped into one racial category.

<sup>8</sup> Information on race categories: <http://nces.ed.gov/pubs2014/2014391.pdf>

Initial racial categories for percent of low income children was determined by parental reports; a child's race can be one or more of these racial categories: American Indian, Asian, Black, or White. Another survey question asked if their child was of Hispanic ethnicity, if selected then the NCCP website categorized them as Hispanic, regardless of the specified race. If children were reported to be of more than one racial group then they were removed from the sample (i.e. The "White" category includes children identified as only being White and non-Hispanic, similarly, children categorized as "Black" were identified as Black and non-Hispanic).

*Children in single parent households.*

Data on children in single parent households were collected from the 2008 to 2012 American Community Survey (ACS). The ACS is devised to provide updated social, economic, and housing data annually for states and communities. The White race category is exclusive only to non-Hispanic Whites. Black/ African American, American Indian, and Asian and Pacific Islander include both Hispanic and non-Hispanic categories. Those in the Hispanic or Latino category include those identified as being in one of the non-White race groups.

## **Independent/Predictor variable**

*Political Leaning.*

In this study I define Red and Blue States as being those who voted for the Republican and Democratic candidates respectively in two out of the last three presidential elections in 2004, 2008, and 2012. These data were collected from the New York Times election results for the 2004, 2008, and 2012 presidential elections. As a top reputable news outlet, the New York Times produces in depth coverage of all types of news, including extensive reports on elections. Coverage on gubernatorial, senatorial, and presidential elections are reliably updated on election night.

The 2000 presidential election not only solidified the popular definitions of the terms Red and Blue States, but also cemented the previously fluid boundaries between the two parties. Sharp political polarization has become a product of this shift to a constrained two-party political system (Paulson 2007). I use presidential elections as opposed to the gubernatorial elections or state legislators because state elections are typically less polarizing and do not always fall in line with the values of a particular party. Rather, political candidates at a state level create an

## Red State verse Blue State: “Who does Better for our Kids?”

image that is specific to their environment instead of adhering to the image indicative of their party.(Ingmire 2015).

While state politics is important, the focus of this paper lies in the general ideological differences found when comparing Republican and Democratic states. Each political party represents an umbrella of deviating and extreme ideologies. At the state level, these various ideologies and familiarity with candidates can regularly sway a gubernatorial election from a Republican winning one year to a Democrat or Independent winning the next.

However in presidential elections, individuals and groups typically align themselves with the party they trust and belong to (Budge, Crewe, and Farlie 2010; Stonecash 2006). This phenomenon is also largely due to the expansive population involved in voting for presidential elections, political parties at the presidential level typically ignore the small intra-party differences and frame issues in a broad all encompassing language that allows extreme and middle leaning party constituents to agree (Slothuus 2010). Party identification, particularly in American politics, has been found to shape perceptions on both issues and political candidates (Miller 1991). For example, a center-right leaning individual will choose the republican candidate even if the candidate's beliefs are more extreme because they are affiliated with the same party's right wing party.

### **Control Variables**

#### ***Median Income.***

States with wealthier citizens have a larger capacity to invest both in social programs by providing a wealthier tax base as well as private investments in their own children. The effects of political leaning on childhood outcomes can actually reflect the effects of parental income (Harknett et al. 2003). To put all states on a level economic playing field, I control for median familial income of state, by race. Measures of median income were derived using Social Explorer (U.S Census Bureau, 2012). Using the American Community Survey's (ACS) 5-Year Estimates from 2008-2012 data on median household income by race<sup>9</sup>, the social explorer application divides the income distribution within a

<sup>9</sup> For information defining the median income variable: [http://www.socialexplorer.com/data/ACS2012\\_5yr/metadata/?ds=Social+Explorer+Tables%3A++ACS+2012+%285-Year+Estimates%29&table=T058](http://www.socialexplorer.com/data/ACS2012_5yr/metadata/?ds=Social+Explorer+Tables%3A++ACS+2012+%285-Year+Estimates%29&table=T058)

state into two equal parts. Half of the households fall below the median income and the other half fall above the states median income. All individuals over 15 years old who have income, families, and households are used to compute the median income using a standard distribution. The median income is then rounded to the nearest dollar.<sup>10</sup>

## ***Percent Urban.***

Many studies have also found a strong correlation between large urban cities and negative outcomes for children (Coulton and Pandey 1991); For this reason I control for the percentage of the total state population living in urban areas. The U.S. Census Bureau's 2010 geographic information on the Percent Urban and Rural by State classifies urban areas as heavily populated developed areas, including commercial, residential, and other non-residential urban areas.

## **Analytical Plan**

I begin by disaggregating states by their political affiliations which are determined by how the state voted in two out of the last three presidential elections. If a State voted Republican, they were then coded Red States and if they voted Democrat then they were coded Blue States. I then used race specific information for variables that provided race specific data. These variables included Infant mortality rates, on-time four-year graduation rates, and percent of state children living in poverty. Rates for Blacks (and then Whites) across political parties are examined to see if there are variations between Red and Blue States for a particular race (i.e. Do Black have higher rates in Red States or Blue States?). For each indicator, I performed a simple linear regression analysis. I then went on to conduct a multiple regression analysis while including my control variables of urbanicity and median family income.

## **Results**

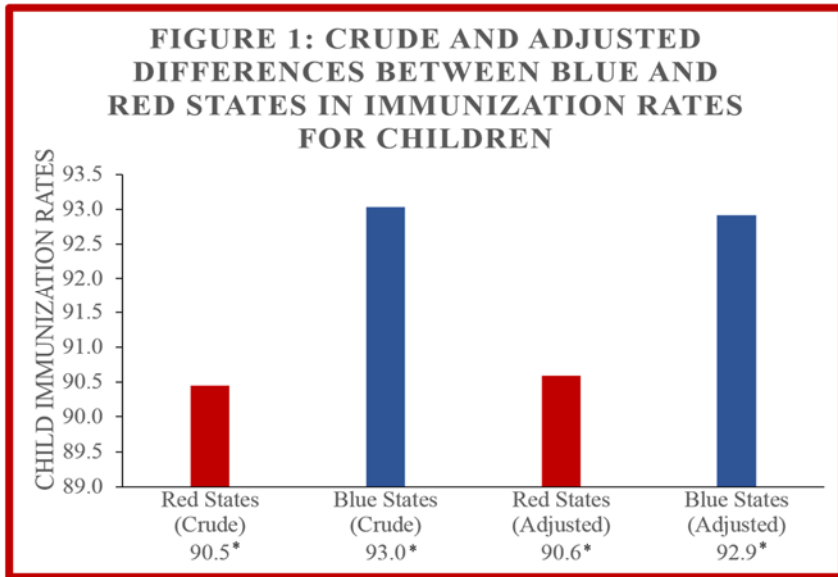
Graphical and numerical predicted averages are summarized in this section. All figures show the crude and adjusted predictive averages of each independent variable separately for Red and Blue States. Variables with distinct race information are analyzed to see within race

<sup>10</sup> For information defining the median income variable: [http://www.socialexplorer.com/data/ACS2012\\_5yr/metadata/?ds=Social+Explorer+Tables%3A++ACS+2012+%285-Year+Estimates%29&table=T058](http://www.socialexplorer.com/data/ACS2012_5yr/metadata/?ds=Social+Explorer+Tables%3A++ACS+2012+%285-Year+Estimates%29&table=T058)

## Red State verse Blue State: “Who does Better for our Kids?”

differences between Red and Blue States.

### **Health.**



*Table 1. Crude and Adjusted Predicted Average of Red and Blue Immunization Rates*

	Red States (Crude)	Blue States (Crude)	Red States (Adjusted)	Blue States (Adjusted)
Overall Immunization Rate	90.5*	93.0*	90.6*	92.9*
Notes: * Significantly different at $p < .05$				

Figures 1 and Table 1 displays the crude and adjusted predicted averages of immunization rates between Red and Blue States. Simple, bivariate linear regression results indicate that Blue States have an immunization rate that is 2.5% higher than that of Red States. Blue States had a 93% immunization rate while Red States had an immunization rate of 90.5%; this difference was statistically significant at a  $p < .05$  level. Once controls for urbanicity and median family income are included into the regression analysis, Blue States continue to lead with a higher predicted immunization rate of 92.9%. Red States have a lower immunization rate of 90.6%. The adjusted difference in immunization

rates between Red and Blue States remains statistically significant at  $p < .05$ .

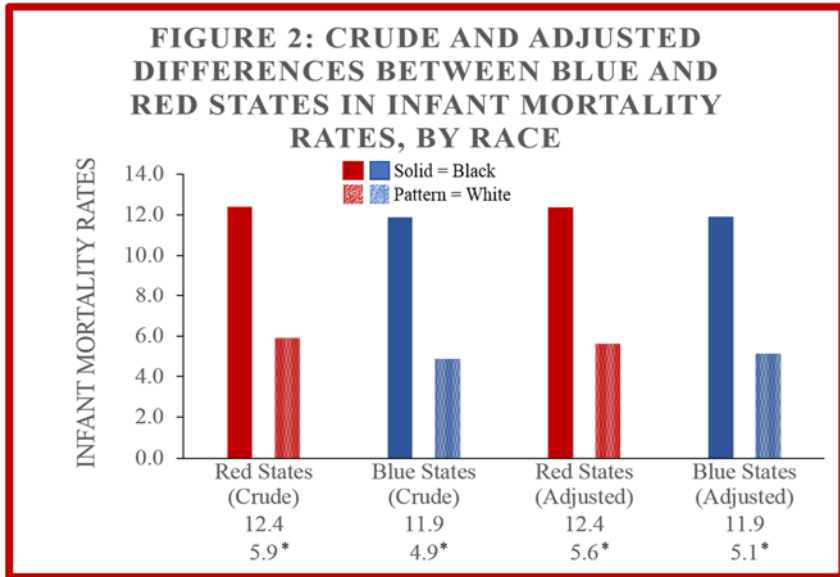


Table 2: Crude and Adjusted Predicted Average of Red and Blue Infant Mortality Rates

	Red States (Crude)	Blue States (Crude)	Red States (Adjusted)	Blue States (Adjusted)
Black Infant Mortality Rate	12.4	11.9	12.4	11.
White Infant Mortality Rate	5.9*	4.9*	5.6*	5.1*
Notes: * Significantly different at $p < .05$				

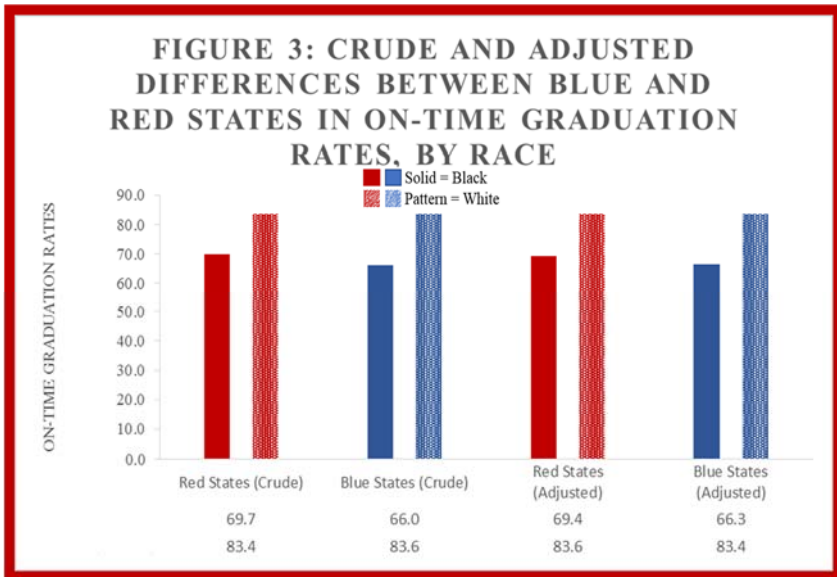
Infant mortality rates, my second health indicator, are shown both graphically and numerically in Figures 2 and Table 2. Black infant mortality rates, while higher than Whites, were not significantly different between red and Blue States for both the crude and adjusted predicted averages. Blacks in Red States had an average infant mortality rate of 12.4 while Blacks in Blue States had an average infant mortality rate of 11.9. The adjusted predicted infant mortality rate for Blacks in Blue States is 11%, 1.4% better than the predicted value for Blacks in Red

## Red State verse Blue State: “Who does Better for our Kids?”

States (12.4%), but, again, this difference was not significant.

Conversely, the White infant mortality rate was significantly different between Blue States and Red States. The crude difference was 4.9%, which was 1% better than the rate for Whites in Red States, was statistically significant at a p level of  $p < .05$ . This advantage for Whites in Blue States remained significant once controls were included, with an adjusted predicted value of 5.1% for Blue States and 5.6% for Red States.

### Education



*Table 3: Crude and Adjusted Predicted Average of Red and Blue On-Time Graduation Rates, By Race*

	Red States (Crude)	Blue States (Crude)	Red States (Adjusted)	Blue States (Adjusted)
Black On-Time	69.7	66	69.4	66.3
White On-Time	83.4	83.6	83.6	83.4
Notes: * Significantly different at $p < .05$				



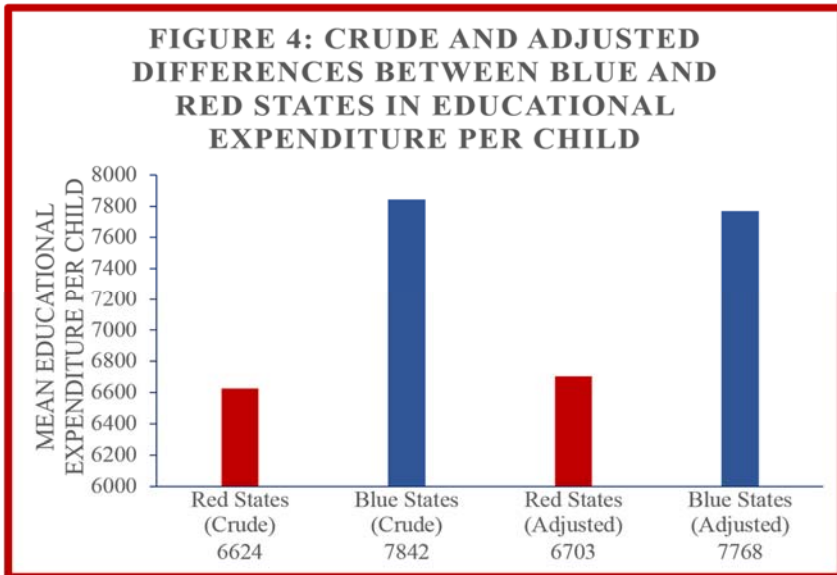


Table 4: Crude and Adjusted Predicted Educational Expenditure per Child in Red and Blue States

	Red States (Crude)	Blue States (Crude)	Red States (Adjusted)	Blue States (Adjusted)
Educational Expenditure per Child	6624	7842	6703	7768
Notes: * Significantly different at $p < .05$				

Figure 3 and Table 3 present the crude and adjusted on-time graduation rates for Black and Whites in both Blue and Red States. The crude and adjusted graduation rates for both Blacks and Whites were not statistically different between Blue and Red States. Analogously, Figure 4 and Table 4 also show non-significant differences between Red and Blue States for crude and adjusted educational expenditures per child.

**Economic Security**

Figure 5 and Table 5 give the crude and adjusted predicted percent of children in single parent households for red and Blue States. With a crude average of 34% for children in single parent households in

## Red State verse Blue State: “Who does Better for our Kids?”

both Blue and Red States, no significant difference is found between political environments. When urbanicity and median income are added as controls, the difference between red and Blue States remains statistically non-significant with predicted averages of 33% and 35% respectively.

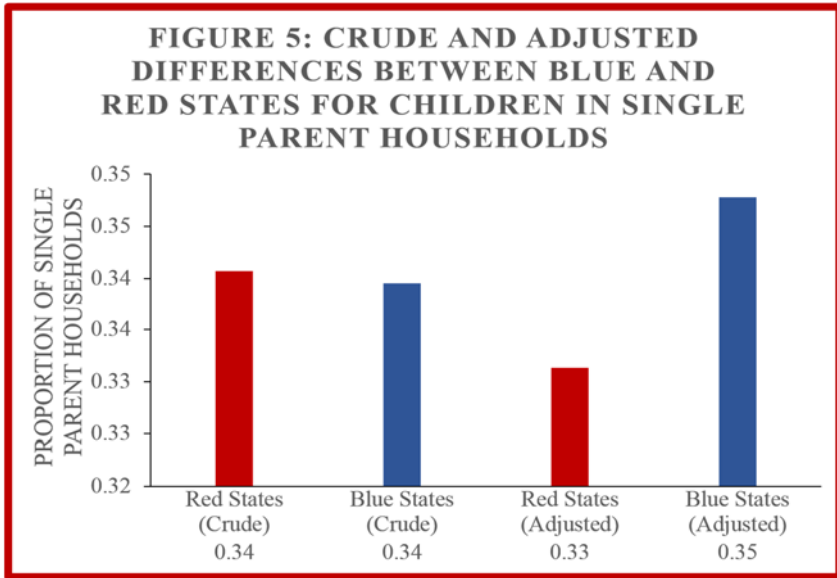


Table 5: Crude and Adjusted Predicted Average of Children in Single Parent Households in Red and Blue States

	Red States	Blue States	Red States	Bl
Children in Single Parent	.34	.34	.33	

Notes: \* Significantly different at  $p < .05$

Differing from my first measure of economic security, the percent of low-income children in Red and Blue States was significantly different for Whites. As seen in Figures 6 and Table 6, Red States had a significantly higher percent of low-income children. Red States had a rate of 35% low income children compared to Blue States, which only had a rate of 28% (7% difference). The adjusted percent of children in poverty remained significant when I controlled for urbanicity. At 30%, Blue States had a 4% lower rate of low-income children than Red States

(34%).

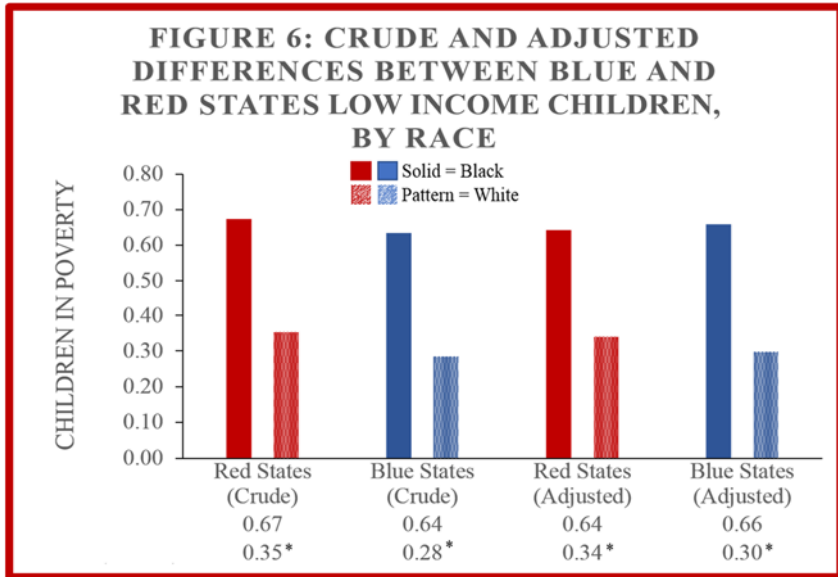


Table 6: Crude and Adjusted Differences Between Blue and Red States Low Income Children, By Race

	Red States (Crude)	Blue States (Crude)	Red States (Adjusted)	Blue States (Adjusted)
Percent of Low Income Black Children	0.67	0.64	0.64	0.66
Percent of Low Income White Children	0.35*	0.28*	0.34*	0.30*
Notes: * Significantly different at $p < .05$				

**Discussion**

For this study I have considered whether political ideology is associated with childhood outcomes by comparing adolescent well-being in “Red States” and “Blue States”. For most comparisons I also consider whether these differences vary by race. The evidence regard-

## Red State verse Blue State: “Who does Better for our Kids?”

ing the interplay of political ideology and childhood wellbeing outcomes is obtained from these regression analyses.

As a common indicator of health, immunizations rates for Blue States surpass that of Red States. However, race specific health indicators, like infant mortality, only favored Blue States for Whites. Blacks infant mortality rate was not significantly different between political environments. The advantage that Whites gain by residing within Blue States is absent for Blacks. This may be attributed to the fact that health disparities are systematically linked with socially disadvantaged groups. The history of systematic and institutionalized racism leaves communities of color, particularly Blacks, at social, economic, and health disadvantages. Historical systems of oppression, like slavery, segregation, and Jim Crow laws have anchored generations of Blacks to the lowest economic rungs of society (Oliver and Shapiro 2006). The stresses and health problems associated with experiencing discrimination, low educational attainment, and economic stressors end up compounding disadvantage and poor health for Blacks (Williams et al. 1997). This producing a high demand for access to health care in these communities of color; a demand that is currently not being fulfilled (U.S. Department of Health & Human Services 2011). Another potential explanation for why the advantage of living in a Blue state is not seen for Blacks could be because the current health systems in place may be inaccessible to Blacks (U.S. Department of Health & Human Services 2011).

Neither educational well-being indicator was found to have a significant relationship with the political environment. Educational expenditure did not significantly vary by Blue and Red States; this is potentially a result of educational funding primarily being supported by the state budget (U.S. Department of Education 2014). As previously mentioned, state legislators tend to cater towards the needs of their state rather than having fidelity to a political party (Ingmire 2015). Therefore, state spending on education, while it may significantly differ by state, does not significantly differ between political parties. The United States is a leading nation when it comes to annual spending per child on education (OECD 2015). While per pupil spending did not differ significantly between Red and Blue States, it is commonly understood that low-income schools do not receive equal funding from local and state governments (U.S. Department of Education 2015). This could mean that all states, regardless of political ideology, similarly spend less on low-income at-risk schools.

Furthermore, graduation rates for Blacks and Whites did not

differ by political climate. Research has shown that Whites have the highest graduation rates while Blacks and Latinos have amongst the lower graduation rates (Greene 2001). It appears that Whites perform equally well in both Blue States and Red States, as Blacks perform equally poorly in both Blue States and Red States.

As an indicator of economic security, the rate of children living in single parent households does not significantly vary across political contexts, meaning there are equal rates of single parent families. This was particularly interesting due to conservative rhetoric against divorce, premarital sex, and childbirth out of wedlock. In-depth analyses should be conducted to see how various definitions of single parent households affect these statistics. Similar to infant mortality, the rate of low income children significantly varied for Whites in Red States and Blue States, but did not for Blacks. Again this could be due to the history of systematic and institutionalized racism. Practices like residential segregation and redlining have significantly inhibited Blacks ability for economic mobility (Zenou and Boccard 2000). These practices were not specific to particular states and therefore being in a Blue State does not prove advantageous as it does for Whites.

The purpose of this study was to explore the relationship between political orientation and childhood outcomes. By investigating the differences in economic security, education, and health well being between Red and Blue States, we revealed that when indicators were significantly different between the two political orientations, they always favored Blue States. However, this advantage was only present for Whites, indicating that regardless of political climate, Blacks fare equally poorly. In order to better understand the relationship between political context and childhood wellbeing, these analyses require various definitions of what a Blue state and Red state are. By looking at the structure of the state government we may see clearer relationships between law makers' orientations and its relationship to child outcomes. Future research in this area should aim to draw links and potential pathways through which political orientation and policies relate to child outcomes.

## Red State verse Blue State: “Who does Better for our Kids?”

### References

- Aghion, Philippe and Patrick Bolton. 1997. “A Theory of Trickle-Down Growth and Development.” *The Review of Economic Studies* 64 (2):151–72.
- Alexander, Michelle. 2012. *The New Jim Crow: Mass Incarceration in the Age of Colorblindness*. The New Press.
- Bambra, Clare, Debbie Fox, and Alex Scott-Samuel. 2005. “Towards a Politics of Health.” *Health Promotion International* 20(2):187–93.
- Biddle, Bruce J. and David C. Berliner. 2002. “What Research Says about Unequal Funding for Schools in America. In Pursuit of Better Schools: What Research Says.” Retrieved March 19, 2015 (<http://eric.ed.gov/?id=ED473409>).
- Braveman, Paula A., Catherine Cubbin, Susan Egerter, David R. Williams, and Elsie Pamuk. 2010. “Socioeconomic Disparities in Health in the United States: What the Patterns Tell Us.” *American Journal of Public Health* 100(S1):S186–96.
- Budge, Ian, Ivor Crewe, and Dennis Farlie. 2010. *Party Identification and Beyond: Representations of Voting and Party Competition*. ECPR Press.
- Case, A., and A. Deaton. 1999. 'School Inputs And Educational Outcomes In South Africa'. *The Quarterly Journal of Economics* 114(3):1047-1084.
- Center for Disease Control, 2015. “CDC - Infant Mortality - Maternal and Infant Health - Reproductive Health.” Retrieved March 19, 2015 (<http://www.cdc.gov/reproductivehealth/maternalinfanthealth/infantmortality.htm>).
- Center for the Study of Social Policy. 2011. “Supporting the Economic Well-Being of Families: Opportunities for Communities in the Federal Budget.” Retrieved June 8, 2016 (<http://www.cssp.org/publications/neighborhood-investment/financing-community-change/Supporting-the-Economic-Well-Being-of-Families-in-the-Federal-Budget.pdf>).
- Coulton, Claudia J. and Shanta Pandey. 1991. “Geographic Concentration of Poverty and Risk to Children in Urban Neighborhoods.” Retrieved March 17, 2015 (<http://eric.ed.gov/?id=ED372136>).
- Darling-Hammond, Linda. 2000. “Teacher Quality and Student Achievement.” *education policy analysis archives* 8(0):1.

- Darling-Hammond, Linda. 2007. "Race, Inequality and Educational Accountability: The Irony of 'No Child Left Behind.'" *Race Ethnicity and Education* 10(3):245–60.
- Dewan, Shaila. 2015. "States Consider Increasing Taxes for the Poor and Cutting Them for the Affluent." *The New York Times*, February 13. Retrieved February 16, 2015 (<http://www.nytimes.com/2015/02/14/upshot/states-consider-increasing-taxes-on-poor-cutting-them-on-affluent.html>).
- Durán-Narucki, Valkiria. 2008. 'School Building Condition, School Attendance, And Academic Achievement In New York City Public Schools: A Mediation Model'. *Journal of Environmental Psychology* 28(3):278-286.
- Engle, Patrice and Maureen Black. 2008. "The Effect of Poverty on Child Development and Educational Outcomes." Retrieved June 8, 2016 ([http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1002&context=psycd\\_fac](http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1002&context=psycd_fac)).
- Elving, Ron. n.d. "The Color Of Politics: How Did Red And Blue States Come To Be?" *NPR.org*. Retrieved February 8, 2015 (<http://www.npr.org/2014/11/13/363762677/the-color-of-politics-how-did-red-and-blue-states-come-to-be>).
- Farley, John E. 1987. "Disproportionate Black and Hispanic Unemployment in U.S. Metropolitan Areas: The Roles of Racial Inequality, Segregation and Discrimination in Male Joblessness." *American Journal of Economics and Sociology* 46(2):129–50.
- Filmer, Deon and Lant Pritchett. 1999. "The Effect of Household Wealth on Educational Attainment: Evidence from 35 Countries." *Population and Development Review* 25(1):85–120.
- Fox News. 2015. "GOP House to Vote next Week to Repeal ObamaCare, after Attacking Law Piece by Piece." *FoxNews.com*. Retrieved February 16, 2015 (<http://www.foxnews.com/politics/2015/02/01/gop-house-to-vote-next-week-to-repeal-obamacare-after-attacking-law-piece-by/>).
- Galí, Jordi, J. David López-Salido, and Javier Vallés. 2007. "Understanding the Effects of Government Spending on Consumption." *Journal of the European Economic Association* 5 (1):227–70.
- Greene, Jay P. 2001. 'High School Graduation Rates In The United States. Revised.'. *ERIC Institute of Education Science*.
- Greene, Jay P. and Marcus A. Winters. 2005. *Public High School Grad-*

## Red State verse Blue State: “Who does Better for our Kids?”

- uation and College-Readiness Rates: 1991-2002. Education Working Paper No. 8.* Manhattan Institute for Policy Research. Retrieved June 8, 2016 (<http://eric.ed.gov/?id=ED498141>).
- Hacker, Jacob S. 2008. *The Great Risk Shift: The New Economic Insecurity and the Decline of the American Dream.* Oxford University Press. Retrieved March 20, 2015 (<https://ideas.repec.org/b/oxp/obooks/9780195335347.html>).
- Harknett, Kristen, Irwin Garfinkel, Jay Bainbridge, and Timothy Smeeding. 2003. “Do Public Expenditures Improve Child Outcomes in the U.S.? A Comparison across Fifty States.” *Center for Policy Research.* Retrieved (<http://surface.syr.edu/cpr/109>).
- Healthandwelfare.idaho.gov,. 2015. 'Idaho And National Immunization Rates'. Retrieved December 1, 2015 (<http://healthandwelfare.idaho.gov/Health/IdahoImmunizationProgram/AboutUs/IdahoandNationalImmunizationRates/tabid/2496/Default.aspx>).
- Heck, Ronald H. 2004. *Studying Educational and Social Policy: Theoretical Concepts and Research Methods.* Routledge.
- Heckman, James J. and Paul A. LaFontaine. 2010. “The American High School Graduation Rate: Trends and Levels.” *Review of Economics and Statistics* 92(2):244–62.
- Huffman, Matt L. 2004. “More Pay, More Inequality? The Influence of Average Wage Levels and the Racial Composition of Jobs on the Black–White Wage Gap.” *Social Science Research* 33 (3):498–520.
- Heyns, Barbara, and Gary Burtless. 1997. 'Does Money Matter? The Effect Of School Resources On Student Achievement And Adult Success'. *Contemporary Sociology* 26(4):488.
- Ingmire, Brock. 2015. “Gubernatorial Candidates In Polarizing Times: Examining Gubernatorial Discourse Through Political Interviews.” Kansas State University. Retrieved June 8, 2016 (<http://krex.k-state.edu/dspace/bitstream/handle/2097/19224/BrockIngmire2015.pdf?sequence=3>).
- Johnson, Devon. 2008. “Racial Prejudice, Perceived Injustice, and the Black-White Gap in Punitive Attitudes.” *Journal of Criminal Justice* 36(2):198–206.
- Kim, James S. and Gail L. Sunderman. 2005. “Measuring Academic Proficiency Under the No Child Left Behind Act: Implications for Educational Equity.” *Educational Researcher* 34(8):3–13.



- MacDorman, Marian F. and T.J. Mathews. 2011. "Understanding Racial And Ethnic Disparities In U.S. Infant Mortality Rates". *NCHS Data Brief* (No. 74).
- Meara, Ellen R., Seth Richards, and David M. Cutler. 2008. "The Gap Gets Bigger: Changes In Mortality And Life Expectancy, By Education, 1981–2000." *Health Affairs* 27(2):350–60.
- Millennium Challenge Corporation, Millennium. 2015. 'Immunization Rates Indicator'. *Millennium Challenge Corporation*. Retrieved December 2, 2015 (<https://www.mcc.gov/who-we-fund/indicator/immunization-rates-indicator.>).
- Miller, Warren E. 1991. "Party Identification, Realignment, and Party Voting: Back to the Basics." *American Political Science Review* 85(02):557–68.
- Mufson, Steven and Juliet Eilperin. 2015. "Obama's Budget Proposal Will Take Aim at the Wealthy." *The Washington Post*, January 17. Retrieved February 19, 2015 ([http://www.washingtonpost.com/politics/obama-likely-to-make-economic-recovery-a-centerpiece-of-state-of-the-union-address/2015/01/17/22ecec32-9cd6-11e4-a7ee-526210d665b4\\_story.html](http://www.washingtonpost.com/politics/obama-likely-to-make-economic-recovery-a-centerpiece-of-state-of-the-union-address/2015/01/17/22ecec32-9cd6-11e4-a7ee-526210d665b4_story.html)).
- National Archives and Records Administration. n.d. "U. S. Electoral College, Official - What Is the Electoral College?" Retrieved June 8, 2016b (<http://www.archives.gov/federal-register/electoral-college/about.html>).
- Navarro, Vicente et al. 2006. "Politics and Health Outcomes." *The Lancet* 368(9540):1033–37.
- Navarro, Vicente and Leiyu Shi. 2001a. "The Political Context of Social Inequalities and Health." *Social Science & Medicine* 52 (3):481–91.
- Navarro, Vicente and Leiyu Shi. 2001b. "The Political Context of Social Inequalities and Health." *Social Science & Medicine* 52 (3):481–91.
- News, N. B. C. n.d. "Tim Russert." *msnbc.com*. Retrieved February 8, 2015 ([http://www.nbcnews.com/id/4459759/ns/meet\\_the\\_press/t/tim-russert/](http://www.nbcnews.com/id/4459759/ns/meet_the_press/t/tim-russert/)).
- Oecd.org,. 2015. 'OECD Calls For Broader Access To Post-School Education And Training - OECD'. Retrieved December 2, (<http://www.oecd.org/general/oecdcallsforbroaderaccesstopost-schooleducationandtraining.htm>).

## Red State verse Blue State: “Who does Better for our Kids?”

- Oliver, Melvin L. and Thomas M. Shapiro. 2006. *Black Wealth, White Wealth: A New Perspective on Racial Inequality*. Taylor & Francis.
- Omi, Michael and Howard Winant. 2014. *Racial Formation in the United States*. Routledge.
- Paulson, Arthur C. 2007. *Electoral Realignment and the Outlook for American Democracy*. UPNE.
- Pettit, Becky and Bruce Western. 2004. “Mass Imprisonment and the Life Course: Race and Class Inequality in U.S. Incarceration.” *American Sociological Review* 69(2):151–69.
- Plosila, Walter H. 2004. “State Science- and Technology-Based Economic Development Policy: History, Trends and Developments, and Future Directions.” *Economic Development Quarterly* 18(2):113–26.
- Slothuus, Rune. 2010. “When Can Political Parties Lead Public Opinion? Evidence from a Natural Experiment.” *Political Communication* 27(2):158–77.
- Sternthal, Michelle J., Natalie Slopen, and David R. Williams. 2011. “RACIAL DISPARITIES IN HEALTH.” *Du Bois Review: Social Science Research on Race* 8(01):95–113.
- Stiglitz, Joseph E., Amanda Sen, and Jean-Paul Fitoussi. 2009. “Report by the Commission on the Measurement of Economic Performance and Social Progress.” Retrieved June 8, 2016 ([http://www.insee.fr/fr/publications-et-services/dossiers\\_web/stiglitz/doc-commission/RAPPORT\\_anglais.pdf](http://www.insee.fr/fr/publications-et-services/dossiers_web/stiglitz/doc-commission/RAPPORT_anglais.pdf)).
- Stonecash, Jeffrey M. 2006. *Political Parties Matter: Realignment and the Return of Partisan Voting*. Boulder, Colo.: Lynne Rienner Publishers.
- The Electoral College - Maine and Nebraska. 2009. “The Electoral College - Maine and Nebraska.” Retrieved June 8, 2016 ([http://archive.fairvote.org/e\\_college/me\\_ne.htm](http://archive.fairvote.org/e_college/me_ne.htm)).
- New York Times, 2015. “President - Live Election Results - NYTimes.com.” *The New York Times*. Retrieved March 14, 2015b (<http://elections.nytimes.com/2012/results/president/big-board>).
- U.S. Department of Education. 2014. “10 Fact About K-12 Education Funding.” Retrieved June 8, 2016 (<http://www2.ed.gov/about/overview/fed/10facts/index.html?exp>).
- US Department of Education. 2014. “Expansive Survey of America’s Public Schools Reveals Troubling Racial Disparities | U.S. De-

- partment of Education.” *Archived Information*. Retrieved June 8, 2016 (<http://www.ed.gov/news/press-releases/expansive-survey-americas-public-schools-reveals-troubling-racial-disparities>).
- U.S. Department of Education. 2015. 'More Than 40% Of Low-Income Schools Don't Get A Fair Share Of State And Local Funds, Department Of Education Research Finds | U.S. Department Of Education'. Retrieved December 2, 2015 (<http://www.ed.gov/news/press-releases/more-40-low-income-schools-dont-get-fair-share-state-and-local-funds-department->).
- U.S. Department of Health & Human Services. 2011. “Disparities in Healthcare Quality Among Racial and Ethnic Groups | AHRQ Archive.” *U.S. Department of Health & Human Services*. Retrieved June 8, 2016 (<http://archive.ahrq.gov/research/findings/nhqdr/nhqdr11/minority.html>).
- Western, Bruce and Becky Pettit. 2000. “Incarceration and Racial Inequality in Men’s Employment.” *Industrial & Labor Relations Review* 54(1):3–16.
- Western, Bruce and Becky Pettit. 2005. “Black-White Wage Inequality, Employment Rates, and Incarceration.” *American Journal of Sociology* 111(2):553–78.
- WHO. 2016. “WHO | 10 Facts about Early Child Development as a Social Determinant of Health.” *WHO*. Retrieved June 8, 2016 ([http://www.who.int/maternal\\_child\\_adolescent/topics/child/development/10facts/en/](http://www.who.int/maternal_child_adolescent/topics/child/development/10facts/en/)).
- Williams, David R. and Selina A. Mohammed. 2008. “Discrimination and Racial Disparities in Health: Evidence and Needed Research.” *Journal of Behavioral Medicine* 32(1):20–47.
- Williams, David R., Yan Yu, James S. Jackson, and Norman B. Anderson. 1997. “Racial Differences in Physical and Mental Health Socio-Economic Status, Stress and Discrimination.” *Journal of Health Psychology* 2(3):335–51.
- World Health Organization. 2016. “WHO | Child Development.” *WHO*. Retrieved June 8, 2016 ([http://www.who.int/topics/child\\_development/en/](http://www.who.int/topics/child_development/en/)).
- Zeller, Tom. 2004. “Ideas & Trends; One State, Two State, Red State, Blue State.” *The New York Times*, February 8. Retrieved February 9, 2015 (<http://www.nytimes.com/2004/02/08/weekinreview/ideas-trends-one-state-two-state-red-state-blue->

## Red State verse Blue State: “Who does Better for our Kids?”

state.html).

Zenou, Yves, and Nicolas Boccoard. 2000. 'Racial Discrimination And Redlining In Cities'. *Journal of Urban Economics* 48(2):260-285.

### **Acknowledgements**

Professor Stewart Tolnay  
Professor Hedwig Lee  
Professor Alexes Harris  
McNair Scholars Program  
Mary Gates Scholars Program

Ferdose Idris  
Sociology; Faculty Mentor: Stewart Tolnay  
[ferdosei@gmail.com](mailto:ferdosei@gmail.com)

My research interests include inequality/stratification, education, race/ethnic relations, and global health. I intend to gain my PhD from Princeton’s Sociology department



# The Benefit of Microbial Evolution Experiments and Why Some Like It Gradually Hot

Cierra M. Leon Guerrero

## Abstract

*As our planet warms, organisms that cannot migrate to more suitable habitats will be forced to adapt to the increasing temperatures or face extinction. An important question to address is how the rate of environmental change affects an organism's chance to adapt. If an environment changes suddenly, then organisms must also adapt rapidly, whereas slower rates of change allow the organism more time to adapt. Microorganisms, such as the virus phi-6, can be utilized to answer this question because they evolve rapidly, allowing us to watch evolution in real time. We evolved phi-6 over 11 weeks to survive high temperatures. In different treatments, the viruses experienced sudden, moderate, or gradual changes in temperature. Sequencing the evolved lineages at two genes revealed multiple mutations. We added the mutations one by one to the ancestor to determine how each mutation affects thermotolerance. We find that each mutation can increase or decrease thermotolerance by a different amount. Interestingly enough, mutations that give the greatest increase in thermotolerance appeared in viruses that experienced slower temperature change. There is also a trend where viruses that experienced slower temperature change had more mutations per lineage than viruses that experienced sudden change in temperature. My results demonstrate that rate of environmental change is an important parameter when taking adaptation into consideration. If the temperature increases too rapidly, there may be fewer ways for organisms to adapt, and they are unlikely to survive climate change.*

## Introduction

A classic essay written by the famous evolutionary biologist Theodosius Dobzhansky titled "Nothing in biology makes sense, except in the light of evolution"<sup>1</sup> argued that evolution plays a crucial role in driving the forms of life we see today, from their physical adaptations to their variance. Due to Darwin and Wallace's renowned work in forming the theory of evolution, scientists today are able to use this "light of evolution" to illuminate the history of life on Earth and the

dynamic processes that shape it. Understanding these processes will enable us to not only predict how an organism will evolve, but also to prevent an organism from evolving unwanted traits, such as drug resistance.

The biology of microbes have made them quick studies at evolution. They have fast generation times, allowing their populations to reach high densities in a relatively little amount of time. As they are rapidly dividing, their replication machinery accidentally makes an error every now and again, resulting in novel mutations in newly synthesized genomes. Replication errors generate genetic diversity within microbial populations, and selection can then act upon the variants within these large populations. Because microbes are replicating and dividing rapidly, genetic diversity allows the population to respond to the environment, and evolve accordingly<sup>2</sup>. This ability for rapid evolution can lead to problems for macroorganisms the microbes interact with. For example, with the development of antimicrobial drugs, microorganisms have responded by swiftly evolving mechanisms of resistance<sup>3</sup>, causing a pressing public health crisis. Pathogenic microbes can evolve increased virulence, worsening their disease symptoms<sup>4</sup>. Addressing these problems requires a thorough understanding how microbes evolve.

Studying the evolution of microbes also has the possibility to illuminate general themes and mechanisms of evolution itself. Thus, microbial evolution experiments can serve as models for evolution in higher organisms that reproduce much more slowly, rendering the real-time study of their evolution impractical. A field of research centers on microbial evolution experiments, utilizing the evolved descendants of viruses, bacteria, and yeast to answer a range of evolutionary questions<sup>2</sup>. Scientists have used microbial evolution experiments to explore evolutionary tradeoffs<sup>5</sup>, the emergence of multicellularity<sup>6</sup>, and even cooperation<sup>7,8</sup>, among other evolutionary theories. Microbes have undergone evolution for millions of years. Scientists can now exploit this evolutionary capacity to further our understandings in biology.

## **ϕ6 Biology**

My research uses the lytic bacteriophage ϕ6 as our model system. ϕ6 was the first phage in the Cystoviridae family to be discovered, and years of prior work have clarified its biology. In the lab, ϕ6 infects the plant pathogen *Pseudomonas syringae* pathovar *phaseolicola*. Scientists have previously discovered that ϕ6 has a 13 kilo-base double-

## The Benefit of Microbial Evolution Experiments and Why Some Like It Gradually Hot

stranded RNA (dsRNA) genome. Notably,  $\phi 6$  is the only bacteriophage with a lipid membrane surrounding its polyhedral nucleocapsid, an aspect that makes it a great model for enveloped animal viruses.

The  $\phi 6$  genome is composed of three segments, distinguishable by size. The largest segment, L, is 6,374 base pairs in length<sup>9</sup> and contains genes for the RNA-dependent RNA polymerase (P2)<sup>10,11</sup>, an NTPase motor involved in packaging the genome (P4)<sup>12</sup>, the major procapsid protein (P1)<sup>13</sup>, and an auxiliary assembly protein (P7)<sup>14</sup>.  $\phi 6$ 's RNA polymerase replicates the genome using a semi-conservative method<sup>10</sup>. The major capsid protein self-assembles with P2, P4, and P7 to form the polyhedral procapsid, encapsulating the dsRNA<sup>15,16</sup>.

The medium segment, M, is 4,063 base pairs in length<sup>9</sup> and contains the lysis protein (P10)<sup>17</sup>, an integral membrane protein responsible for membrane fusion (P6)<sup>18</sup>, the spike protein or the virion attachment protein (P3)<sup>19,20</sup>, and a minor, nonessential membrane protein (P13)<sup>21</sup>. The spike protein is bound to P6 on the virion, and its receptor is the pilus IV of the bacterial host<sup>20</sup>. After attachment to the pilus,  $\phi 6$  infects *P. phaseolicola* through direct fusion with the membrane<sup>22</sup>.

The S segment is 2,948 base pairs in length<sup>9</sup> and contains the minor capsid protein (P8)<sup>23</sup>, an assembly factor (P12)<sup>24</sup>, the major membrane protein (P9)<sup>24,25</sup>, and a muralytic enzyme protein that chews through the host's peptidoglycan layer during infection and lysis (P5)<sup>9,26</sup>. Although P1 makes up the primary structure of the nucleocapsid, trimers of P8 enclose the polyhedral nucleocapsid<sup>3</sup>, and during entry P8 drives the penetration of the nucleocapsid into the cytoplasm<sup>23</sup>.

Packaging of these segments into the viral procapsid occurs sequentially and is extremely precise, for every virion contains one of each of the three genomic segments<sup>9</sup>. The S segment is packed into the capsid first, followed by the M segment, and finally the L segment<sup>9</sup>. This is particularly interesting, for the assembly of an infectious  $\phi 6$  virion depends on packaging the S segment.

$\phi 6$  is ideal for genetic and reverse genetic work. With current technology,  $\phi 6$ 's small genome is easy to sequence, allowing the comparison of ancestral and evolved genomes. Each of its three segments have been cloned into their own respective plasmid behind a T7 promoter, and co-transformation of the three plasmids into a host cell with a T7 RNA polymerase results in viable phage<sup>9</sup>. Because plasmids are easy to manipulate genetically, this constitutes a convenient reverse genetics system. Due to the thorough understanding of  $\phi 6$ 's biology, it is a great model to use for further research.



## Experimental Questions

In my research, I use  $\phi 6$  to understand processes of evolution under changing environments. Specifically, we are interested in how the *rate* of environmental change affects the evolutionary pathways that are available to a population. This question has applications in particular to climate change. Our planet has been warming at an increasing rate since the 1970s, with the ten warmest years occurring in the past twelve<sup>27</sup>, but the rate of warming varies by location. Organisms that are unable to tolerate the resulting temperature increases via plasticity or behavior, and cannot relocate to a more suitable environment must rely on genetic changes (evolution) to avoid extinction<sup>29</sup>. An analysis of how the rate of environmental change influences adaptation would provide insights into if and how organisms can evolve in response to increasing temperatures.

The majority of the current primary literature involves studies that experimentally evolve thermotolerance by exposing the protein or organism only to a single high temperature, or that assay and propagate only the most thermotolerant variants. Exposing a system to only one condition does not accurately reflect the gradual warming of our planet, which is why conducting an experiment where temperature is changing at different rates can produce more relevant results. Temperature is an easy variable to manipulate, and it is a realistic climate change stressor that organisms are going to face. Prior work also suggests that the rate of environmental change makes a difference to the evolutionary paths available at each time point<sup>28</sup>. These varying rates are occurring in nature, making it important to understand how such rates affect the evolution of life.

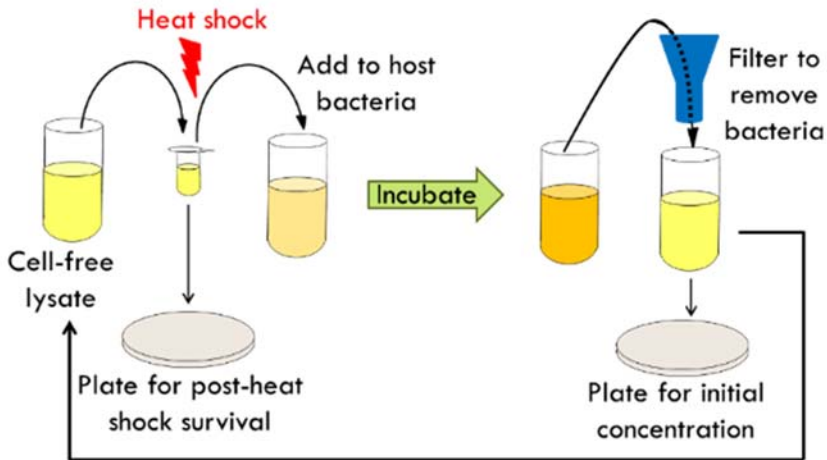
## Methods

### *Evolution Experiment*

I evolved populations of  $\phi 6$  Cystovirus for over 100 generations to withstand high-temperature heat shocks. The heat shock temperature increased to a maximum of 50°C at different rates (gradually, moderately, or suddenly) in different treatments.

At each transfer, cell-free lysates of virus were heat shocked at a particular temperature. After heat shock, viruses were added to their host bacteria and grown overnight at a permissive temperature. The following day, the viruses were separated from the bacteria and heat shocked again.

## The Benefit of Microbial Evolution Experiments and Why Some Like It Gradually Hot



*Figure 1. Schematic of the evolution experiment.* Bacteria-free lysates of  $\phi 6$  are heat shocked for 5 minutes at up to 50°C. Viruses are plated with bacteria before and after heat shock to track changes in survival. Surviving viruses are then added to culture with fresh host and grown overnight at the normal lab temperature (25°C). The following day, viruses are separated from bacteria via filtration, and the resulting cell-free lysate is again heat shocked. This continues for 32 transfers, ~100 viral generations.

In different treatments, the heat shock temperature increased at different rates (Fig. 2):

*Sudden:* First and all subsequent heat shocks were at the highest (target) temperature of 50°C.

*Moderate:* Heat shock temperatures increased over the course of evolution, reached the 50°C halfway through the experiment, and then remained at 50°C.

*Gradual:* Heat shock temperatures increased at each transfer and only reached 50°C on the final transfer.

*Control:* To account for evolution under normal conditions, viruses only received a mock “heat shock” at their normal growth temperature (25°C).

Each treatment group had five replicate lineages. A sample of the isogenic ancestor lysate was frozen and stored, as well as samples of the viral populations at each transfer, constructing a “living fossil record” of the evolution of  $\phi 6$  throughout this experiment. The ancestor

and the final populations were sequenced to determine what mutations occurred during evolution.

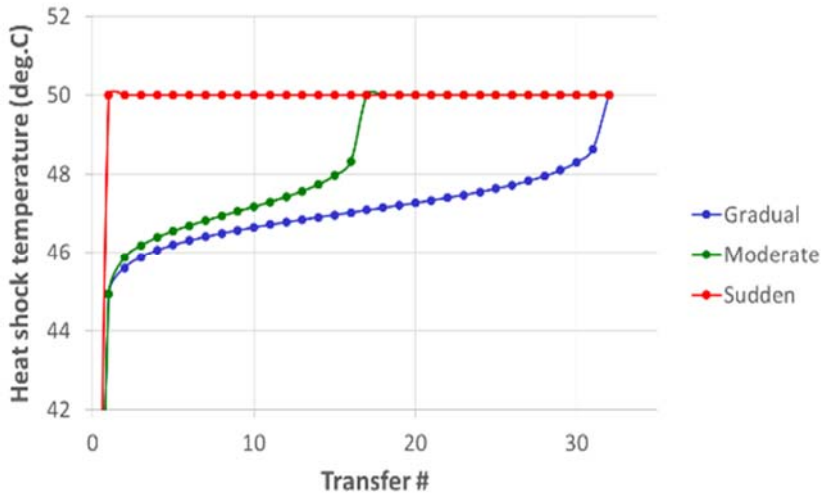


Figure 2. Heat shock temperature treatments. Each point in the Gradual and Moderate treatments represents an equivalent drop of the ancestral genotype in percent survival to heat shock. A Control treatment of heat shocks at a constant 25°C (not shown) was included to account for evolution under experimental conditions. All of the treatment groups reached the same final temperature of 50°C by the end of the experiment.

Reverse engineering

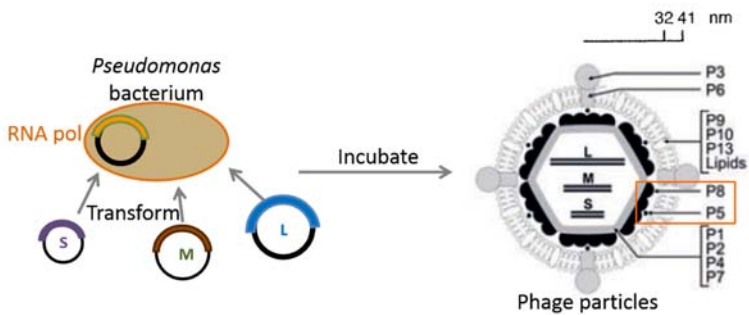


Figure 3. Schematic of the reverse engineering methods. A cDNA of each segment has been cloned onto a plasmid vector. Here, we focus on engineering mutations found in both the P8 and P5 genes on the S plasmid.

## The Benefit of Microbial Evolution Experiments and Why Some Like It Gradually Hot

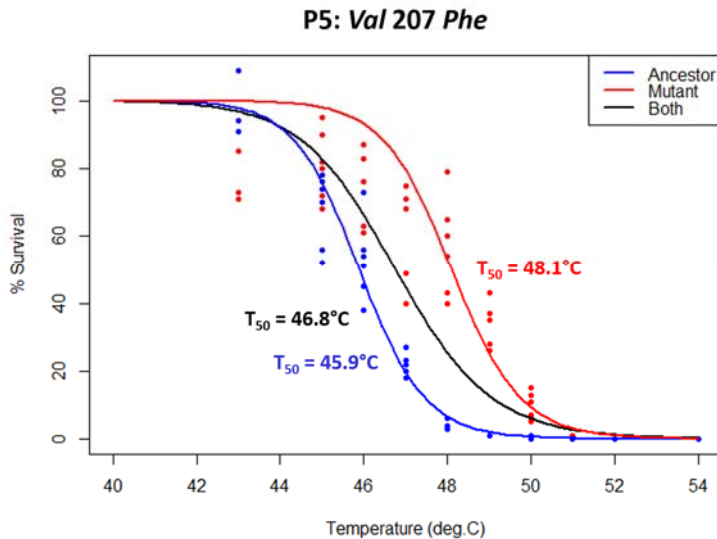
Each of the three segments of the  $\phi 6$  genome has been inserted into its own plasmid. Co-transforming all three plasmids into a bacterial host results in viable phage<sup>9</sup> (Figure 3). I conducted site-directed mutagenesis on the plasmids to introduce the mutations from the evolved lineages into the ancestral genetic background. The plasmids were then co-transformed to produce phage. Mutations in the phage were confirmed by sequencing. For lineages where multiple mutations arose, I am engineering the mutations both singly and in combination (see Future Work).

### *Evaluating thermostability*

To determine the thermotolerance of mutant phage, I evaluate their survival over a range of temperatures. Bacteria-free lysates of engineered  $\phi 6$  were heat shocked over 25-55°C. Lysates were plated on the laboratory host before and after heat shock to determine how many phage survived heat shock. I fit

$$S = 100 \times \frac{(T_{50})^n}{(T_{50})^n + T^n}, \text{ Eq. 1}$$

to the survival  $S$  at each temperature  $T$ , where  $T_{50}$  (temperature with 50% survival) and  $n$  (steepness of the decrease in survival) are estimated by maximum log likelihood. Increases in  $T_{50}$  indicate that the genotype is more thermotolerant (see Figure 4).

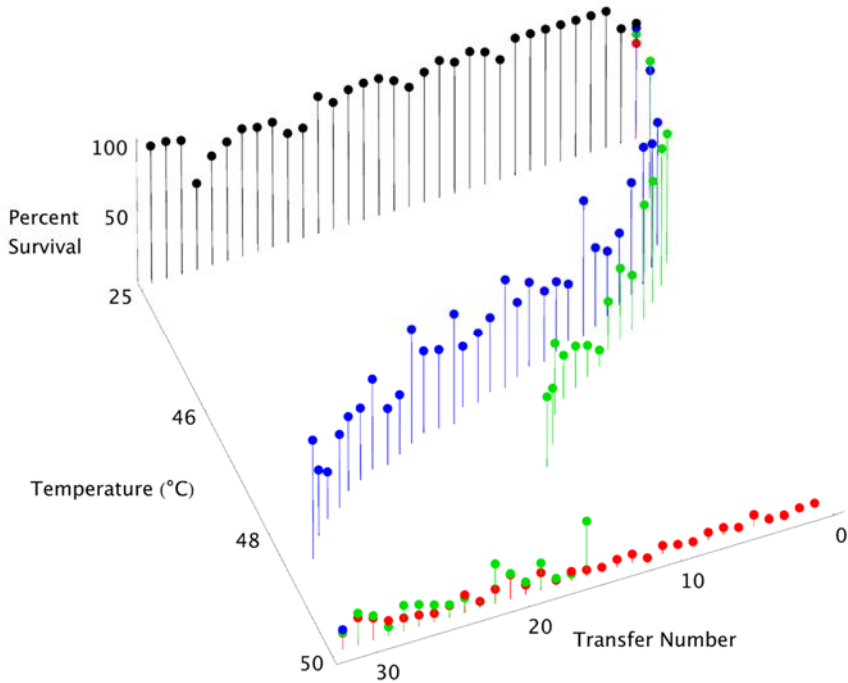


*Figure 4. Thermal kill curve of a P5 mutant phage (V207F) and its isogenic ancestor.*

An experiment conducted by Dessau and colleagues deduced that a single amino acid substitution in the viral lysin protein P5 (V207F) improved the structural and thermal stability of the protein through increased amino acid interactions<sup>30</sup>. The amino acid change filled a cavity that was previously unoccupied in the ancestor, and this directly contributed to maintaining the protein's conformation at 50° C, the temperature at which Dessau and colleagues evolved  $\phi 6$ <sup>30</sup>. This exact mutation was also discovered in our evolution experiment. Figure 4 illustrates the data from a kill curve assay of the engineered P5 (V207F) mutant and its isogenic ancestor. This assay involves heat shocking the lysates at a range of temperatures and calculating survival. After plotting the survival data, a curve is fitted to either the P5 mutant or the ancestor, or both. Because the curve in Figure 4 that is fitted to both strains differs significantly from the curves fitted to each strain individually, it can be concluded that the V207F mutation in P5 contributes to increased thermotolerance.

# The Benefit of Microbial Evolution Experiments and Why Some Like It Gradually Hot

## Results



*Figure 5. Results of the evolution experiment. 3D graph of the average percent survival across lineages (lollipop heights) for each treatment, plotted against temperature and transfer number (on the horizontal plane, both increasing towards the front corner).*

Over the duration of the experiment, viral populations evolved better survival at high temperatures (thermotolerance). As the Moderate and Gradual treatment groups approached stressful conditions, their survival began to drop, but then rebounded as adaptation took hold. The Sudden treatment group’s survival was relatively low throughout the experiment, suggesting that evolving to this condition may take more than 11 weeks. Interestingly enough, the Moderate and Gradual treatment groups had a slightly higher survival than the sudden treatment group at 50° C, even though the sudden treatment group was exposed to 50° C for a longer time.

*Sequencing of evolved populations.*

Gene	Mutation	A.A. change	Lineages
P8	<b>a 3144g</b>	<b>gln 69 arg</b>	G4, G1
P8	<b>a 3224g</b>	<b>ile 96 val</b>	S2, S3
P8	<b>a 3230g</b>	<b>asn 98 asp</b>	G5, G2
P8	<b>g 3263a</b>	<b>val 109 ile</b>	M1, M4, M5
P5	c 4259t	synonymous	C4
P5	a 4309g	lys 19 arg	M2
P5	<b>a 4623g</b>	<b>arg 124 gly</b>	C1-5, G2-5, M1 & 3-5, S1-5
P5	a 4625t	arg 124 ser	G1
P5	g 4854a	synonymous	M2, G1, S5
P5	g 4863c	val 204 leu	M3
P5	<b>g 4872a</b>	<b>val 207 ile</b>	M2
P5	<b>g 4872t</b>	<b>val 207 phe</b>	G3
P5	g 4875a	ala 208 thr	G5
P5	<b>g 4910a</b>	<b>trp 219 STOP</b>	C3
P5	g 4916c	STOP 221 tyr	C2

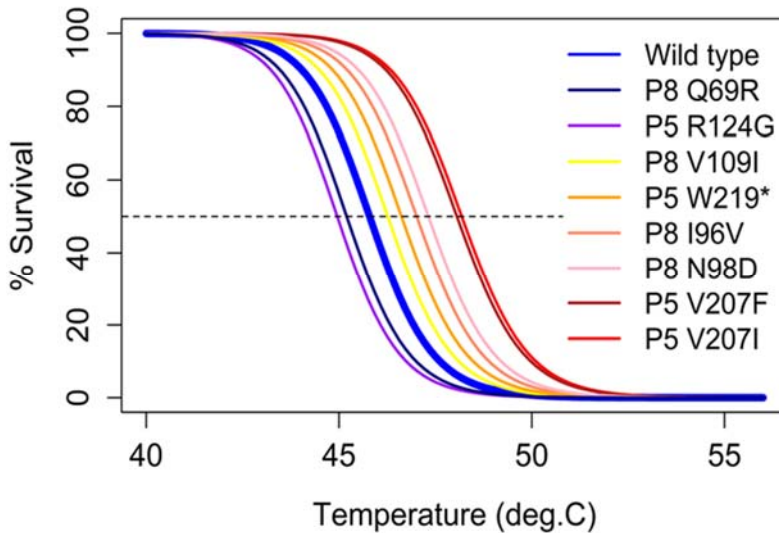
*Table 1. Mutations present in P8 (outer shell protein) and P5 (lysis protein) after 32 days of evolution under periodic heat shock. Bolded mutations have been reverse engineered and evaluated for thermostability (see Fig 6).*

Sequencing two genes of the evolved populations, the lysis protein (P5) and the outer shell protein (P8), revealed a total of 15 unique mutations (Table 1). Lineages that experienced a gradual temperature increase tended to have more mutations per lineage (average of 2.2 mutations), and a more unique mutations overall (6) than lineages that experienced rapid temperature increase (average of 1.8 mutations per lineage and 4 unique mutations). This is consistent with a prior study that evolved hundreds of populations of bacteria to survive an antibiotic, where the concentration increased at differing rates: There is a trend for lineages under gradual and moderate change to accumulate more mutations per lineage and a greater overall number of unique mutations<sup>28</sup>. Their results suggest that slow rates of environmental change may enable adaptations that are selectively inaccessible under fast rates of change. If similar dynamics constrict the evolution of thermotolerant proteins<sup>31</sup>, then this can explain the survival of both the gradual and moderate treatment groups at 50° C. Undergoing slower rates of in-

## The Benefit of Microbial Evolution Experiments and Why Some Like It Gradually Hot

creased thermal stress has allowed Gradual and Moderate treatment groups to accumulate more mutations than the Sudden treatment group, and such mutations may have contributed to their increased survival at 50° C. The effects of these mutations must be further evaluated to support this claim.

*Reverse engineering*



*Figure 6. Thermal kill profiles of the ancestor (blue, wild type) and 8 engineered single mutants from proteins P5 and P8.*

To determine exactly how the observed mutations affect viral thermostability, I have reverse engineered and evaluated eight of the mutations from the evolved lineages singly (Fig. 6). Different mutations give different gains in viral thermostolerance. Since I see mutations that give both high and moderate gains in thermostolerance, or even decrease thermostolerance, this data already suggests that there may be interactive effects between mutations that contribute to thermostolerance. Single mutations that decrease thermostolerance may depend on another mutation to be adaptive. This is similar to a compensatory mutation for antibiotic resistance. Gaining resistance to an antibiotic usually comes with a cost in fitness<sup>32</sup>, and an additional mutation can alleviate that cost. However, the benefit of a compensatory mutation may not be seen if it is not paired with the mutation that confers for resistance. It may be the case that the genetic background determines the role a certain mutation



can play. Exploring these interactions is the aim of my ongoing work.

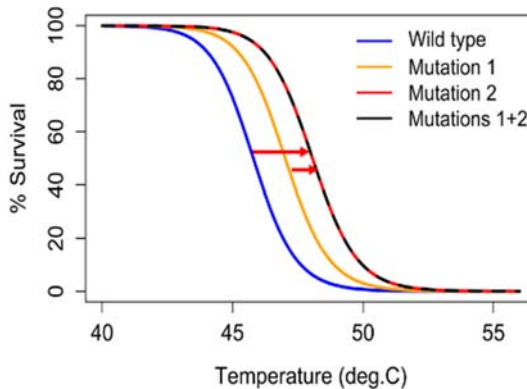
**Future Work**

I am currently completing the process of reverse engineering mutations from the evolved populations into the ancestral genetic background singly, and I am beginning to engineer combinations of double mutations. These data will help me understand evolutionary mechanisms of adapting to increasing thermal stress under different rates of change.

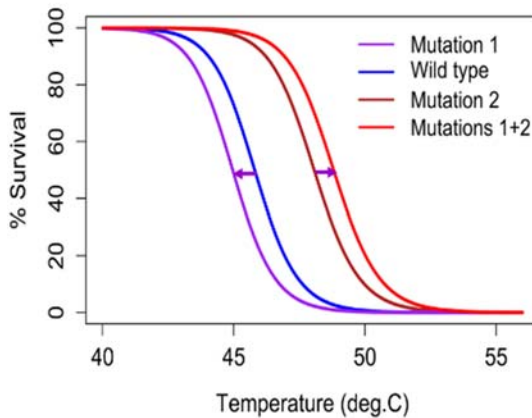
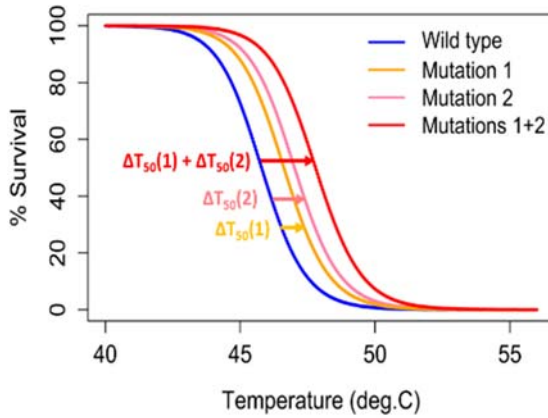
*Hypotheses*

There are three mechanisms by which mutations might influence viral thermotolerance in combination (Figure 7).

- 1) Mutations may have effects that are independent of one another. In this case, the mutation that increases thermotolerance the most will dominate (Fig. 7A).
- 2) Mutations may have additive effects. In this case, each mutation that increases thermotolerance will, in combination, add up to confer greater thermostability (Fig. 7B).
- 3) Mutations that decrease thermotolerance alone may *increase* thermotolerance in specific backgrounds (Fig. 7C).



# The Benefit of Microbial Evolution Experiments and Why Some Like It Gradually Hot



**Figure 7. A) Independent mutations.** Adding mutation 2 (red arrows) to a wild type background or a background with mutation 1 results in the same final thermotolerance. **B) Additive mutations.** The double mutant (red arrow) has proportionally more thermotolerance than either single mutant (mutation 1, orange; mutation 2, pink) alone. **C) Dependency on genotypic background.** Addition of mutation 2 (purple arrow) decreases thermotolerance in a wild type background but increases thermotolerance in a background with mutation 1.

It is possible that the lower temperatures experienced in treatments with changing temperatures may have selected for mutations with intermediate thermotolerance. As the temperature increased, those mutations no longer provided enough thermotolerance, and other mutations arose on top of them. In contrast, in an environment where the temperature changed suddenly, only mutations that provide high thermotolerance are selectively favorable. For this reason, I expect more additive or genotype-dependent combinations of mutations in lineages that experienced gradual or moderate change and more independent mutations in lineages that experienced rapid change.

## Conclusion

The “light of evolution” has much to illuminate, for our understanding of its dynamics is developing. We can further our knowledge of these dynamics by conducting microbial evolution experiments, and observing how a microbe responds to and overcomes a stressor. Various technologies, from sequencing to genetic engineering, allow us to extract bulk data to evaluate, rigorously testing evolutionary theories. To completely understand mechanisms of adaptive thermotolerance, untangling how mutations interact with one another and the environment is crucial. In particular, we need to gain deeper knowledge on how *changing* environments shape evolutionary outcomes. This work is particularly important with respect to climate change, where the *rate* of temperature change may make a difference to how populations adapt in response. If an environment changes suddenly, then populations must also adapt rapidly, whereas slower rates of change allow the population more time to adapt. Rate is thus an important parameter when taking adaptation into consideration. Data from evolving a virus under differing rates of increasing temperatures suggests that slow rates of environmental change may enable adaptations that are selectively inaccessible under fast rates of change, consistent with other literature<sup>28</sup>. These conclusions can transfer with grave consequences to macroorganisms that are experiencing fast rates of environmental change, such as polar bears and Adélie penguins as they face longer ice-free summers, negatively impacting their lifestyle. The evolution of thermotolerance is also relevant to the biology of viruses, many of which experience temperature changes during transmission or fever responses. Understanding the evolutionary mechanisms that allow viruses to adapt to higher temperatures will give us a better idea of possible evolutionary pathways and con-

# The Benefit of Microbial Evolution Experiments and Why Some Like It Gradually Hot

straints for thermotolerance in viruses and the macroorganisms that they are used as models for.

## References

- Dobzhansky, T. (1973) Nothing in biology makes sense except in the light of evolution. *American Biology Teacher* 35(3):125–129
- Elena, S. F. and Lenski, R. E. (2003) Evolution experiments with microorganisms: the dynamics and genetic bases of adaptation. *Nature Reviews*, 4, 457-469.
- Chadwick, D. J. & Goode, J. (eds) (1997) *Antibiotic Resistance: Origins, Evolution, Selection and Spread* (Wiley, Chichester, UK)
- Boots, M. and Sasaki, A. (1999) ‘Small worlds’ and the evolution of virulence: infection occurs locally and at a distance. *Proc. R. Soc. Lond. B* 266, 1933–1938.
- Rainey, P. B. and Travisano, M. (1998) Adaptive radiation in a heterogeneous environment. *Nature*, 394, 69-72.
- Ratcliff, W. C., Denison, R. F., Borrello, M. and Travisano, M. (2012) Experimental evolution of multicellularity. *PNAS*, 109 (5), 1595-1600.
- Kerr, B., Riley, M. A., Feldman, M. W. and Bohannan, B. J. M. (2002) Local dispersal promotes biodiversity in a real-life game of rock-paper-scissors. *Nature*, 418, 171-174.
- Rainey, P. B. and Rainey, K. (2003) Evolution of cooperation and conflict in experimental bacterial populations. *Nature*, 425, 72-74.
- Mindich, L. (1999) Reverse genetics of dsRNA bacteriophage  $\phi 6$ . *Adv. Virus Res.* 53, 341-53.
- Usala, S.J., Brownstein, B.H. and Haselkorn, R. (1980) Displacement of parental RNA strands during in vitro transcription by bacteriophage  $\phi 6$  nucleocapsids. *Cell*, 19, 855-862.
- Van Etten, J.L., Burbank, D.E., Cuppels, D.A., Lane, L.C. and Vidaver, A.K. (1980) Semiconservative synthesis of single-stranded RNA by bacteriophage  $\phi 6$  polymerase. *J. Virol.*, 33, 769-773.
- Pirttimaa, M.J., Paatero, A.O., Frilander, M.J. and Bamford, D.H. (2002) Nonspecific nucleoside triphosphatase P4 of double-stranded RNA bacteriophage  $\phi 6$  is required for single-stranded RNA packaging and transcription. *J Virol*, 76.
- Gottlieb, P., Strassman, J., Bamford, D. and Mindich, L. (1988b) Production of a polyhedral particle in *Escherichia coli* from a cDNA copy of the large genome segment of Phi 6. *J. Virol.*, 62, 181-187.

- Juuti, J.T. and Bamford, D.H. (1997) Protein P7 of phage phi6 RNA polymerase complex, acquiring of RNA packaging activity by in vitro assembly of the purified protein onto deficient particles. *J Mol Biol*, 266, 891-900.
- Grimes, J.M., Burroughs, J.N., Gouet, P., Diprose, J.M., Malby, R., Zientara, S., Mertens, P.P. and Stuart, D.I. (1998) The atomic structure of the bluetongue virus core. *Nature*, 395, 470-8.
- Poranen, M.M., Paatero, A.O., Tuma, R. and Bamford, D.H. (2001) Self assembly of a viral molecular machine from purified protein and RNA constituents. *Molecular Cell*, 7, 845-854.
- Johnson, M.D. (3rd) and Mindich, L. (1994b) Isolation and characterization of nonsense mutations in gene 10 of bacteriophage phi 6. *J. Virol.*, 68, 2331-8.
- Bamford, D.H., Romantschuk, M. and Somerharju, P.J. (1987) Membrane fusion in prokaryotes: bacteriophage phi6 membrane fuses with the *Pseudomonas syringae* outer membrane. *EMBO J.*, 6, 1467-1473.
- Mindich, L., Sinclair, J.F. and Cohen, J. (1976) The morphogenesis of bacteriophage phi6: particles formed by nonsense mutants. *Virology*, 75,224-231.
- Romantschuk, M. and Bamford, D.H. (1985) Function of pili in bacteriophage phi6 penetration. *J. Gen. Virol.*, 66, 2461-2469.
- Gottlieb, P., Metzger, S., Romantschuk, M., Carton, J., Strassman, J., Bamford, D.H., Kalkkinen, N. and Mindich, L. (1988a) Nucleotide sequence of the middle dsRNA segment of bacteriophage phi 6: placement of the genes of membrane-associated proteins. *Virology*, 163, 183-90.
- Mindich, L. (1988) Bacteriophage phi6: a unique virus having a lipid-containing membrane and a genome composed of three dsRNA segments. *Adv. Virus Res.* 35, 137-176.
- Butcher, S.J., Dokland, T., Ojala, P.M., Bamford, D.H. and Fuller, S.D. (1997) Intermediates in the assembly pathway of the double-stranded RNA virus phi6. *EMBO J.*, 16, 4477-4487.
- Johnson, M.D. and Mindich, L. (1994a) Plasmid-directed assembly of the lipid-containing membrane of bacteriophage phi 6. *J Bacteriol*, 176, 4124-32.
- Sinclair, J.F., Tzagoloff, A., Levine, D. and Mindich, L. (1975) Proteins of the bacteriophage phi6. *Virology*, 75, 685-695.
- Mindich, L. and Lehman, J.F. (1979) Cell wall lysin as a component of the bacteriophage phi6 virion. *J. Virology*, 30, 489-496.

# The Benefit of Microbial Evolution Experiments and Why Some Like It Gradually Hot

- T.C. Peterson et.al., (2009) Special Supplement to the Bulletin of the American Meteorological Society 90: S17
- Lindsey HA, Gallie J, Taylor S. Kerr B. Evolutionary rescue from extinction is contingent on a lower rate of environmental change. *Nature*. 2013;494:463–467.
- Gonzalez, A., Ronce, O., Ferriere, R., & Hochberg, M. E. (2013). Evolutionary rescue: an emerging focus at the intersection between ecology and evolution. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 368(1610), 20120404.
- Dessau, M., Goldhill, D., McBride, R. L., Turner, P. E. and Modis, Y. (2012) Selective pressure causes an RNA virus to trade reproductive fitness for increases structural and thermal stability of a viral enzyme. *PLOS Genetics*, 8 (11), e1003102.
- Weinreich, D. M., Delaney, N. F., DePristo, M. A. and Hartl D. L. (2006) Darwinian evolution can follow only very few mutational paths to fitter proteins. *Science*, 312, 111-114.
- Gagneux, S., Long, C. D., Small, P. M., Van, T., Schoolnik, G. K. and Bohannan, B. J. M. (2006) The competitive cost of antibiotic resistance in mycobacterium tuberculosis. *Science*, 312, 1944-1946.

## Acknowledgements

I would like to thank the McNair Program for funding, and the McNair staff for guidance and support. I would also like to thank the Early Identification Program for funding. I would like to express my gratitude to my mentors, Sonia Singhal and Dr. Ben Kerr for all they have done. I am grateful for the support from the Kerr Lab.

Cierra M. Leon Guerrero  
Department of Microbiology, Dr. Benjamin Kerr (Department of Biology)  
cierra.maria@gmail.com

I am interested in viruses and how their life cycles drive their evolution. I intend to pursue my Ph.D. studying the ecology of infectious diseases.



# **Chronic Health Effects of Racial Discrimination: NLAAS data correlation analysis**

Claudia Linares

## **Abstract**

*This research paper examines the association between chronic stress and health among the Hispanic and Asian population in the United States. Data from the National Latino and Asian American Study (NLAAS), 2002-2003, specifically questions regarding perceived racial/ethnic discrimination to measure chronic stress and self-reported chronic conditions to measure health were obtained and used in this study. The study hypothesized that there would be a positive association between perceived discrimination and reported chronic illnesses. Indeed, the logistic-regression analysis showed a positive correlation. However, this was only the case for chronic illnesses that are apparent and can be self-diagnosed. Chronic illnesses needing doctor diagnoses resulted in unexpected negative correlations: the more discrimination the less likelihood of having a chronic illness. This research paper argues that the multi-layered experience of racism leads to chronic health conditions, some of which go undiagnosed. The unique racial/ethnic experience of Asian and Hispanic population such as, lack of health care insurance, language barriers, immigration status, etc may be the reason for lack of diagnoses.*

**Key Words:** Asians, chronic stress, health, Hispanics, racial/ethnic discrimination.

## **Introduction**

Research regarding stress and health outcomes has gotten more and more attention over the years. Stress is defined as any uncomfortable "emotional experience accompanied by predictable biochemical, physiological and behavioral changes" (APA). These biochemical, physiological, and behavioral changes are a result of the "fight-or-flight" response of the sympathetic nervous system, causing hormones such as adrenaline and cortisol to surge through the body" (psychologytoday.com). Chronic stress is considered even more health harming than acute stress—stress associated with a temporary internal or external event— and is defined as, "A state of prolonged tension from internal or external stressors, which may cause various



physical manifestations—e.g., asthma, back pain, arrhythmias, fatigue, headaches, hypertension, irritable bowel syndrome, ulcers—and suppress the immune system (medical dictionary). Chronic stress is especially harmful because the prolonged nature of it activates the nervous system for a prolonged amount of time, eventually wearing the body out. An alarming statistic, by the “American Psychological Association,” states that in the United States (US) about 40% of deaths are related to stress, particularly chronic stress (APA). Moreover, according to the American Institute of Stress, stress increases the likelihood of heart disease by 40%, heart attack by 20%, and the risk of stroke by 50% (AIS). This is particularly important in the US, because heart disease and stroke are among the top 10 causes of deaths. In summary, stress is an issue that the US is facing and the connections and outcomes it has on our health are huge.

While these statistics apply to the general population, low-income and racial/ethnic minority populations are at even greater-risk for stress-exposure and, consequently, health complications (CDC.gov). The goal of this research is to understand to what extent unique chronic stressors faced by racial/ethnic minorities, like everyday discrimination, have on the health, in particular chronic illnesses. The implications for this research can potentially lead to policy efforts regarding prevention of poor health among racial/ethnic minority groups and possibly reduce racial/ethnic disparities in health. More importantly, however, the research findings illustrate the harsh and true reality of racism in the US and the very real effects it has on minority groups’ health. It not only calls into question the society that we live in that fosters institutionalized racism, but also what has been done or will be done as a result of not addressing institutionalized racism? This paper focuses specifically on the effect of chronic stress measured by perceived racial discrimination on the health of the Hispanic and Asian population in the United States.

## **Literature Review: Racial Discrimination and Health**

Racial discrimination occurs when a person is treated less favorably than another person in a similar situation because of his/her/their race, color, descent, national or ethnic origin or immigrant status. Racism is the belief that all members of each race possess characteristics or abilities specific to that race, especially to distinguish it as inferior or superior to another race or races. The term institutional racism

## Chronic Health Effects of Racial Discrimination: NLAAS data correlation analysis

describes “societal patterns that have the net effect of imposing oppressive or otherwise negative conditions against identifiable groups based on race or ethnicity” (civilliberties.com). So far most research regarding chronic stress and health have been outside the realm of understanding the stresses that racism and racial discrimination have on individuals’ health. However, racial discrimination, which is often a consequence of racism, can be considered a chronic stressor because it affects an individual on an everyday basis. Some of the reported forms of everyday racial discrimination include being treated with less courtesy than others, having poor restaurant service, feeling as if people act afraid of you, etc. Below is a brief literature review following some of the most distinguished research on the connection between racial discrimination and health, along with unique racial experiences.

It has been established that African American individuals suffer worse health outcomes than whites. The term used to describe this phenomenon in the US is health disparities. Williams and colleagues (1997) sought out to explain the black–white differences in self-reported measures of physical and mental health through racial differences in socioeconomic status (SES), social class and acute and chronic indicators of perceived discrimination, as well as general measures of stress. Their research was aimed to understand the ways in which unique experiences linked to race, such as non-economic forms of racial discrimination can adversely affect health through a social-stratification lens that pays close attention to the experience of race and racism. According to Williams and colleagues (1997), “...race is a gross indicator of distinctive social and individual histories and not a measure of biological distinctiveness.” Williams and colleagues critique researchers who examine racial differences in health by treating on SES as responsible for racial differences in health. William et al 1997 argue that this approach is inadequate, because of group differences in the very nature of SES. In other words, SES is not enough to explain racial differences. In fact, race often times determines SES, and that is not a factor of innate abilities or differences, it based on the fact that racism in this country continues to foster a social hierarchy that determines the fate of racial groups in education, SES, and, consequently, health (William et al 1997). The results show that blacks have higher scores on variables in SES, social class, stress, but whites reported higher ratings of general chronic stress. Blacks, however, reported more chronic stress in financial and life events. Blacks also have higher scores on chronic indicators of everyday discrimination. Overall, blacks reported lower levels of

health, compared to whites. When controlling for education and SES, William et al 1997 found that the results were reduced but still significant.

In another article, the study sought out to understand the potential causes of mental health outcomes of Hispanic adolescents. Hispanic adolescents report greater sadness, depressive symptoms, suicidal ideation and suicidal attempts than do their non-Hispanic peers (CDC, 2012; Nock et al., 2013; Zayas, Lester, Cabassa, & Fortuna, 2005). Moreover, Hispanic adolescent female's depressive and suicidal behavior are nearly three times higher than the general population. In recent years, a number of scholars have worked to understand the factors that contribute to depression and suicide among Hispanic adolescents and have found that racial and ethnic minorities are often exposed to a disproportionate number of acute and chronic stressors compared to non-Hispanic White adults in the United States (Boardman, 2004; Boardman & Alexander, 2011; Schulz et al., 2000). Cervantes and colleagues (2014) support the findings that minority groups, such as Hispanics, are exposed to unique stressors which influence their health outcomes. Unique stressors that Hispanic adolescent population that they are often exposed to include family economic stress, cultural or educational stress, acculturation-gap stress, immigration stress, discrimination stress, family immigration stress, community or gang-related stress, and cultural stress. The findings show that when using general linear models (GLM), only family economic, acculturation gap, family immigration, discrimination, and family drug stress had a unique effect on depression and effect varied by group. Acculturation gap stress was associated with depression for the nonclinical group but not the clinical group ( $p < .001$ ) and community gang stress was more strongly related to depression for the clinical group ( $p < .05$ ). He concludes that culturally appropriate interventions are needed. According to his study, very few Latinx<sup>1</sup> continue with their therapy to its completion—meaning they

<sup>1</sup> Latinx, pronounced "La-teen-ex," includes the numerous people of Latin American descent whose gender identities fluctuate along different points of the spectrum, from a gender or nonbinary to gender non-conforming, gender-queer and gender fluid. The "x" makes Latino, a masculine identifier, gender-neutral. It also moves beyond Latin@ – which has been used in the past to include both masculine and feminine identities – to encompass genders outside of that limiting man-woman binary. See: <http://www.latina.com/lifestyle/our-issues/why-we-say-latinx-trans-gender-non-conforming-people-explain>

## Chronic Health Effects of Racial Discrimination: NLAAS data correlation analysis

prematurely drop out of therapy, and many more avoid therapy as it is stigmatized in their culture. Such issues make it very difficult to reach and help Latinx. Thus a greater understanding of unique experiences and cultural beliefs of counseling are needed to better fit the need and outreach the Latinx population.

An article by the Asian American Health Initiative also demonstrates the need for understanding unique racial and cultural experiences, in regards to health care and access to health care in the Asian community. To begin, authors of this article first debunk the “Model minority myth,” which is the belief that all Asians are healthy, have a high income, and have high education. The article quickly shows that this is not always the case. Many Asians have succeeded in the attaining the American Dream in education and accomplishing stable incomes, but this is not case for all Asians. In fact, two million Asian Americans do not have insurance in the U.S., one in five Asian American between the ages of 18-64 report having no health insurance or being uninsured at some point in the past year. Consequently, Asian Americans have higher prevalence of tuberculosis (TB) than all other racial and ethnic groups, cancer and cardiovascular disease are the leading causes of death in the Asian American community, Asian Americans account for over half of deaths resulting from chronic Hepatitis B infection in the U.S., and Asian women aged 65 years and over have the highest suicide rate in the country compared with any other populations in that age group. These statistics illustrate the consequences of lack of health care access and preventative care on physical and mental health. Some of the reasons why Asian Americans may not have access to health care, according to the article, is that “Asian Americans face cultural and linguistic barriers that may discourage or prevent them from accessing health care services available to them. The way that Asian Americans may deal with illness and disease may also be very different from the general population (AAHI). Thus, beyond monetary issues (ie SES), Asian Americans face additional obstacles to accessing health, all of which should be crucial for necessary and effective interventions.

Among the unique experiences that minority groups experience, there is also research that shows the physiological consequences of racial discrimination. Researchers suggest that particular stressors unique to racial and ethnic minorities can activate physiological and emotional stress responses (William et al. 2009). According to Hans Selye’s General Adaptation Syndrome (GAS) model, the body undergoes a step-by-step process when dealing with a stressor. Selye first coined

the word stress in 1936, as “the non-specific response of the body to any demand for change.” According to Selye’s GAS model, the first stage in responding to stress is known as the “alarm reaction” in which the body prepares to either fight or flight through recruiting all necessary energy and resources to prepare for reacting to the stressor. The second stage, is the stage of resistance where, if the stress is continuing or ongoing, the body adapts to the stressor that it is exposed to. Thus, the body finds ways to adapt to the stressor in order to reduce the effect of the stressor; and a resistance to stress is built. However, if the duration of the stressor is sufficiently long, the body enters a stage of exhaustion, which is the last stage. During this stage, the body goes through a sort of aging due to wear and tear (Seyle 1936; Seyle 1950; Seyle 1985). Chronic stressors lead to prolonged stress, where the body becomes more vulnerable to illnesses and diseases due to the exhaustion stage and the wearing and tearing it has undergone or is undergoing. Having an over-reactive nervous system can lead to chronic illnesses such as high blood pressure, chronic fatigue, chronic pain, chronic lung cancer, certain types of arthritis like rheumatic arthritis, strokes, and many more other types of chronic illnesses (AIS; APA, Seyle 1936; Seyle 1950; Seyle 1985). The chronic stressors that ethnic/minority individuals are exposed to helps explain the physical symptoms, such as chronic illnesses, that they may experience and may help in explaining some of the reasons for health disparities, ie unique ongoing racial experiences.

Indeed, the health of Latinx and Asian Americans is a public health concern. CDC fast facts reports that Cancer, Heart disease, and Stroke are the leading causes of deaths for Asian population. In the Latinx population cancer, heart disease, and accidents (unintentional injuries) are the leading causes of deaths. Their statistics show that 25% of Hispanics ages under 65 report are uninsured, and 10% of Asians under 65 report not having health insurance. The lack of health care is crucial to the preventary care of deaths within this population. Health People 2020 have noted the importance of health care access and insurance and have made Hispanics and Asians their target populations in increasing the number of insured individuals. According to Health 2020, Hispanics are the least insured of all groups in the US, and Asian Americans are the 3<sup>rd</sup> less likely uninsured—Native Americans and Pacific Islanders are the 2<sup>nd</sup> least likely to be insured.

In this paper I examine the association between racial discrimination and chronic health outcomes in Latinx and Asian American pop-

# Chronic Health Effects of Racial Discrimination: NLAAS data correlation analysis

ulations in the US.

## **Methodology**

### *Data*

The National Latino and Asian American Study (NLAAS), 2002-2003 data, a large and generalizable national survey was obtained and used for this research. The National Latino and Asian American Study (NLAAS) provides national information on the similarities and differences in mental illness and service use of Latinx and Asian Americans. The NLAAS is one of the most comprehensive studies of Latinos and Asian Americans ever conducted using up-to-date scientific strategies in the design, sampling procedures, psychiatric assessments, and analytic techniques. The final NLAAS sample consisted of 2,554 Latino respondents and 2,095 Asian American respondents. To allow for important subgroup analysis, respondents were further stratified into the following ethnic subgroup categories: Puerto Rican, Cuban, Mexican, Other Latinos, Chinese, Vietnamese, Filipino, and Other Asians. Data collection took place between May 2002 and November 2003. To be eligible to complete the NLAAS, respondents were required to be 18 years of age or older, living in the non-institutionalized population of the coterminous United States or Hawaii, of Latino, Hispanic, or Spanish decent, or of Asian descent. The NLAAS instrument was administered in the respondent's choice of the following languages: English, Spanish, Chinese, Vietnamese, or Tagalog by fully bilingual lay interviewers.

### *Variables*

The variables of interest were perceived discrimination, race/ethnicity, and chronic illness. The independent variables were discrimination and race/ethnicity and the dependent variable was chronic illness. The NLAAS include David R. Williams's Everyday discrimination scale, which was a unique and innovative scale that is the most reliable and used measure of discrimination today. The everyday discrimination scale assesses the occurrence and frequency of perceived chronic interpersonal discrimination that individuals experience. Respondents were asked to report how often the following occurs (0 = never, 1 = less than once a year, 2 = a few times a year, 3 = a few times a month, 4 = at least once a week): You are treated with less courtesy or respect than other people; you receive poorer service than other people at restaurants or stores; people act as if they think you are not smart; people act as if they are afraid of you; and you are threatened or harassed (alpha =

0.75). We sum and took the mean of individuals' responses to the five questions.

What makes this survey measure different from others is that it captures microaggression<sup>2</sup> and a bigger racial experience. Prior surveys examined big traumatic experiences, such as being unfairly fired from a job due to race/ethnicity, that were not generalizable, the everyday discrimination is a more reliable and valid measure of discrimination .

The chronic health conditions were also included in the data. The questions were broken up to ask questions of self-diagnoses, such as "have you ever had" and questions that required doctor diagnoses such as "doctor ever told you." Table 1 shows the list of all chronic health conditions. The NLAAS included Latinx and Asian American population in the US. Race was measured by 1=Vietnamese, 2= Filipino 508, 3 =Chinese 600, 4 =All other Asian, 5 Cuban, 6= Puerto Rican, 7=Mexican, 8=All other Hispanic. All Asian subgroups were included in one Asian category. All Latinx subgroups were included in a Latinx category.

The study implemented a logistic regression analysis. It used race and discrimination as independent variables and chronic illness as the dependent variable. Controlling for Hispanics did not invalidate the relationships that were found. Using the mean of discrimination, individual logistic regressions were ran for each individual chronic illness (14 questions and 14 types of chronic illnesses).The mean discrimination was used to predict the health conditions for Asian and Latinx Americans.

## Results

The results showed a positive correlation (i.e., the more racial discrimination reported the more likely to report also having he specific chronic illness) for questions that could be self-diagnosed and did not need doctor diagnoses. These outcomes includes the more perceived discrimination reported the more chronic back/neck pain, severe headaches, any form of chronic pain, seasonal allergies like hay fever, and asthma. There was a negative correlation between discrimination and

<sup>2</sup>Microaggressions: a subtle but offensive comment or action directed at a minority or other nondominant group that is often unintentional or unconsciously reinforces a stereotype: such as "I don't see you as black." See: <http://www.dictionary.com/browse/microaggression>

## Chronic Health Effects of Racial Discrimination: NLAAS data correlation analysis

the other health outcomes (i.e., the more racial discrimination reported the less likely to not report having the chronic illness). These outcomes includes the more perceived discrimination reported, the less likely to also report having heart disease, heart problems, chronic lung disease, diabetes/high blood sugar, and ulcer in stomach inset. Control for Hispanics did not change the relationship between racial discrimination and chronic illness.

Chronic illness	Significant relationship
<b>1.Ever had arthritis/rheumatic</b>	Negative
<b>2.Ever had chronic back/neck problems</b>	Positive
<b>3.Ever had frequent or severe headaches</b>	Positive
<b>4.Ever had any other chronic pain</b>	Positive
<b>5.Ever had seasonal allergies like hay fever</b>	Positive
<b>6.Ever had stroke</b>	Not Significant
<b>7.Ever had heart disease</b>	Negative
<b>8.Doctor or health professional told have heart problems</b>	Negative
<b>9.Doctor or health professional told have asthma</b>	Positive
<b>10.Doctor or health professional told chronic lung disease</b>	Negative
<b>11.Doctor or health professional told diabetes/high blood sugar</b>	Negative
<b>12.Doctor or health professional told ulcer in stomach/inset</b>	Negative
<b>13.Doctor or health professional told epilepsy</b>	Positive
<b>14.Doctor or health professional told cancer</b>	Not Significant

*Table 1.* Racial Discrimination association with Chronic Illness



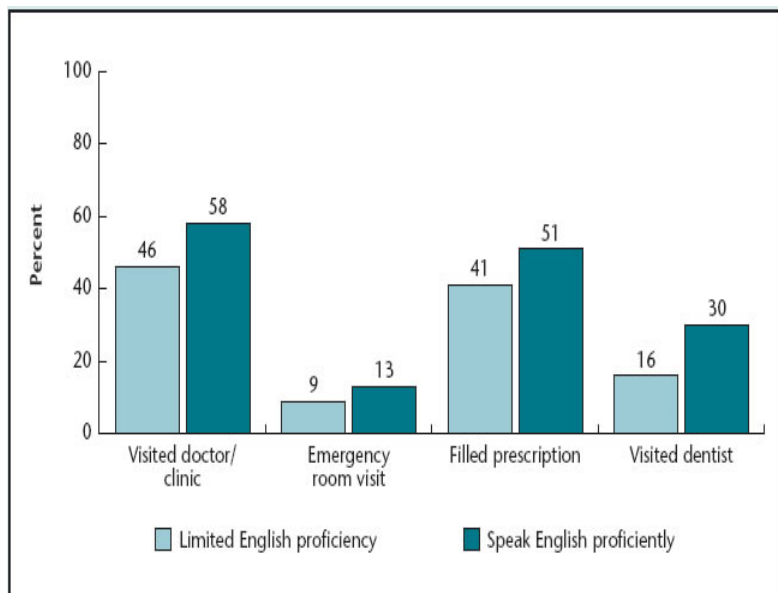
## Discussion

The results showed that a positive correlation for question starting with “Ever had” or questions that could be self-diagnosed: the more perceived discrimination reported, the more likely they were to also report having the chronic illness of interest. The findings show a negative correlation for questions starting with “Doctor or health professional told” or questions that could not be diagnosed: the more discrimination they experienced, the less likely they were to report having the chronic illness of interest. My hypothesis was partially met. The results demonstrated an interesting pattern—for questions that can be self-diagnosed and did not need doctor diagnosis, a positive correlation existed between discrimination and health. However, for questions that did need doctor diagnoses a negative correlation existed between discrimination and health. Our findings align with Williams and colleagues (1993) in that racial discrimination does affect chronic health outcomes. However, the pattern did bring into question why our hypothesis was not met for reported health conditions that needed doctor diagnosis. Our literature review and leading researchers on the subject all agree that the more stress an individual accumulates the more likely they are to have chronic illnesses. Chronic stress, like racial discrimination, is highly correlated with chronic illnesses. Our findings are contrary to our literature review painting that stress leads to chronic illnesses for reported health conditions that needed doctor diagnosis (AIS; APA; William et al 1997; Williams et al 2009; CDC; Healthy People 2020).

The findings in this study point to a multi-layered experience. Perceived discrimination is positively related to the health conditions that are self-diagnosed. But perceived discrimination is negatively related to health conditions that require a medical diagnosis. We suspect that this unexpected negative relationship is due to barriers to medical care. Those who perceive more discrimination may also be more likely to lack the financial resources and insurance to get routine medical care; have language barriers; have immigration status problems; and to avoid medical care because of the expectation that they will not be treated respectfully. In fact, a recent study points to some of the limitations language barriers may have on accessing health. For instance, a study by Brach et al 2008 shows that individuals who lack English proficiency are 11% less likely to seek medical help and that is for basic care, seeking out emergency care in the ER, regular check-ups, etc (See Figure 1). A study by Escarce et al 2012, consistently finds that blacks and

## Chronic Health Effects of Racial Discrimination: NLAAS data correlation analysis

Hispanics are more likely than whites to report not having a usual source of care.



*Figure 1. Association between English proficiency's and Health care visits. Source: Demographics and Health Care Access of Limited-English-Proficient and English-Proficient Hispanics, MEPS Research Findings.*

Continuing on the idea that racially discrimination groups experience unique stressors and experiences, aligns with Williams and colleagues (1997) claim. According to Williams 1997, race determines social class and SES, and so that they may not have access to health care and/or may not afford it. That is, race is an antecedent and determinant of SES, and SES differences between blacks and whites reflect, in part, the impact of economic discrimination as produced by large-scale societal structures. Authors of this article point that the most profound impact of racism is at the level of societal institutions in shaping the socio-economic opportunities, mobility and life chances of racialized groups. The quality and quantity of a broad range of health-enhancing resources, including medical care, are differentially distributed by societal institutions, to members of discriminated against racial groups. Much of the observed racial differences in SES reflects the results of these processes (Williams et al 1997).

While one of our limitations was lack of control for education and income, researchers like William point that income is not the reasons for health disparities, racial discrimination is.

## Conclusion

Our hypothesis was partially met. Our hypothesis was that the more perceived discrimination reported, the more chronic illnesses reported. We found that for nearly all questions that asked “Have you ever [e.g., chronic illness]” individuals, individuals with high levels of perceived discrimination reported were also more likely to report having the chronic illnesses of interest. We also found that for illnesses that could be self-diagnoses, like having chronic pain or frequent headaches, individuals with high levels of perceived discrimination reported having more chronic illnesses. For “Doctor ever told you” we found a negative relationship. The more perceived discrimination reported, the less likely they were to report having the chronic illnesses. For the medical chronic conditions that required diagnoses, less people reported having it. I believe that this may be due to barriers that decreases access to health care, such as language, income, and immigration status. Unfortunately, I was unable to control for these variables as nearly no respondents answered questions of education, immigration status, etc. Indeed, a limitation of the research were that we could not control for education, immigration status, age, or income due to the low number of respondents on these questions. Future research should reexamine these questions including these controls. Despite these limitations, this paper adds to the robust body of research linking discrimination to poor health among populations of color. It sought out to demonstrate unique racial discrimination as explanation for health outcomes: chronic stress, racial discrimination, types of stress,

## References

- American Institute of Stress "What Is Stress?" *The American Institute of Stress*. Web. 31 May 2016. <<http://www.stress.org/what-is-stress/>>.
- American Psychological Association. *The Impact of Stress*. Retrieved October 29<sup>th</sup>, 2015 from: <http://www.apa.org/news/press/releases/stress/2011/impact.aspx>
- American Psychological Association. *Health Disparities and Stress*. Retrieved April 29, 2016 from: <https://www.apa.org/topics/health-disparities/stress.pdf>
- Brach, Cindy, and Frances M. Chevarley. *Demographics and Health Care Access and Utilization of Limited-English-proficient and*

## Chronic Health Effects of Racial Discrimination: NLAAS data correlation analysis

- English-proficient Hispanics*. Rockville, MD: Agency for Healthcare Research and Quality, 2008. *Meps.gov*. Agency for Healthcare Research and Quality U.S. Department of Health & Human Services, Feb. 2008. Web. 2016. <[http://meps.ahrq.gov/mepsweb/data\\_files/publications/rf28/rf28.pdf](http://meps.ahrq.gov/mepsweb/data_files/publications/rf28/rf28.pdf)>.
- Boardman, Jason D., and Kari B. Alexander. "Stress Trajectories, Health Behaviors, and the Mental Health of Black and White Young Adults." *Social Science & Medicine* (1982). U.S. National Library of Medicine, May 2011. Web. 08 June 2016.
- Boardman, Jason D. "Race Differentials in Obesity: The Impact of Place." *Journal of Health and Social Behavior* 46.3 (2005): 229-43. Colorado.edu. 2005. Web. 1 June 2016.
- Centers for Disease Control and Prevention. "Health of Asian or Pacific Islander Population." *Centers for Disease Control and Prevention*, 27 Apr. 2016. Web. 31 May 2016. Retrieved from: <http://www.cdc.gov/nchs/fastats/asian-health.htm>
- Centers for Disease Control and Prevention. "Health of Hispanic or Latino Population." *Centers for Disease Control and Prevention*, 27 Apr. 2016. Web. 31 May 2016. Retrieved from: <http://www.cdc.gov/nchs/fastats/hispanic-health.htm>
- Cervantes, R. C., Cardoso, J. B., & Goldbach, J. T. (2014, November 3). Examining Differences in Culturally Based Stress Among Clinical and Nonclinical Hispanic Adolescents. *Cultural Diversity and Ethnic Minority*
- "Chronic Stress." *TheFreeDictionary.com*. N.p., n.d. Web. 31 May 2016. Retrieved from: <http://medical-dictionary.thefreedictionary.com/chronic+stress>.
- Collaborative Psychiatric Epidemiology Surveys (CPES), 2001-2003 [United States] (ICPSR 20240)." *Collaborative Psychiatric Epidemiology Surveys (CPES), 2001-2003 [United States]*. Web. 31 May 2016. Retrieved from: <<http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/20240>>.
- Escarce, José J., and Sarah Goodell. "Racial/Ethnic Disparities in Infant Mortality — United States, 1995–2002." *Morbidity and Mortality Weekly Report* 54.22 (2005): 553-56. Robert Wood Johnson Foundation, Sept. 2012. Web. 2016. Retrieved from: <http://www.health.state.mn.us/divs/hpsc/hep/transform/novdocuments/rwjsynthesis.pdf>.

- Healthy People 2020."Access to Health Services." *Healthy People 2020*.Web. 31 May 2016. Retrieved from: <<https://www.healthypeople.gov/2020/topics-objectives/topic/Access-to-Health-Services/national-snapshot>>.
- Schulz, Jb, J. Dichgans, J. Lindenau, and J. Seyfried. "Glutathione, Oxidative Stress and Neurodegeneration." National Center for Biotechnology Information. U.S. National Library of Medicine, Web. 08 June 2016.
- Seyle, Hans. "STRESS AND THE GENERAL ADAPTATION SYNDROME." *British Medical Journal* (1950): 1383-92. Web. 01 June 2016
- Seyle, Hans. "The Nature of Stress." *National Center for Biotechnology Information*. U.S. National Library of Medicine, n.d. Web. 01 June 2016. <<http://www.ncbi.nlm.nih.gov/pubmed/2990402>>.
- Williams, D. R., Yu, Y., Jackson, J. S., & Anderson, N. B. (1997). Racial Differences in Physical and Mental Health: Socioeconomic Status, Stress, and Discrimination. *Journal of Health Psychology* , 2 (3), 335-351.
- Williams, David R., and Selina A. Mohammed. "Discrimination and Racial Disparities in Health: Evidence and Needed Research." *Journal of Behavioral Medicine*. U.S. National Library of Medicine, Feb. 2009. Web. 08 June 2016

# Chronic Health Effects of Racial Discrimination: NLAAS data correlation analysis

## Acknowledgements

This research was supported by the Ronald E. McNair Scholar Program who provided me with support and grant money to complete this research project.

We thank our fantastic mentors Dr. Hedwig Lee Director of the Honors Sociology Program and Associate Professor of Sociology at the University of Washington and Dr. Jerald Herting Chair of the Sociology Department and Professor of Sociology who provided insight and expertise that greatly assisted the research.

We thank Patty Glynn, computing support person in the Sociology Department, for assistance in the research methods and statics. We are extremely thankful for her support in the research analysis that provided great insight for understanding the research results.

We are immensely thankful to Dr. Lee and Mrs. Glynn who provided pearls of wisdom throughout the whole course of the research. The guidance that I was given throughout the whole course of the project has indeed helped me value research and understand the detailed preparation needed. I am incredibly grateful for the mentorship of these intelligent and wonderful women. Thank you for the comments and edits on the earlier versions of the manuscript, although any errors are my own and should not tarnish the reputations of these esteemed persons.

It has been truly an honor to work under the guidance and wisdom of all of my mentors and I am eternally grateful for their patience and dedication in helping me achieve this project.

---

Claudia Linares

---

University of Washington Psychology Department  
[clinares@uw.edu](mailto:clinares@uw.edu)

My research interests concerns the interconnectedness of the mind with the body, particularly the ways that stress affects the physical body. I am interested in exploring how social and economic stressors affect physical and mental health, with the end goal of providing personalize/culturally appropriate intervention/treatments.

---



# Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds?

Kenny Lino

## Abstract

*Although many learners are able to learn the vocabulary and grammar of another language, many learners find difficulty in acquiring the sounds of another language (Flege, 2003). Korean, in particular has a set of consonants that seem strikingly similar to English speakers, which makes it arduous to tell them apart. For example, the words for 'moon' and 'mask' in Korean, pronounced [tal], both begin with a [t] but are produced slightly differently, with the [t] in 'moon' unaspirated and the [t] in 'mask' aspirated (Aspiration is the puff of air that can accompany certain sounds like [b, p, t, d, k, g]). Research has shown the pitch of the vowel following these consonants can also serve as a reliable cue, with the vowels following aspirated sounds having a higher pitch than the vowels following the unaspirated sounds (Kim, M. 2004).*

*In this study, I examined whether teaching L2 learners of Korean to recognize pitch as a cue could help them discriminate between the lenis and the aspirated stops. To test this, I gathered a group of students and separated them into an experimental and control group. They were then asked to take a short online survey where they either watched a short video about a) how pitch could be used as a cue, or b) Korean grammar, respectively. Both groups were then tested on their perception of these stops through a word identification task to gauge possible improvements.*

*With this training, it was expected that learners of Korean could better segregate these consonants with better accuracy. However, due to the limited scope and time of the experiment, the results were inconclusive and show that simply teaching students to listen to pitch as a cue to identify these sounds was not effective. Although this particular study was inconclusive, it is hoped that this will bring more attention to the need to improve pronunciation education and pave the way towards further research in teaching learners of Korean how to better perceive and pronounce these sounds.*



## Literature Review and Theoretical Basis

The Critical Period Hypothesis has long been a point of contention, especially for linguists who strive to account for differences in language acquisition between adults and children. This hypothesis was popularized by Lenneberg (1967) in his book, *Biological Foundations of Language*, where he presented evidence in support of the hypothesis through the universal pattern of language development and cerebral lateralization. Lenneberg suggested the loss of neuroplasticity, which occurs from the lateralization of the cerebrum, inhibits humans from successfully acquiring language after its conclusion. He supports his claim through observations made from patients of certain variations of aphasia. He asserts children are able to completely recover from aphasia while adults are not because children's language faculties can be relateralized.

There has been other evidence to support the hypothesis from extreme cases like Genie, who was found abused and deprived of language until she was found at age 13, the age cerebral lateralization is said to conclude. Although there were many attempts to teach her language, it was found that Genie was incapable of acquiring appropriate levels of speech, and according to the most recent information about her, Genie is speechless once again (James 2008). This and other cases such as Victor, the "Wild Child" are often referenced as evidence for the Critical Period Hypothesis. However, it is often debated whether these cases are adequate indications of the existence of such because of the extremities of the situation surrounding both cases.

Despite the constant debate surrounding the Critical Period Hypothesis and *first* language acquisition, many have contended that the hypothesis accounts for the varying levels of performance in *second* language, especially in areas like pronunciation, as learners get older (Scovel 1988). Previous studies conducted by Johnson and Newport (1989) have found evidence to support this hypothesis, as seen through the correlation between a learner's age of arrival and their declining accuracy on a grammatical judgment task. However, a subsequent replication conducted by Birdsong and Molis (2001) found that although age is generally correlated with learners' performance on the task, there were also a small subset of learners who achieved native-like accuracy on the task despite their age. Similar effects were found in other studies such as Bongaerts (1998) who find that a small number of Dutch learners who acquired English at age 12, an age argued to be after the critical

## Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds?

period, were judged to be within 1.2 standard deviations of a native speaker's pronunciation. After cross-examining their own data with previous research like Bongaerts (1998), following Long (1990)'s criterion for rejecting the Critical Period Hypothesis, Birdsong and Molis suggest in their conclusion that the evidence of native-like performance by learners who acquired language beyond the maturational period is enough to reject the hypothesis.

This hedging of the Critical Period Hypothesis by Birdsong and Molis (2001) falls in line with statements made by Flege in his 1987 article, who argued that there is no conclusive evidence to support the hypothesis even before Johnson and Newport's study. Flege criticizes previous claims made by Lenneberg, who cited evidence from patients of aphasia as a critical piece of evidence for the hypothesis. However, other evidence presented by Flege such as Snow (1986) have suggested that children do not actually make a complete recovery from aphasia as Lenneberg claimed. Flege cites further issues with the hypothesis by drawing comparisons to characteristics of imprinting seen in chickens, ducks and geese. If language learning is constrained by a critical period like imprinting, then it should: appear under well-defined conditions, cannot be forgotten or revised once established, and be characteristic of a species rather than individuals. However, according to Flege, the only characteristic that holds true for language learning is that it appears under well-defined conditions; that is, language learning occurs in a universal pattern cross-linguistically. Because the Critical Period Hypothesis centers around neuroplasticity, it inherently suggests that children would perform better in pronunciation than adults. However, similar to Birdsong and Molis (2001), Flege (1987) cites other articles such as Winitz (1981) and Snow and Hoefnagel-Höhle (1978) who found that adults perform better than children on the pronunciation tasks tested. Although specific numbers are not stated in Flege's mention of these articles, Flege makes similar comments to Birdsong and Molis (2001) in that this presents confounding information to the hypothesis.

In further discussion of the hypothesis, Flege delves into other possible factors that could account for the difference in performance between adults and children such as input and social factors including motivation. He points to studies such as Cochrane (1977) and Burling (1981), which both found that adults received comparatively less input than children because adults were less obliged to speak in the L2. In his discussion of motivational influences, he points to Macnamara (1973) who proposed that children may feel pressured to pronounce foreign

languages better than adults in order to conform. After detailing other possible accounts, Flege concludes that the Critical Period Hypothesis oversimplifies the complicated nature of language acquisition, and is not a testable hypothesis that can account for the diverse nature of L2 learners because of the numerous inconsistencies not found other precedents for the hypothesis.

Despite how one views the Critical Period Hypothesis and its validity, it can be argued that there is evidence for a maturational effect on second language learning, especially in areas of pronunciation. It has been demonstrated in Birdsong and Molis (2001) that the *majority* of language learners beyond the proposed critical period still have difficulties acquiring the phonology of an L2. However, according to the confounding evidence presented by Flege (1987) and Birdsong and Molis (2001), if it is possible for a *minority* of learners to achieve native-like pronunciation as seen in studies like Bongaerts (1998), Winitz (1981) and Snow and Hoefnagel-Höhle (1978), then shouldn't the majority of learners be able to achieve the same? This raises the question of how one can teach learners pronunciation.

According to Darcy, Ewert, and Lidster (2012) who examine pronunciation instruction in ESL environments, pronunciation tends to be difficult to teach because teachers do not receive enough guidance to teach it. Because there is no commonplace method to teach or measure performance in pronunciation like grammar and vocabulary, pronunciation often ends up being neglected. Previous attempts to teach pronunciation have raised debates on when to attend to pronunciation in the classroom, whether to focus on suprasegmentals or segmentals when teaching it, and how to balance perception and production. Even when students are taught pronunciation, it has been found that students often lose it when they focus on meaning. A small survey conducted in Darcy, Ewert and Lidster (2012)'s study found that although almost all teachers find pronunciation to be crucial in order to promote intelligibility and comprehensibility, many of them fail to address it in their classrooms. They propose a curriculum for teaching pronunciation in English where they divide various segmental and suprasegmental features into three levels: survival, clarity and awareness, and accuracy/attention. Despite this proposal being a step forward in mitigating the issue of pronunciation within L2 learners, Darcy, Ewert and Lidster (2012) do not address in detail how to put their proposal in to action, and even admit that there are multiple barriers, such as the lack of materials and teacher training.

## Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds?

Some studies such as Perrachione et al. (2015) have attempted to tackle this issue of how to teach subjects to perceive new sounds through training. In their study, Perrachione et al. (2015) recruited 37 English monolinguals with no previous knowledge of Korean and trained them through triplets of pseudowords, which were associated with distinct images of various objects. These subjects were trained through four computer-based sessions that included feedback and then a daily test for attainment. This was later followed-up 60 days later with another test, which found that all learners improved in their perception of the stops, but at varying degrees. However, because this study was conducted with English monolinguals, it is hard to extrapolate this data towards actual L2 learners of Korean. Unlike L2 learners of Korean, who are more likely to encounter and utilize situations to apply the training, it can be argued that the subjects of this study performed at varying degrees on the final attainment test because of the lack of input.

Other studies have considered methods to teach learners both perception and production. Studies conducted by Saito have investigated the paradigm of the acquisition of English [ɪ] by adult Japanese learners. Because Japanese has no similar sounds, most Japanese learners invariably have issues perceiving and producing [ɪ] and usually consider [ɪ] as a “poor exemplar of the Japanese tap”. Following Lyster and Ranta’s pedagogical sequence of form-focused instruction: noticing, awareness and practice, Saito and Lyster (2012) investigated the effects of form-focused instruction and corrective feedback on Japanese learners of English learning [ɪ].

In this study, Saito tested the effects of these methods on the development of [ɪ] by Japanese learners, and found that although form-focused instruction and corrective feedback can help learners make minor gains in production, this alone is not enough to facilitate the acquisition of [ɪ]. Saito further explored this paradigm in his 2013 study, where Saito cites Celce-Murcia et al. (1996) and incorporates explicit phonetic instruction in conjunction with the previous methods of Saito and Lyster (2012) to teach Japanese learners how to accurately pronounce [ɪ] once more. During the explicit phonetic training, learners were taught qualities of English [ɪ] such as lip rounding and the raising of the tongue tip to promote understanding amongst the learners. Unlike Saito and Lyster (2012), where the learners were tested on a small word list, Saito (2013) also tested whether explicit phonetic instruction, form-focused instruction and corrective feedback could promote [ɪ] in both familiar and unfamiliar lexical contexts. Each exemplar was categorized

into four levels: the English /l/, hybrid exemplars, bad exemplars, and good exemplars, which was determined by the F3 values. The results of this study found that learners who received explicit phonetic instruction had improvements from hybrid exemplars of [ɹ] to good exemplars of [ɹ] in both familiar and unfamiliar lexical contexts as compared to students who did not. Students who only received form-focused instruction and corrective feedback were only able to make improvements from hybrid exemplars to poor exemplars of [ɹ] in familiar lexical contexts and did not outperform the control group for unfamiliar lexical contexts. This article has shown that these learners are not constrained by maturational effects as long as learners' attention is drawn to notice phonetic differences, they are explicitly taught features of new sounds and are encouraged to practice them through activities.

### **Korean Stop Consonants**

Korean stop consonants pose a problem for L2 English learners of Korean because Korean has a three-way contrast between tense, lax, and aspirated stops. Korean stops are often considered to be all voiceless except for the lax stops, which may become "lightly voiced" in between voiced sounds. Unlike English stops, where stops are categorized by voicing and aspiration, most Korean linguists agree that Korean stops are classified by tensity and aspiration (Kim 1965). The categorization of consonants by tensity is a unique feature to Korean proposed by Kim (1965), who supported his claim through voice onset time (VOT) measures. According to Kim, tense consonants have the shortest VOT at around 12 milliseconds, lax consonants in the middle at 30-50 milliseconds, and aspirated consonants the longest at around 100 milliseconds. Comparing this to the VOT of English consonants, voiceless consonants usually occur around a VOT of 70 to 85 milliseconds, which is in between the VOT of Korean lax and aspirated consonants. This makes it particularly difficult for English speakers to distinguish the Korean lax and aspirated consonants (Ha, Johnson, and Kuehn 2009).

Other studies have shown that Korean speakers utilize not only VOT, but also the fundamental frequency (F0), or pitch of the following vowel to distinguish the stops. This can be attributed to the fact that the VOT ranges can overlap across the three phonation types (Cho, Jun, & Ladefoged, 2002). It has been thought that in terms of F0, the lenis is the lowest, the fortis is in the middle, and the aspirated is the highest

## Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds?

(Kim, 2002). However, like VOT, F0 values also have overlap, where some aspirated sounds were found to be lower in pitch than fortis sounds. Because of the overlap in both articulatory cues, Kim (2002) and other researchers have stated that Korean speakers do not rely on just VOT or F0 alone to distinguish between the lenis, fortis and aspirated, but instead a combination of the two features. Kim (2002) observes this in her study, where she manipulated F0 values of each sound type in word-initial position to see its effects on participants in a perception task. She found that manipulating the pitch of the vowels had little to no effect on the participants' ability to identify the fortis, which she attributes to the extremely short VOT of fortis stops. In observing the aspirate and lenis sounds, she found that there was a phonetic trading relationship between VOT and F0, where, as the VOT gets longer, the F0 range of the aspirated becomes larger and the F0 range of the lenis becomes smaller and vice versa. She concludes that although there is this trading relationship, the lenis has relatively shorter VOT and lower F0, and the aspirated has longer VOT and higher VOT.

### **Experiment Design**

The purpose of this study is to determine whether L2 learners of Korean are able to perceive the differences between the lenis and the aspirated stops through explicit phonetic instruction using the information presented above about the fundamental frequency and following in the footsteps of the methods found in Perrachione et al. (2015) and Saito (2013). The fortis stops will be left out in this current study as most of the confusion in perceiving the differences between the stops is between the lenis and aspirated because of their converging voice onset time (VOT) values for English speakers.

#### *Research Questions*

Can learners of Korean be taught to perceive the phonetic differences between the lenis and the aspirated stops through explicit phonetic instruction using pitch as a cue?

#### *Hypothesis*

Using pitch as a cue, explicit phonetic instruction will help learners perceive the differences between the lenis and aspirated stops.

### **Methodology**

#### *Sampling*

I enlisted the help of students within a Korean language pro-

gram at a local university who at minimum, had the ability to read the Korean alphabet, *hangul*, with confidence to do the task at hand. I discussed the project with the instructors of the Korean language program to get permission to conduct the study, and they subsequently sent the information to their students via e-mail. The sample was comprised of only students who voluntarily participated, and thus there were only a total of 14 students who participated.

After the sample was determined, the participants were divided into two groups: a null group and an experimental group to establish a hierarchical-mixed model design. The participants were divided using a pseudo-random number generator set between 1 and 100. This was done individually by the participant because the study was all conducted remotely. After the participants generated their random number, their placement was determined by whether their number was even or odd. Students that had odd numbers were placed in the null group, and students that had even numbers were placed in the experimental group. It was explained to the students prior to the study that the experiment would be divided this way so they would not be alarmed if they did end up in the control group. Because the groups were divided randomly, the groups were slightly uneven; the experimental group had 8 participants, while the control group had 6 participants.

### *Procedure*

The study was conducted all remotely using Google Forms to create an online survey. Participants were originally recruited and then were going to be randomized into two separate groups by the investigator, but this resulted in too few participants. In order to get and retain more subjects, the students were sent the survey directly. Before beginning the study, students were asked general information such as their age, their current year in Korean, how long they have been studying Korean, their native language and any other languages they spoke, and how much time they spend talking/listening to Korean outside of the classroom. This data was collected in hopes of finding any possible correlations in their performance on the task. Below is a chart detailing each participant's background.

## Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds?

Partici- pants	Year (in Korean)	Age	Group	Time spent a week outside of class	Native Language
1	2	19	Experimental	8 - 10 hours	English
2	2	20	Experimental	8 - 10 hours	English
3	1	19	Experimental	4 - 6 hours	English
4	1	19	Experimental	8 - 10 hours	English
5	1	21	Experimental	0 - 2 hours	English
6	2	20	Experimental	0 - 2 hours	English
7	1	19	Experimental	2 - 4 hours	English
8	2	20	Experimental	4 - 6 hours	English
9	1	19	Control	0 - 2 hours	English
10	3	20	Control	20 - 25 hours	English
11	2	25	Control	2 - 4 hours	English
12	1	<i>n/a</i>	Control	0 - 2 hours	English
13	1	19	Control	2 - 4 hours	English
14	4	22	Control	8 - 10 hours	English

*Table 1. Participant demographics*

After this data was collected, the null group was asked to watch a video detailing Korean sentence order and case particles (see Appendix A). The topic for this video was chosen at random, as the video only needed to be the same length as the experimental video. At the end of the video, the participants were given a small practice task to fill in the particles. This data was not collected. The experimental group was asked to watch an instructional video detailing what exactly Korean stops are (see Appendix B), the differences between each stop, and how to distinguish between the lenis and the aspirated, in particular using pitch. The participants were presented with a few examples, and then given a small practice task at the end of the video. Similarly, this data was not collected. The students in the experimental group were also presented with videos that contained words that contrasted so they could familiarize themselves with the concept explained in their video. After watching the videos, both groups were asked to summarize their videos to ensure that they had actually watched the videos before con-



tinuing on to the next task.

After watching their respective videos, the participants were asked to do a word identification task. The word list was recorded by 1 male native Korean speaker and 1 female native Korean speaker in both isolation and in utterances, with buffers placed at the beginning and the end of the word list. For the purpose of this study, only the words recorded in utterances were used. The words were all in [lenis/aspirated a lenis/aspirated o] environments and included words at the bilabial, alveolar and velar places of articulation. This means the aspirated and lenis versions of [p, t, k] were included. These words were then placed in the carrier phrase, [igΛ \_\_\_\_\_ yeyo], meaning “This is a \_\_\_\_\_”. The environments, places of articulation and speakers together created a total of 24 words to be used in the task.

### *Instrumentation*

In order to conduct the recordings for the word list, I used a Zoom H4N recorder and a headset from the UW Phonetics Lab. The audio recordings created were used in both the instructional video for the experimental group and in the word identification task. The experiment was presented using the online survey presentation platform, Google Forms, and the videos used in the experiment were all hosted on YouTube. The statistics software, *R*, was also used in attempts to run statistical analysis as well as to create visual charts.

## **Results**

In order to gauge the success of teaching the experimental group that using pitch as a cue could help them perceive the differences between the lenis and the aspirated stops, they were compared to the control group. Originally, in collecting the data about the students’ current year in Korean or their native languages, I intended to see if there were any correlations between their success in perceiving the sounds more accurately using a linear or a logarithmic regression model. However, the data pool was too small to draw any firm conclusions using such models, so instead, I have chosen to present data using more simple statistical information.

Because the collected data was simply the answers to what the participants heard, the data needed to be quantified into numbers. In order to quantify the words into numbers, each consonant was assigned one point. Since each word contained two consonants, the total possible points for the whole task was 48 points. Below is the distribution of

## Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds?

scores on the word identification task for the control and the experimental groups.

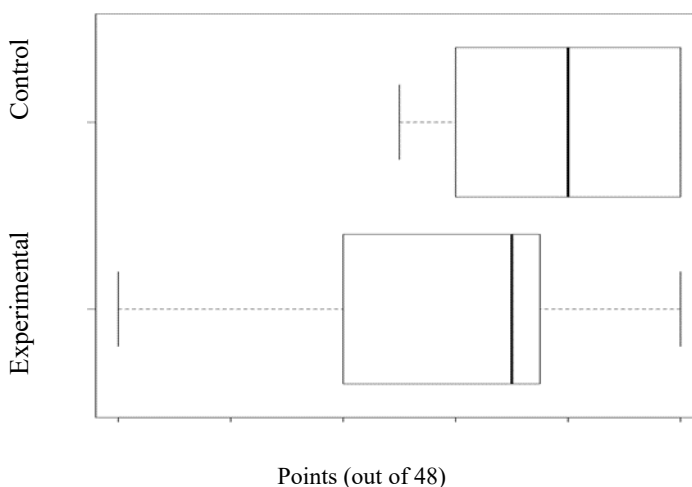
Participant	Group	Points	Participant	Group	Points
1	Exp.	40	9	Control	44
2	Exp.	42	10	Control	39
3	Exp.	41	11*	Control	27
4	Exp.	36	12	Control	44
5	Exp.	41	13	Control	40
6	Exp.	44	14	Control	42
7	Exp.	34			
8	Exp.	41			

*Table 2. Distribution of scores on the word identification task..*

\*Participant 11 did not complete the whole task

The following is a boxplot depicting the data set of the experimental and control groups with the outlier of the control group, Participant 11, removed to better display the distributions of both sets.

### Point Distribution on the Word Identification Task



*Figure 1: Distribution of scores on the word identification task (with Participant 11 removed)*

As we can see, the distribution of the scores between the experimental and control groups in terms of the average is roughly the same, with the experimental group at an average of 41 points out of 48 points, and the control group at an average of 42 points out of 48 points with the outlier removed. What was most interesting to note was that most students performed pretty well and scored around or above 40 out of 48 points. Only four students, participants 4, 7, 10 and 11 scored below 40 points. In particular, participant 11 scored very low as compared to the rest of the participants. However, this was due to the fact that participant 11 had some technical difficulty in loading half of the audio files in the task, which means that they were unable to complete the study in full.

## **Conclusion**

Because I intended to following some of the methodologies presented in Perrachione et al. (2015) and Saito (2013), I anticipated that the results from this study would have concluded similarly. However, due to some complications and a lack of time, I was not able to actually make the training as salient as I intended and thus the study was limited to a small one-time training instead of a longer training period as seen in Perrachione et. al (2015) and Saito (2013). One thing to note about this study and Saito (2013) is that unlike Saito (2013) which taught learners a new sound altogether, this study attempted to teach students to overcome overlapping sounds in the L1 and L2. Even if I was able to fully replicate Saito (2013), it may have been the case that the training may not have been as successful as it was in Saito (2013) due to this fact.

Despite this fact, it did seem that participants did find the training to be at least somewhat helpful. At the end of the study, participants were asked to detail their experience in the study, including how useful they felt the video was. Most students who were in the experimental group said that they believed that using the pitch was a good way to try and distinguish the sounds. One key point to note which was mentioned by one of the participants is that using pitch as a cue was only useful “When similar sounds are compared together.” Thus in future studies, it may be fruitful to get students to be more acquainted with the notion of pitch before expecting students to identify the words. Of course, a lot of students seemed to have trouble remembering the information in the video, simply because they were not given much chance to make the

## Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds?

instruction salient. Again, in the future, students will need more time to actually practice to put the training to use.

In light of the evidence presented by multiple critics of the Critical Period Hypothesis, it is problematic to continue to assert that L2 pronunciation is completely constrained by age effects. Despite this information, not enough work has been conducted to teach L2 learners pronunciation, which remains an area in much need of advancement as discussed through the lens of ESL in Darcy, Ewert and Lidster (2012). Although some works like Saito (2013) and Perrachione et al. (2015) make an attempt to address these issues, further research needs to be conducted to support the findings of these studies before they can be declared as efficient methods for L2 learners. Although this study only encompasses Korean stop consonants, if this study proves to be successful in teaching learners the stop distinctions, then there will be further evidence against the Critical Period Hypothesis and evidence to support the use of explicit phonetic instruction to teach language learners. Of course, if phonetic training does prove to be a successful method, there will still be the question of how to train teachers on how to utilize it in the classroom and finding time for it since it will be much too difficult to spend immense amounts of time on single phonetic differences. Although it may be the case that there will need to be further discussion of its implementation in classrooms as research in this field persists, it is likely that the methods utilized in phonetic training will slowly become more efficient and gradually become more accessible to all learners.

This study was limited in a numerous number of ways which can later be expanded upon in further research. This includes the use of more native speakers to introduce more variability in training the experimental group, as the use of more speakers will help us better solidify our understanding of whether explicit phonetic instruction proves to be useful or inutile. As mentioned previously, it would be important to include a larger pool of participants in order to establish statistical significance. More words and environments beyond the included environments of [consonant a consonant o] (see Appendix D) would also have to be included as well, as the VOT and F0 may differ depending on the vowel qualities as discussed by Kim (2002). In future studies, it may be good to include the fortis stops, even though it was mentioned that most of the trouble in perceiving these sounds lie between the lenis and the aspirated stops. Another thing to consider is that perhaps participants may have been influenced by other cues besides pitch in selecting their an-

swers. In the future, it may be better to find a way to get learners to solely focus on pitch if this is the cue I want learners to pay attention to. Of course, this type of training may not be salient for learners to use in running speech; this issue may be resolved from a longer duration in training. Another minor but important limitation to mention is that this study is only limited to the Seoul dialect of Korean, meaning that the results of this study cannot be extrapolated for any other dialects of Korean. If future studies of using pitch as a cue to disambiguate between the lenis and the aspirated stops are successful, it is hoped that this will pave the way to help learners begin pronouncing the stops more accurately and intelligibly. To conclude, much like all research, any results that emerge from any study will need to be further corroborated with further research.

## References

- Birdsong, D., & Molis, M. (2001). On the evidence for maturational constraints in second-language acquisition. *Journal of Memory and Language*, 44(2), 235-249.
- Cho, T., Jun, S., & Ladefoged, P. (2002). Acoustic and aerodynamic correlates of Korean stops and fricatives. *Journal of Phonetics*, 30(2), 193-228.
- Darcy, I.; Ewert, D; & Lidster, R. (2012). Bringing pronunciation instruction back into the classroom: An ESL teachers' pronunciation "toolbox". In J. Levis & K. LeVelle (Eds.). Proceedings of the 3rd Pronunciation in Second Language Learning and Teaching Conference, Sept. 2011. (pp. 93-108). Ames, IA: Iowa State University
- Flege, J. (1987). A critical period for learning to pronounce foreign languages?. *Applied Linguistics*, 8(2), 162-177.
- Flege, J. (2003). Assessing constraints on second-language segmental production and perception. *Phonetics and Phonology in Language Comprehension and Production Differences and Similarities*, 319-355.
- Ha, S., Johnson, C., & Kuehn, D. (2009). Characteristics of Korean phonology: Review, tutorial, and case studies of Korean children speaking English. *Journal of Communication Disorders*, 42(3), 163-179.
- James, S. (2008). Wild child 'Genie': A tortured life. Retrieved December 1, 2015, from <http://6abc.com/archive/6130233/>

## Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds?

- Johnson, J.S., & Newport, E.L. (1989). Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive Psychology*, 21(1), 60-99.
- Kim, M. (2004). Correlation between VOT and F0 in the perception of Korean stops and affricates. In *INTERSPEECH*.
- Lenneberg, E. (1967). *Biological foundations of language*. New York: Wiley.
- Perrachione, T., Finn, A. S., Minas, J., Tan, C., Chan, B., & Gabrieli, J. D. (2014). Acquisition of the complex three-way Korean plosive contrast by native English speakers. *The Journal of the Acoustical Society of America*, 135(4), 2354-2355.
- R Core Team (2012). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org/>
- Saito, K. (2013c). Re-examining Effects Of Form-Focused Instruction On L2 Pronunciation Development. *Studies in Second Language Acquisition Stud Second Lang Acquisition*, 1-29.
- Thomson, R., & Derwing, T. (2014). The effectiveness of L2 pronunciation instruction: A narrative review. *Applied Linguistics*, 36(3), 326-344.

**Appendix**

**Appendix A**

*Script for Control Group Video*

Korean is a language that generally follows a subject, object, verb (SOV) sentence order. This is different from English, which follows a subject, verb, object (SVO) sentence order, which can cause difficulties in forming sentences in Korean at first. Let's take the sentence, "Hannah eats the sandwich." If we looked at the Korean sentence, we would get, "하나가 샌드위치를 먹어요." However, Korean also has something known as particles, which can mark the 'role' a word in a sentence. Do you see the particles? Because Korean has these particles, Korean can move these words around more freely. So we can say something like "샌드위치를 하나가 먹어요." because the 가 particle marks the subject and the 를 particle marks the object. We can't do this in English because we rely on the sentence order to tell us the 'role' of each thing in the sentence. Now let's try filling in some of the particles.

*\* Mostly identical to the final version of the video.*

**Appendix B**

*Script for Experimental Group Video*

Korean is a language that has a set of sounds that often sound very similar to speakers of English. These sounds include like [ㅁ, ㅂ, ㅍ] [ㄷ, ㄸ, ㅌ] [ㄱ, ㅋ, ㆁ]. *{play examples of sounds}* In particular, the pairs [ㅁ, ㅍ] [ㄷ, ㅌ] [ㄱ, ㅋ] can be extremely difficult to tell apart in regular speech for non-native Korean speakers. However, there are ways to tease these two sounds apart with better accuracy. Let's take a listen to these sounds again. *{plays examples of pairs}* If you listen to the pitch of the vowel following the sounds, you can tell that the aspirated sounds [ㅍ, ㅌ, ㅋ] have a higher pitch than [ㅁ, ㄷ, ㄱ]. Let's try listening to it again. *{plays examples of sounds}* Can you hear it? Now this time, let's write down what you hear. *{plays examples of sounds}*

*\* Mostly identical to the final version of the video.*

# Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds?

## Appendix C

### Questionnaire

1. What year of Korean are you in?
2. How long have you been studying Korean?
3. What is your native language?
4. Do you speak any other languages? If so, how fluently?
5. How much time do you spend speaking Korean outside of the classroom?

## Appendix D

### Word List

	<i>Bilabial stops</i>	<i>Alveolar stops</i>	<i>Velar stops</i>
1. [lenis a lenis o]	1. 바보	1. 다도	1. 가고
2. [lenis a aspirated o]	2. 바포	2. 다토	2. 가코
3. [aspirated a lenis o]	3. 파보	3. 타도	3. 카고
4. [aspirated a aspirated o]	4. 파포	4. 타토	4. 카코

	<i>Bilabial stops</i>	<i>Alveolar stops</i>	<i>Velar stops</i>
1. [lenis a lenis o]	1. [papo]	1. [tato]	1. [kako]
2. [lenis a aspirated o]	2. [pap <sup>h</sup> o]	2. [tat <sup>h</sup> o]	2. [kak <sup>h</sup> o]
3. [aspirated a lenis o]	3. [p <sup>h</sup> apo]	3. [t <sup>h</sup> ato]	3. [k <sup>h</sup> ako]
4. [aspirated a aspirated o]	4. [p <sup>h</sup> ap <sup>h</sup> o]	4. [t <sup>h</sup> at <sup>h</sup> o]	4. [k <sup>h</sup> ak <sup>h</sup> o]



## Acknowledgements

I would first like to thank my research advisor, Professor Julia Herschensohn. With your course on second language acquisition and your suggestions for the direction of my project, I was able to formulate a better understanding of my own research interests. You also kept me grounded and helped me constrain my project into something a little more manageable! I only aspire to be a linguist of half of your caliber one day.

I would also like to thank the Linguistics department chair, Professor Richard Wright, for helping me organize my thoughts into a cohesive study. Without your help, I think my study would have still just been a cluttered idea somewhere in the back of my mind. I hope that I'll one day have the ability to intrigue my students the way you intrigued me with phonetics!

I would also like to thank Professor Soohee Kim over in the Asian Languages and Literature department. I know that when I first came to you with my original research idea that it was still somewhat messy, but you really helped me figure out how to approach the study in a way I never considered.

I would also like to mention Elizabeth McCullough, who helped me sift through my data and understand the statistics underneath it all. I really appreciate you taking the time to meet me even though we had never met at all! Your patience and your ability to help me understand the numbers was exactly what I needed.

Finally, I would like to thank the McNair Scholar Program for their support and encouragement. Without the McNair Scholar Program, I don't know if I would have ended up conducting a research project. Their guidance has slowly helped me overcome my imposter syndrome and has encouraged me to pursue my interests. I would like to thank Cynthia especially, who has always made me laugh every time I came into the office. Thank you for keeping it real with me!

## Explicit Phonetic Instruction Aids Learners of Korean Perceive Korean Sounds?

Kenny Lino

Department of Linguistics; Julia Herschensohn

[kfino@uw.edu](mailto:kfino@uw.edu)/[kennywino@gmail.com](mailto:kennywino@gmail.com)

Research interests: Second language acquisition; Phonology,  
Computational Linguistics, Japanese, Korean

Intended Graduate Program: Erasmus Mundus European Masters  
Program in Language and Communication Technologies; 1<sup>st</sup> year at the  
University of Basque Country in San Sebastián, Spain and 2<sup>nd</sup> year at  
the University of Malta in Msida, Malta.



# SHOTS FIRED!

## Socio-Structural Context and Mass Shootings in the U.S.

Ferdinand Orbino

### Abstract

*Mass shootings are a growing public health and social policy concern in the United States. Mass shootings are defined by the Gun Violence Archive as four or more individuals shot and/or killed in a single event, at the same general time and location, not including the shooter. Most media outlets attribute this phenomenon to lack of access to mental healthcare leading to untreated mental illness of the shooter and/or lax gun legislation leading to easy access of firearms. For this research project, I explore these and other social factors which may help to determine variation in mass shooting across states. Using data from the United States Census Bureau, Uniform Crime Report, Kids Count Data Center, the Henry J Kaiser Family Foundation, and the Gun Violence Archive, I utilize ordinary least squares regression to examine the role of poverty, social disorganization, gun legislation, and mental health spending to explain variation in the number of mass shootings across states during the period of 2010 to 2015. In the bivariate model most variables were found to be significantly correlated with the number of mass shootings. However, when controlling for state population size in a multivariate model, statistical significance was lost across the board. The results of these findings will provide a greater understanding of the contributors for mass shootings, inform further existing research, and assist policy makers in the reduction of future incidents.*

*Keywords: Mass Shootings, Inequality, Poverty, Social Disorganization, Gun Legislation, Mental Health, Palma Ratio, GINI coefficient, Mass Media*

### Introduction

Since 2011, according to a study by Harvard's School of Public Health, the rate of mass shootings in the United States has tripled (Cohen et al. 2014). The media would lead us to believe the circumstances surrounding mass shootings revolve around a few isolated inci-

dents of mental illness or inadequate firearm regulations. In this paper, I broaden the consideration of the antecedents of mass shootings to include multiple variables. I use ordinary least –squares regression to evaluate the relationship between multiple socio-structurally based variables and mass shootings. I expect to find statistically significant relationships between all of the independent variables I have chosen and mass shootings. My motivating question is, why do some states have more mass shootings than others? The larger goal of my research is to increase the effectiveness of harm reduction policies and broaden the scope future research.

## **Background**

The first publicized mass shooting in the United States, according to Smithsonian.com , occurred on Labor Day, 1949. Howard Unruh (a 28 year old, blue-collar, World War II veteran, and gay man) murdered 13 people and injured 3 others. Mr. Unruh's murderous rampage became reality to his 16 victims he was stood up for a date at the movies by another man (<http://www.smithsonianmag.com/history/story-first-mass-murder-us-history-180956927/?no-ist>). In a time when homosexuality was not only socially unacceptable, but illegal, the societal pressures Mr. Unruh experienced must have been tremendous. What may have once been diagnosed as paranoia had, over time, developed into a "persecution complex" and may have been a key contributor for his decision to begin his rampage.

As much as we would like to view mass shootings as anomalous events caused by ineffective gun control and/or mental health, I would contend that these shootings could be reflective of what is happening in the larger society. From the inception of this nation—guns, violence, and conflict have been a fundamental part of American culture, which continues to this day. Mass shootings are merely a byproduct of the culture that has been cultivated since 1776. Since the inception of this country, guns and gun ownership have been interwoven into the fabric of American society. For over 239 years American citizens, under the 2nd Amendment, have believed that it is their fundamental right "to keep and bear arms" (U.S. Bill of Rights). With the exception of the past few decades, the perpetuation of gun violence within American society has appeared to spike like never before in our Nation's history. The rising trend of violence in American communities across the nation requires us to take an in-depth look into the potential factors

## SHOTS FIRED! Socio-Structural Context and Mass Shootings in the U.S.

which may be contributing to mass shootings. What once may have been considered isolated incidents is rapidly escalating to epidemic proportions. From a cultural perspective, it would be erroneous to assume the cause of the incidents hinge on only two factors. Ignoring other potential factors is not simply a mistake, but could have deadly implications.

According to Patrick Sauer, "What is known is that the United States, with five percent of the world's population, was home to nearly one-third of the world's mass shooters from 1966-2012. Before that, mass gun murders like Unruh's were too rare to be considered a threat" (Sauer 2015). Stories like Mr. Unruh's and countless testimonies from other mass shooters pushed me to explore the potential structural influences surrounding mass shootings. As such, the variables I have chosen represent potential factors associated with these violent outcomes.

### **Social Structural Constructs**

#### *Gun Legislation*

At the forefront of many discussions surrounding mass shootings, lax gun legislation is a hot-button issue. Many proponents suggest an increase in gun restrictions across the country is a solution for reducing mass shooting events. I chose to include gun legislation in my model to test the effectiveness of those claims.

The data set I used to measure a state's level of gun legislation was provided by *The Henry J. Kaiser Family Foundation*. The categories included Safe Storage or Gun Lock Requirements, Child Access Prevention Firearm Laws, and/or Assault Weapons Ban (<http://kff.org/other/state-indicator/firearms-and-children-legislation/>). In my analysis, I combined this information to create a binary variable for analysis. Any gun legislation within a state qualified that state as having gun legislation (coded "1"); states with no gun legislation are coded "0." My hypothesis is that states with any form of gun legislation have fewer incidents of mass shootings.

#### *Mental Health Spending*

Like lax gun legislation, inadequate investment in mental health is often discussed as a key contributor to more mass shootings. With such a high variation in mental health spending across states (ID \$32.77 - ME \$345.36), I wanted to test the claims of effectiveness against mass shootings. If the claims made by the media are true, I expect to find a negative relationship between per capita spending on mental health and

the number of mass shootings.

*Inequality*

If messages from our environments dictate measures of success, mass shootings may be a byproduct of society's inability to allow some individuals to reach the goals which it has set (Merton, 1938). If so, the common thread between mass shooters and other types of gun related violence may be the sense of hopelessness that stems from feelings of inadequacy or estrangement from the communities where these individuals live, no matter where they are from.

Strain theory posits that it is the culture which both defines and frames the context for individual's goals, purposes, and interests. In addition to goal setting, the context for how these outcomes can be achieved is also determined by the culture. Merton suggests it is these limitations which push individuals towards extreme behaviors. In the context of mass shootings, it could be conceived that the actions of the individuals who carry out these atrocities are motivated by their inability to live up to or achieve the standards which their culture has predetermined. Perhaps, one of the reasons the individuals who carry out these shootings appear to be so rare is, because they fall into Merton's least common adaptation to blocked goal attainment, cultural goals-adaptation IV, rejection of goals, and means. "Sociologically, these constitute the true "aliens" (Merton, 1938:677). According to many shooter accounts, carrying out mass shootings is a way to achieve the social ascent that they have not been able to achieve up to that point through legitimate means. Merton further states that it is not always a mere lack of opportunity that drives these extreme behaviors, but could be evidence of "a comparatively rigidified class structure" (1938:680). As we continue to see the widening of the wealth gap, it should be less surprising to see an increase in this type of violence.

According to many scholars, relative deprivation is the feeling of dissatisfaction a person feels based on their deprivation in relation to others or society (Abraham and Kumar 1989; Panning 1983; Yitzhaki 1979). I would contend, however, in the context of most individuals who come from middle class backgrounds, that it isn't how they feel that pushes them to acts of violence but the signals they are receiving from members of their own community which pushes them towards consistently isolated lifestyles, embitteredness towards their surroundings, and ultimately extreme acts of violence (Newman et al. 2007). Unlike their urban counterparts (who come from impoverished backgrounds where violence is often a result of attempting to meet basic

## SHOTS FIRED! Socio-Structural Context and Mass Shootings in the U.S.

subsistence levels), suburban/rural violence is most often directed towards the people and institutions that the shooters believe have consistently failed to be inclusive and have maintained the roadblocks which sustain their marginality (Newman et al. 2007).

The propensity for mass shootings should be expected in environments with high levels of inequality, real or perceived.

### *Social Disorganization*

Previous research has demonstrated a positive relationship between a large variety of anti-social behaviors and the level of “social disorganization” within a community (Land, McCall, and Cohen 1990). Social disorganization is defined, broadly, as a lack of social cohesion, low levels of social capital and collective efficacy, and high residential turnover. Common indicators used to represent the level of social disorganization within a community include the percent of the population living in poverty and the proportion of families that are headed by a single parent. Higher levels of social disorganization are, in turn, reflected by higher levels of violent and property crime. I draw from these variables to measure the level of social disorganization within states and to test my hypothesis that mass shootings are more common in states with higher levels of social disorganization.

At the community level, Newman (2007) outlines specific lifestyle characteristics that shooters have in common—lifestyle of isolation, excessive t.v. watching, video game playing, and internet usage. She also cites another reading that further explains a lifestyle of isolation, *Bowling Alone* by Robert Putnam. She uses this reading to address the ways in which communities that have high levels of civic engagement, community activities, and associational life fail to address the “underside” of an otherwise tranquil community. The shooters, who come from these communities, are considered the outliers in the communities where they live, and the lifestyle of isolation further reduces the availability of acquiring social capital (Newman et al. 2007). By framing mass shooter's as outliers within their own community, it becomes easier to examine the factors which may lead an individual to act against the institutions that they perceive to have failed them.

Even in the communities not considered to be marginalized by societal standards, social capital is not exempt from adolescent rites of passage (2007:116). This creation of outliers promotes the conditions within which mass shootings happen. Newman (2007) refers to the failure to recognize the signs leading up to shootings as “filtering”. Filtering is when individuals downplay the negative behaviors of others be-



cause it reflects poorly on the overall reputation and master narrative of the community. When the media publicizes mass shootings in these areas as anomalous, it may not be reflective of what is actually happening within those communities at the structural level.

In the media, the way in which mass shootings incidents are framed is often a result of the environments in which they occur. In urban settings, mass shootings are often attributed to gang violence. Whereas, in suburban or rural settings, mass shootings are often framed as isolated events carried out by individuals suffering from mental illness. Potentially, the difference between the ways the shooting are carried out in rural or suburban communities can be attributed to the lack of networking availability (such as collective action), or culturally approved methods of expression within their own communities (Papachristos and Wildeman 2014). Instead of having a group of like-minded individuals, people in less populated areas act on their own. In urban communities, mass shooters are commonly referred to as gang members. In rural and suburban communities, the common narrative for mass shootings is, typically, a result of "untreated mental illness or lax gun legislation." In either case, violence is typically carried out on the communities in which the shooters live.

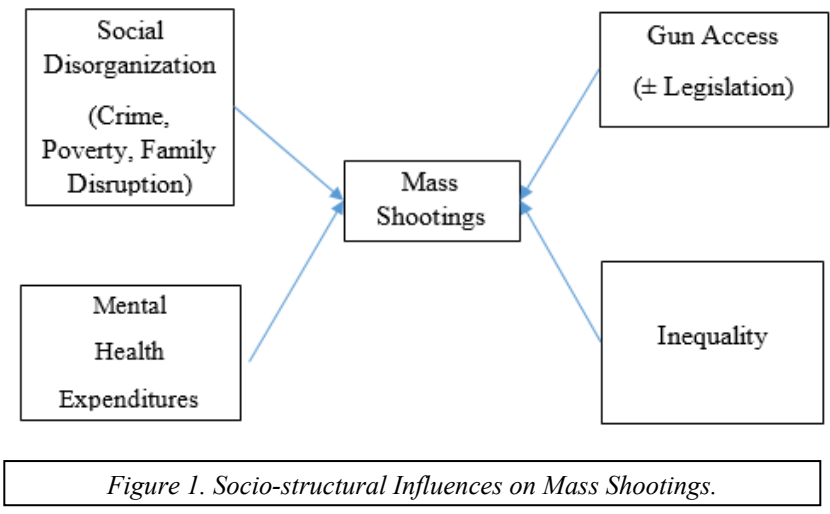
As outliers in communities not traditionally considered marginalized, the likelihood of being influenced by informal control mechanisms, like intergenerational closure, (i.e. non-parental adult intervention, gossip, and reputation) is lower. Since the outliers also know how the informal control mechanisms operate, they are able to adapt and remain undetected until the time of the shooting. Similar to the creation of subculture norms in impoverished communities (i.e. gangs, selling drugs, etc.), individuals who find themselves as outliers, either in society or their community, will adapt to and find ways which reclaim or reestablish themselves as relevant members of society (Newman et al. 2007; Merton 1938) .

Although the level of inequality in a community is likely correlated with the level of social disorganization, I contend that the two structural forces also represent unique influences on anti-social behavior. For this reason, in addition to the level of inequality, I consider the possibility that the level of mass shooting is associated with property crime, violent crime and single-parent households.

By analyzing as many potential structural influences as possible, my goal is to either broaden the scope of discussion, or isolate the impacts of lax gun legislation or mental health spending. For these rea-

# SHOTS FIRED! Socio-Structural Context and Mass Shootings in the U.S.

sons, I have chosen variables which I thought would be indicative of the societal structural influences which may be contributing to mass shooting events. When we combine mental health issues, gun availability, inequality, and social disorganization factors—individuals resort to the only culturally accepted method for shedding their ascribed status and reclaim their self-worth, by shooting. Figure 1 presents the conceptual model that summarizes my expectations regarding relationship of socio-structural influences on mass shootings.



## Data, Variables, and Method

### Data

This is an exploratory study that seeks to identify possible social factors related to the variation in intensity of mass shootings across states. The specific variables are selected to reflect the structural processes described and discussed in the previous section. Admittedly, the list of possible factors is not limited to the variables I've chosen, but my hope is that the results will lead to further research. In this study I will be focusing on state level data for gun legislation, inequality, mental health spending per capita, poverty rates, violent crime rates, percentage of single family households, and mass shootings in the United States. In most data sets, Washington D.C. and Puerto Rico are listed, but I chose to exclude them. There were two reasons I chose to not to include D.C. and Puerto Rico in my analysis. First, the data set I used for mass shootings does not account for Washington D.C. or Puerto

Rico. Second, I wanted my data sets to be as consistent as possible at the state level. Even though there is data available for both, they are not states. By doing a state level analysis, I hope to identify overarching societal characteristics which may have influence on the culture and mass shootings in the United States.

Dependent Variable

One of the reasons it is difficult to establish an accurate baseline for this problem is because the definition of mass shooting is very unclear. For the purposes of this paper, I will be using the *Mass Shooting Tracker's* definition to measure the dependent variable—mass shootings. I don't believe other source's definitions are able to adequately reflect the true reality. According to *Mass Shooting Tracker* (2015:1), the definition of a mass shooting consists of a shooting which occurred in a public place and where four or more people were injured or killed. Other definitions, which only emphasize four or more people killed or exclude gang violence, other types of defined violent crime, and/or domestic violence, do not depict the extreme impact that mass shootings are having on this society. Because of the many interpretations, the media often misinform the public based on biased information. By using the definition established by *Mass Shooting Tracker*, there have been 1,044 mass shootings in the U.S. since 2013 . On average there have been 14.86 incidents per state nationwide. The range between states is from 0 to 89 mass shootings.

<b>Table 1. Descriptive Statistics</b>				
<b>Variable (State Level Data)</b>	<b><math>\bar{X}</math></b>	<b>SD</b>	<b>Min</b>	<b>Max</b>
<b>Mass Shooting Total Incidents</b>	<b>14.86</b>	<b>17.96</b>	<b>0.00</b>	<b>89.00</b>
<b>Any Gun Legislation (# of 3 categories)</b>	<b>0.90</b>	<b>0.93</b>	<b>0.00</b>	<b>3.00</b>
<b>Inequality (Gini Coefficient)</b>	<b>0.45</b>	<b>0.02</b>	<b>0.42</b>	<b>0.50</b>
<b>Mental Health Spending Per Capita</b>	<b>\$128.28</b>	<b>\$77.48</b>	<b>\$32.77</b>	<b>\$345.36</b>
<b>Violent Crime Rate/100k</b>	<b>366.45</b>	<b>142.81</b>	<b>122.10</b>	<b>663.00</b>
<b>Property Crime Rate/100k</b>	<b>2860.94</b>	<b>587.08</b>	<b>1780.20</b>	<b>3905.40</b>
<b>Poverty Rate (population %)</b>	<b>13.97</b>	<b>3.88</b>	<b>7.20</b>	<b>23.06</b>
<b>Total State population</b>	<b>6363963</b>	<b>7150942</b>	<b>584153</b>	<b>38802500</b>
<b>Single Parent Household Percentage</b>	<b>0.33</b>	<b>0.05</b>	<b>0.19</b>	<b>0.46</b>

Table 1. Reflects the distribution for each variable used in the different OLS models.

# SHOTS FIRED! Socio-Structural Context and Mass Shootings in the U.S.

## Independent Variables

Gun legislation and mental health spending were chosen for me. Since the media focuses on these two the most, I wanted to find out if—in fact—these variables had as much influence on mass shootings as they are portrayed. The information I collected for gun legislation and mental health spending per capita was provided by the Henry J Kaiser Family Foundation (<http://kff.org/other/state-indicator/smha-expenditures-per-capita/>). The variable "Any Gun Legislation" is inclusive of states which have any form of gun legislation. Because gun legislation can be broken down into many parts (child access prevention, safe gun storage/gun lock requirement, or assault weapons ban), I chose to have gun legislation be reflective of any type of legislation. Those states with any gun restricting legislation are coded "1"; other states are coded "0". 90% of all states have some form of restrictive gun legislation. In regards to gun legislation, there is no uniformity across states. At the state level, there is a tremendous amount of variation across the country .

In the same way, there is tremendous variation across states for the amount spent per capita on mental health. The range for spending is \$32.77-\$345.36, with missing values for Florida and New Mexico (<http://kff.org/other/state-indicator/smha-expenditures-per-capita/>). On average, states currently spend \$128.28 per capita on mental health. Unlike the variables that follow, I expect to see fewer mass shootings in states with gun legislation and high per capita mental health spending .

To measure inequality I used data from the United States Census Gini Index for Income Inequality ([http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS\\_10\\_1YR\\_B19083&prodType=table](http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_1YR_B19083&prodType=table)). The Gini Index statistically measures levels of inequality within society. The scale for the Gini Coefficient is from 0 to 1. Larger Gini coefficients represent higher levels of inequality and smaller Gini coefficients represent lower levels of inequality. The range associated with the Gini Index shows the difference between income distributions within a society, or in this case, states. The average Gini Coefficient nationwide is .45, and the range is from .42 to .50. The reason I chose to use inequality as a measure for one of my variables is because I believe it is reflective of how, in this society, individuals perceive and measure themselves in relation to the rest of the population. Definitions of success are often rooted in financial gain; these images are often propagated throughout the media.

Inequality and poverty are often used interchangeably to describe negative structural effects of an unbalanced economic system. However, poverty and poverty rates are often easier to observe, because of their unit of measurement, such as dollars. According to the U.S. Census, poverty rates are based on “The percentage of people (or families) who are below poverty.” during any given year. Poverty is defined as any person or family that cannot financially meet their daily needs for subsistence (<https://www.census.gov/hhes/www/poverty/methods/definitions.html>). Using thresholds determined by the Census, I used poverty rates to examine the relationship with rates of mass shootings. The dataset I used was from 2014. I chose to use this year because it is the most current and, according to the census, there was no significant change from the previous four (4) years. The average poverty rate was 13.97 percent. The state minimum poverty rate was 7.2% and the maximum was as high as 23.06%, with a standard deviation of 3.88%. I anticipate poverty and inequality to have similar outcomes in relation to mass shootings. Higher poverty and inequality rates will yield more mass shootings.

For measures of violent and property crime, information was collected from the Uniform Crime Report (<http://www.ucrdatatool.gov/Search/Crime/State/RunCrimeOneYearofData.cfm>). Violent crime consists of murder, forcible rape, robbery, and aggravated assault. Property crime includes burglary, larceny-theft, and motor vehicle theft. The data used in this analysis is reflective of crime rates per 100,000 in 2010. As with other measures of social disorganization, I would expect higher rates of mass shootings in states that have high rates of crime. On average, the violent crime rate in 2010 was 366.34 per 100,000 people. The range was between 122.10 and 663. The average for property crime was 2860.94, and the range was between 587.08 and 1780.20 per 100,000 (<http://www.ucrdatatool.gov/Search/Crime/State/RunCrimeOneYearofData.cfm>).

The final measure I used to analyze social disorganization is the percentage of households with single family homes (<http://datacenter.kidscount.org/data/tables/106-children-in-single-parent-families#detailed/2/2-52/false/133/any/429,430>). Based on many studies, disruption of the nuclear family plays an integral role in the negative life course trajectories of many people. For this reason I chose to examine the impact of single parent homes on mass shooting frequencies. On average, in the United States, 33% of the population are comprised of single parent households. Across states, the range is be-

# SHOTS FIRED! Socio-Structural Context and Mass Shootings in the U.S.

tween 19% and 46%. Based on social disorganization theory, I expect more mass shootings in states that have higher percentages of single parent homes.

Population size (logged) was used a control variable in the multivariate models (<https://www.census.gov/popest/data/state/totals/2014/tables/NST-EST2014-01.csv>). The purpose for using the log of population is to standardize the distribution of population size; this process allows for more accurate observations within heavily skewed statistics. Essentially, I wanted to adjust for population's influence on mass shootings in states that are less populous than others, and try to account for the predictor variable's influence, which could also vary by population size. The average state population is 6,363,963. The state with the smallest population is 584,153 and the highest populous is 38,802,500 people.

## Method

To analyze the relationship between mass shootings and the independent variables, I use the Statistical Package for the Social Sciences (SPSS) to obtain bivariate and multivariate correlation and regression coefficients describing the relationship between the number of mass shootings (DV) and gun legislation, inequality, poverty, mental health spending per capita, violent crime rates, and percentage of single family households, using ordinary least-squares regression. I initially report the bivariate correlation and regressions coefficients to describe the overall, unadjusted, relationship between the numbers of mass shootings and the different predictors. Next, I present multivariate models that control for the size of the state population (logged).

## **Findings**

Table 2 reports the bivariate correlations between all predictor variables and the number of mass shootings, along with the statistical significance of the correlation. The evidence In Table 2 reveals that many of the predictor variables have a strong and statistically significant relationship to mass shootings. However, there were a couple of surprises. Initially, I anticipated (based on media accounts) that gun legislation and mental health spending would have negative relationships to mass shootings. Surprisingly, for gun legislation, the opposite result occurred. I interpret this finding to suggest that the implementation of gun legislation is a reactive process. That is, the higher frequency of mass shootings account for the subsequent adoption of gun legis-

lation, thereby leading to a positive association between the two factors, when only cross-sectional evidence is considered. Similarly, although mental health spending had a negative relationship, as hypothesized, the association was not statistically significant. I would have expected to see fewer shootings in states that have higher rates of mental health investment.

Another result I found interesting was the lack of statistical significance between mass shootings and a state’s poverty rate. I would have anticipated the presence of higher levels of absolute poverty to be a significant predictor of the frequency of mass shootings. According to many scholars, poverty is usually a justification for many types of anti-social behavior.

All other factors—inequality, violent crime, property crime, and percent of single parent households—were in line with my initial hypotheses. That is, more mass shootings occurred in states with greater inequality, higher crime rates (both violent and property), and with more single-parent families. While the bivariate correlation coefficients were generally consistent with expectations, it is necessary to proceed with the multivariate regression analyses that control for state population size before drawing definitive conclusions.

**Table 2. Bivariate Associations of Socio-Structural Factors and Mass Shootings**

		Total State population	Any Gun Legislation	Inequality	Mental Health Spending Per Capita	Violent Crime Rate	Property Crime Rate	Poverty Rate	Single Parent Household Percentage
Mass Shooting Total Incidents	Pearson Correlation	.902**	.425**	.571**	-.032	.371**	.201	.260	.321*
	Sig. (2-tailed)	.000	.002	.000	.830	.008	.162	.068	.023
	N	50	50	50	48	50	50	50	50

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

At the next stage of my analysis, the bivariate regression analyses remained consistent with the correlation coefficient outcomes, as expected. In Table 3, with the exception of mental health spending per capita and property crime, all variables in the bivariate model were statistically significant. What I found most interesting in the bivariate model were the associations between the two main predictors that initially sparked my research, mental health spending per capita (MHSPC) and gun legislation. Even though the relationship between MHSPC did have a negative relationship, the association was not statistically significant. Perhaps, the maximum amount currently being spent (\$345.46 per

## SHOTS FIRED! Socio-Structural Context and Mass Shootings in the U.S.

capita) is not enough to reflect a statistically significant outcome. For gun legislation, the relationship was opposite of what I expected; its relationship was positive. The only conclusion I could draw from this result was the ordering of events. Since enacting gun legislation would typically follow a mass shooting(s), then it would make sense there is more gun legislation in states with more mass shootings. However, when I controlled for population in the multivariate model, the relationship for every variable failed to reach statistical significance at the  $p < .05$  level, and population was the only variable to maintain statistical significance.

<b>Table 3. Bivariate and Multivariate relationships between context variables and Mass Shootings</b>				
Variable	Bivariate		Multivariate	
	b	se	b	se
<b>Any Gun Legislation</b>	<b>8.20*</b>	<b>2.52</b>	<b>-.727</b>	<b>3.181</b>
<b>Inequality</b>	<b>574.94*</b>	<b>119.34</b>	<b>70.319</b>	<b>208.163</b>
<b>Mental Health Spending Per Capita</b>	<b>-0.01</b>	<b>0.03</b>	<b>.012</b>	<b>.030</b>
<b>Violent Crime Rate</b>	<b>0.05*</b>	<b>0.02</b>	<b>.010</b>	<b>.019</b>
<b>Property Crime Rate</b>	<b>0.01</b>	<b>0.004</b>	<b>.002</b>	<b>.005</b>
<b>Poverty Rate</b>	<b>1.20*</b>	<b>0.65</b>	<b>.274</b>	<b>.935</b>
<b>Log of Population</b>	<b>15.41*</b>	<b>1.87</b>	<b>13.53*</b>	<b>3.03</b>
<b>Single Parent Household Percentage</b>	<b>110.43*</b>	<b>47.09</b>	<b>-19.370</b>	<b>80.294</b>

\*denotes statistical significance of  $p < .05$ , two-tailed test

### Conclusions

Overall, this study is a cautionary tale. In the bivariate model, almost all of the relationships between the socio-structural factors and mass shootings (with the exception of Mental Health Spending and Gun Legislation) were consistent with my hypotheses. As a consumer of information, I have often found myself influenced by statements made by the media that are presented as facts. At the rudimentary level, their claims may be true. However, in the case of mass shootings, if I had not done further analysis I would have never discovered the actual relationship these factors play in mass shooting events. In the multivariate model, there is no statistically significant relationship between any of the variables and mass shootings. In regards to mental health spending, there was no statistical significance based on any model, and the outcome in the bivariate model for gun legislation should be considered spurious at best, because of the possibility that gun legislation is enact-



ed post incident. Making policy decisions, or reshaping American culture, based on inaccurate information could prove to be detrimental to our society as a whole.

There are a few important limitations to this study that should be mentioned. First, there are differing definitions of mass shootings. I tried to use the definition that was most inclusive, or more reflective, of the societal characteristics I wanted to analyze. It is possible if I had used an alternative definition, that my results might be different. For example, mass shooting might take place where a shooter does not shoot four people, although he/she might have attempted to do so. Using a different definition of mass shootings might have provided different results.

Second, the measure of inequality used is not perfect. There are alternative measures that could be more accurate in assessing the influence of inequality. According to Cobham, the Palma ratio is a better measure, because the Palma ratio can explicitly capture changes between the top 10% and bottom 40% that the Gini coefficient does not (Cobham 2016).

Despite these limitations, this study provides an initial glimpse at the relationship (or lack thereof) between a variety of social structural characteristics and the frequency of mass shootings in the United States. Future research should explore alternative definitions and, potentially, use comparative community level models, which could be more indicative of the effects of socio-structural influences than are state level characteristics.

## References

- Abraham, C. M., and K. Pradeep Kumar. 1989. "Preconditions of Relative Deprivation - an Empirical Validation". *Indian Journal of Industrial Relations* 25(1): 82–8.
- Cobham, Alex. 2016. "Palma vs Gini: Measuring post-2015 inequality." Center For Global Development. Retrieved May 19, 2016 (<http://www.cgdev.org/blog/palma-vs-gini-measuring-post-2015-inequality>).
- Cohen, Amy, Deborah Azrael, and Matthew Miller. 2014. "Mass Shootings Becoming More Frequent." *Mass Shootings Becoming More Frequent*. Harvard School of Public Health, Web.
- Kennedy, Bruce P. and Ichiro Kawachi. 1998. "Social Capital, Income Inequality, and Firearm Violent Crime." *Social Science & Med-*

# SHOTS FIRED! Socio-Structural Context and Mass Shootings in the U.S.

*icine* 47(1):7–17.

- LaFree, Gary and Kriss A. Drass. 1996. "The Effect of Changes in Intra-racial Income Inequality and Educational Attainment on Changes in Arrest Rates for African Americans and Whites, 1957 to 1990." *American Sociological Review* 61(4):614–34.
- Land, Kenneth C, Patricia L McCall, and Lawrence E Cohen. 1990. "Structural Covariates of homicide rates: Are there any Invariances across time and social space?" *American Journal of Sociology* 95(4):922–963.
- LaVeist, Thomas, Keshia Pollack, Roland Thorpe, Ruth Fesahazion, and Darrell Gaskin. 2011. "Place, Not Race: Disparities Dissipate in Southwest Baltimore When Blacks and Whites Live Under Similar Conditions." *Health Affairs* 30(10):1880–7.
- Mass Shooting Tracker. 2015. *Cited Lists of Known Mass Shootings 2013-2015*
- Merton, Robert K. 1938. "Social Structure and Anomie." *American Sociological Review* 3(5): 672-82.
- Newman, Katherine S., Cybelle Fox, David J. Harding, Jal Metha, and Wendy Roth. 2007. *Rampage: The Social Roots of School Shootings*. New York, NY: Basic Books.
- Panning, William H. 1983. "Inequality, Social Comparison, and Relative Deprivation." *The American Political Science Review* 77 (2):323–9.
- Papachristos, Andrew V. and Christopher Wildeman. 2014. "Network Exposure and Homicide Victimization in an African American Community." *American Journal of Public Health* 104(1):143-50.
- Sauer, Patrick. 2015 "The Story of the First Mass Murder in U.S. History." *Smithsonian*. Web.
- U.S. Bill of Rights. Amendment II.
- Yitzhaki, Shlomo.1979 "Relative Deprivation and the Gini Coefficient". *The Quarterly Journal of Economics* 93(2):321-4.

*Acknowledgments*

The McNair Program  
University of Washington Honors Program  
Dr. Hedy Lee, Honors Director

Ferdinand Orbino  
Dr. Stewart Tolnay, Faculty Mentor  
f.orbino@outlook.com

# **First-generation college students and adversity: Mechanisms of coping compared to continuing-generation college students**

Alicia Mendez Sawers

## **Abstract**

*College presents many challenges for students, and how students cope with these challenges can affect how well they fare academically and socially. First-generation college students (FGs: students whose parents do not have four-year degrees) face more social, academic, and financial challenges and have higher dropout rates than continuing-generation students (CGs: students with at least one parent with a four-year degree). Research has shown that when facing challenges in college, FGs are unlikely to seek university resources; however, it is not clear what FGs are doing in the face of challenge. This exploratory study uses a social and cultural-psychological lens to begin understanding how FGs respond to challenges in college. We presented 279 undergraduate students (68 FGs) with a series of vignettes describing academic, financial, and social challenges and asked students to predict how they would respond to each challenge. Results show that when faced with financial challenges, FGs were more likely to remove themselves from the situation than CGs; when faced with social challenges, CGs were more likely to think about the situation than FGs; and when faced with academic challenges FGs and CGs did not differ in anticipated coping responses. Given that FGs tend to struggle more in college than CGs do, this research has implications for understanding how to help future FGs deal with challenges in the university.*

## **Introduction**

"In the 21st century, the best anti-poverty program is a world-class education," (Obama, State of the Union Address, 2010).

For many Americans, attending college is the American Dream in action, and to many policy makers, it is an end to inequality. As Obama suggests, many believe that if we simply expand access to education to allow historically underrepresented groups to attend college, these groups will have better life outcomes. However, this notion that college is a panacea for social problems is not the whole story. Many students from the underrepresented groups that policy makers hope to

target are first-generation college students (FGs; students whose parents do not have four-year degrees). Although FGs are entering universities at greater and greater rates (Bowen, Kurzwil, Tobin, 2005; Riggs, 2014; & Stephens, Fryberg, Markus, Johnson, Covarrubias, 2012), once in the university, FGs experience many more challenges than continuing-generation college students (CGs; students with at least one parent with a four-year degree). FGs earn lower GPAs and have significantly higher dropout rates than CGs (Bowen, et al., 2005; Pascarella, Pierson, Wolniak, & Terenzini, 2004; Stephens, et al., 2012). This achievement gap shows that simply expanding access to college is not enough to end inequality. To close this achievement gap and work toward equality, we need to first understand why the achievement gap occurs.

One common explanation for the social class achievement gap posits that FGs simply do not know how to handle the challenges that they encounter in college. In a New York Times article titled “Who Gets to Graduate?” Paul Tough (2014) writes, “[FGs] get to a good college and encounter what should be a minor obstacle, and they freak out. They don’t want to ask for help, or they don’t know how. Things spiral, and before they know it, they’re back at home, resentful, demoralized and in debt.” While this is an overgeneralization not founded in research, it does reflect a common assumption about why FGs struggle in college. The assumption is that FGs generally do not know how to handle challenges. It is more likely that FGs are coping with challenges in a way that is in line with their *interdependent* cultural model of self, a self that does not align with university’s *independent* cultural expectations (Stephens, Markus, Phillips, 2013). The cultural expectations from FGs’ interdependent working-class backgrounds differ from the cultural expectations of the independent middle-class university, and these differences lead FGs to respond to every day life experiences differently than people who come from independent middle-class backgrounds (Johnson, Richeson, and Finkel, 2011; Stephens, et al. 2012; and Stephens, et al. 2015). Yet research has not examined how these cultural expectations shape the way students cope with college challenges.

This exploratory study will use a social and cultural psychological lens to begin understanding the ways that FGs respond to adversity in college. We will focus on how FGs’ backgrounds may shape their responses to challenge in ways that differ from universities’ expectations about how students should respond to challenge. Thus far, many strategies for helping FGs succeed have focused on teaching them to act in ways universities expect students to act (e.g., through interventions

## First-generation college students and adversity: Mechanisms of coping compared to continuing-generation college students

that encourage students to utilize university resources such as office hours) (Stephens, et al. 2015). For example, Tough describes an intervention one college professor implemented that provided an abundance of college resources for low-achieving, FG students, “He offered [the] students two hours each week of extra instruction; he assigned them advisers who kept in close contact with them and intervened if the students ran into trouble or fell behind; he found upperclassmen to work with the...students one on one, as peer mentors.” Indeed, providing FGs with a plethora of resources proved to improve GPA and graduation rates. Empirical research does suggest that, without intervention, FGs tend to seek fewer university resources when they encounter challenges in college compared to CGs (Stephens, et al., 2012; Stephens, Hamedani, Destin, 2015; Stephens, Townsend, Hamedani, Destin, & Manzo, 2015). However, the focus on FGs’ use (or lack thereof) of college resources is rooted in the notion that there is one appropriate way to deal with college challenges (i.e., by turning to college resources to overcome these challenges). By focusing on what FGs are *not* doing, research has yet to understand what FGs *are* doing when they encounter challenges. Furthermore, less emphasis has been placed on universities and how *they* can change their practices to better accommodate their growing FG population. While it is important to understand ways to change FGs’ behaviors to help them succeed in universities, it is equally important to understand the cultural roots of their behaviors and consider the ways that universities can validate FGs and build upon FGs’ current ways of coping.

### *Social Class and Cultural Models of Self*

To understand the nuance of students’ behavior and collegiate experience we first must understand their backgrounds and how these backgrounds shape the experiences they have and the way they come to understand the world and themselves. Broadly, a person’s background shapes the person’s *cultural model of self*, or set of assumptions and understanding about the “right” way to think, feel, and behave in a given context (Markus & Kitayama, 1991; Snibbe, Markus, 2005). Widely understood throughout a cultural context, cultural models of self dictate the normative rules of how to be a “good” person (Markus, et al. 1991), and they manifest in an individual’s thoughts and feelings, in interactions between individuals, in the rules and norms of societal institutions, in the core ideas and ideologies of a cultural context, and in the cultural products with which individuals or groups identify (Snibbe, et al. 2005, Stephens, et al. 2012). These models of selves are shaped by

the many identities and experiences people have, including their economic background, regional background, religion, race, and gender. All of these experiences interact and shape a person's attitudes and behavior (Snibbe, et al. 2005). That is, each person's varying cultural contexts lead to a person having multiple models of self, each self dependent on the cultural contexts in which they are embedded. According to the theory of mutual constitution, people's models of self are shaped by their context, and that the context is mutually shaped by the people living within it (Markus, Kitayama, 2010). That is, as the context shapes the way people act to align with cultural expectations, and by complying with these expectations, people reinforce them. In this paper, I will focus on the cultural models of self that are derived from a person's socioeconomic context, and the university expectations that are in direct opposition of FGs' model of self.

*Middle-Class Independence.*

One of the two dominant models of self is the *independent cultural model of self*. Those who endorse an independent model of self view the self as separate from others, unique, and autonomous, and they view the individual as the sole source of their own thoughts, feelings, and actions (Markus, et al. 1991). Cultural contexts that promote an independent model of self tend to value freedom and choice (Stephens, et al. 2007; Stephens, et al. 2011). In these contexts, people are expected to behave in ways that demonstrate their uniqueness and set themselves apart from others, such as by expressing their thoughts and feelings and asserting their opinions (Markus, et al. 1991, Markus, et al. 2003, Stephens, et al. 2007). The independent model of self is the dominant model of self in middle-class cultural contexts, which grant people a relatively high level of geographic mobility, income, and education (Stephens, et al. 2007; Stephens, et al. 2011). Additionally, the types of occupations people from middle-class backgrounds pursue often promote autonomy and offer copious opportunities for individuals to assert themselves (e.g., mechanical engineer, or marketing careers). The independent model of self influences not only people coming from these backgrounds but also institutions that are largely influenced by this model of self.

Importantly, the independent model of self is pervasive in university contexts, and it shapes the expectations universities have of their students. Stephens and colleagues (2012) surveyed 261 high-level administrators (deans, directors of academic programs, and administrators in the provost office) from 75 universities and found that administrators

## First-generation college students and adversity: Mechanisms of coping compared to continuing-generation college students

overwhelmingly endorsed an independent cultural model, whether they were employed at top public universities, liberal arts universities, or Ivy universities. Even at lower tier universities—ones that often serve greater numbers of working-class students—administrators still largely endorsed independent values. Administrators were asked to pick five of the most important university expectations for students from a list of 12 learning goals. Of the goals, 6 were interdependent (e.g. learning to work with others, learn to ask others for help), and 6 were independent (e.g. learning to express oneself, learning to be a leader). Across universities, the majority of administrators were more likely to endorse independent learning goals for their students compared to interdependent learning goals. That is, in line with the independent cultural model of self, universities expected their students to voice their opinions regularly, learn and work independently, and to individually influence learning situations to meet their needs (Stephens, et al. 2012, Fryberg & Markus, 2007).

### *Working-Class Interdependence.*

In contrast, the second dominant model of self is the *interdependent model of self*. Those who endorse the interdependent model of self view the self as connected, and they tend to focus on fostering and maintaining their relationships with others, often placing others' interests and needs before their own (Markus, et al., 1991; Stephens, Markus, Townsend, 2007). Cultural contexts that endorse an interdependent model of self emphasize group harmony, adjusting the situation, and deferring to authority (Lareau, 2003; Snibbe, et al. 2005; Markus, et al., 1991; Stephens, et al. 2012; Stephens, Markus, Townsend, 2007; Stephens, Markus, Phillips, 2013). Various contexts promote the interdependent model of self such as people from non-Western countries, women, and minorities. Additionally, those who endorse an interdependent model of self often come from lower socioeconomic status (SES) backgrounds, and that is the context we will focus on. Those from a lower SES background tend to work in blue-collar hourly-waged positions that offer few opportunities for exercising agency (e.g., electricians, or retail jobs). Because of the social and economic conditions in working-class communities, people in these communities tend to have relatively little geographic mobility and few career and social choices at their disposal (Markus, et al. 1991; Stephens, et al. 2012). Furthermore, those who endorse an interdependent model of self tend to rely on others for social and economic support, and thus maintain close relationships with family and friends (Stephens, Markus, Townsend,



2007; Stephens, Markus, Phillips, 2013).

Because they come from lower socioeconomic status backgrounds, FGs endorse this interdependent model of self. Stephens, et al. (2012) showed this tendency when they asked FGs and CGs to name their motives for attending to college. To assess their motives the same methodology for assessing university administrators learning outcomes was used; that is students chose from a list of independent and interdependent motives for attending college (Stephens, et al. 2012) Not only did FGs choose less independent motives, but they also endorsed significantly more interdependent reasons for attending college than CGs (Stephens, et al. 2012).

#### *FGs and the Cultural Mismatch*

Because universities' endorse an independent model of self this creates a cultural mismatch for FGs who come from backgrounds that foster interdependence (Stephens, et al. 2012). University expectations align with CGs' independent model of self creating a cultural match, but undermines FGs' normative interdependent way of being (Stephens, et al. 2012). FGs attend college motivated by interdependent motives, but when universities do not acknowledge those interdependent motives FGs question their sense of belonging in the university setting (Johnson, et al. 2012; Stephens, et al. 2012). When this cultural mismatch is eliminated, however, FGs perform as well as CGs. Stephens, et al. (2012) presented FGs and CGs with a welcome letter from the university president that either endorsed independent or interdependent values. Following the letter, student performance was measured via a verbal academic task. Results showed that manipulating a welcome letter—a cultural product—to acknowledge FGs' interdependent value system improved FGs' academic performance compared to when the welcome letter reflected only an independent value system. That is, FGs found the academic task more difficult when they were presented with a welcome letter endorsing an independent model of self because it undermined their normative behavior and motives for attending college (Stephens, et al. 2012).

Thus, the cultural mismatch has already been shown to undermine FGs' academic performance by creating an environment where FGs feel more socially, academically, and psychologically challenged. Furthermore, college is already considered a hallmark where young adults learn how to handle challenging situations. Could this mismatch also undermine FGs' performance in college by invalidating or failing to recognize the ways that FGs cope with challenges? That is, the uni-

## First-generation college students and adversity: Mechanisms of coping compared to continuing-generation college students

versity expects students to deal with challenge one way, the independent way, placing FGs yet again at a disadvantage. While Tough (2014) and others posit that FGs do not know how to handle challenge, we posit that what is more likely is that FGs are engaging challenge in ways that align with their interdependent model of self and background that the university overlooks (Stephens, et al 2012).

For example, consider an academic situation in which a FG receives a bad grade on a test. Universities expect students in this situation to utilize university resources, such as seeking extra help and/or attending the professor's or teaching assistant's office hours to discuss the grade and create an action plan for the student to move forward successfully. Each of these expectations align with an independent model of self as it encourages one taking charge of the situation, exercising agency, and/or confronting authority. Because interdependent contexts like working-class communities expect that people adjust to the situation and defer to authority, it may be unlikely that the FG will go to office hours to dispute or ask questions of the professor as to why they received a bad grade, or how they could earn extra credit to make up for it. Furthermore, it could be that receiving the bad grade reinforces FGs' sense that they do not belong in the university setting thus making them even less likely to utilize university resources. Instead, the FG may be more likely accept the grade and press on. In response, a professor may interpret this behavior to mean that the FG is not invested in the class, which could in turn affect the likelihood of that professor reaching out to the student. Throughout their collegiate experience FGs may face many situations in which the university expects them to interact with or even confront authority, or assert themselves in a way that is not normative for people from interdependent backgrounds.

The cultural mismatch likely impacts FGs not only academically, but also socially (Lareau, 2003; Stephens, et al., 2011). For example, students often work on group projects in their classes. Here the university expectation is that students will collaborate on the project, sharing the thinking, planning, and workload and asserting their ideas and voicing their opinions often. However, in this situation FGs may be more likely to go along with the majority's preference, even if it does not align with their own preference, rather than advocating for their own preference. CG students may misunderstand this desire for group harmony as a lack of interest or effort put forth by the FG student. Many of these key background differences that can influence FGs' behaviors in the academic setting do not mesh with many university expectations of

how to be a student. It is likely, that when faced with challenge, the university's independent expectations extend to "right ways" that students should cope when faced with challenge.

Largely this cultural mismatch creates challenges for FGs in the university, as their normative behavior does not meet the university's expectations of independent behavior. However, if one's cultural model of self, *does* align with the cultural model of self and resulting expectations for how to behave in a given context, transitioning in these new contexts is smooth and familiar, this phenomena is what Lareau (1987) refers to as cultural capital. When one has cultural capital, such as CGs entering into the university who come from a middle-class independent background, one is more likely to do better in that context. Lareau explains that education is not level playing field; rather it is rigged to be most adaptive for the "social and cultural experiences of the intellectual and economic elites." University expectations of students compliment an independent sense of self. Due to these cultural expectations fitting one kind of student, middle-class, independent CGs, FGs go through their entire educational career at a cultural disadvantage.

Taken together, the university is a context in which FGs' normal agentic behavior is not valued, and perhaps overlooked. That is universities encourage independent coping styles that often get lumped in to being the "right" way to cope, as opposed to being "a" way to cope. As it is likely that FGs *are* dealing with challenges, however in ways that more align with their independent backgrounds. *If* it's true that FGs are dealing with challenges in ways that differ from the ways universities expect them to deal with challenges, this difference could explain in part why FGs underperform compared to CGs (who have the cultural capital of knowing how to deal with college challenges). The goal if this research is to understand how FGs engage with challenge. FGs coping strategies are likely to be in opposition to the independent university expectation of the "right way" to engage with challenge.

#### *Current Research*

The current study aimed to paint a picture of how FGs deal with challenges in college. To understand FGs' coping responses, we presented FGs with a series of vignettes describing social, academic, and financial challenges and asked them to predict how they would respond to these challenges. We predicted that FGs' working-class interdependent cultural backgrounds would influence the way that FGs respond to and cope with challenges. Specifically, we hypothesized that FGs, influenced by the interdependent norm of accepting the way things

## First-generation college students and adversity: Mechanisms of coping compared to continuing-generation college students

are, rather than individually influencing one's situation, would be more likely to disengage from challenges rather than engaging in direct action (Stephens, et al., 2007; Lareau, 1987; Stephens, et al. 2011).

### **Method**

#### *Participants*

Participants were recruited through the University of Washington's (UW) Online Subject Pool Program (OSPP). Participants in this pool were psychology students earning extra credit for their undergraduate level classes. All participants were U.S.-born; non-U.S.-born participants were excluded because our research focuses on understanding how social class shapes people's behaviors, and social class differs cross-culturally, creating a potential confound if participants are not U.S.-born. In total, we recruited 279 participants. Participants were excluded from the final data if they did not specify generation status (i.e. they did not indicate their parents'/guardians' educational attainment). After excluding 12 participants for not specifying their parents'/guardians' educational attainment, a total of 267 participants remained in the sample, 68 FGs, and 54.7% female. Of these participants, 50.9% identified as White/Caucasian, 30.5% as Asian American, 4.3% as Hispanic/Latino, 1.1% as African American, 13.3% as multiracial/other.

#### *Materials and Procedure*

##### *Challenge scenarios.*

Each participant was presented with a series of five scenarios that they were to imagine themselves in. Each scenario reflected a situation in which a person would face an academic challenge, a social challenge, or a financial challenge. In total we created two social scenarios, three financial scenarios, and five academic scenarios (see Table 1). These scenarios were created to reflect the types of challenges both FGs and CGs face in college, and they were based on research about college challenges (e.g., Martin & Marsh, 2008; Martin, 2013; Rheinschmidt, Mendoza-Denton, 2014). Following each scenario, participants were asked a series of questions about whether they had experienced a situation similar to the one presented in the scenario and how they would respond if they experienced the situation described in each scenario.

# MCNAIR SCHOLARS JOURNAL

Social Vignettes	Financial Vignettes	Academic Vignettes
<p>1) Imagine a friend or family member tells you that since you've started college you think you're better than everyone else and that they no longer feel close to you.</p> <p>2) Imagine that a person close to you died in the middle of the quarter.</p>	<p>1) Imagine your financial aid runs out, and you realize you cannot pay for housing for the rest of the quarter.</p> <p>2) Imagine your closest friends keep inviting you to eat out at restaurants and you decline the invitations because you cannot afford it, and eventually they start leaving you out from all invitations, not just restaurants.</p> <p>3) Imagine a family member of yours asks you why you are spending all your time focusing on school when you could be working and financially providing for your family.</p>	<p>1) Imagine you have just received a failing grade on an exam.</p> <p>2) Imagine that you are struggling to keep up in your classes because you have had to take on extra hours at your part time job recently.</p> <p>3) Imagine that when the teacher shows the distribution of scores after an exam, you are consistently on the bottom, even though you studied as much as you could.</p> <p>4) Imagine your TA doesn't call on you, but you notice they call on students who speak freely, often without raising their hand.</p> <p>5) Imagine that your academic advisor has just told you that you are not going to graduate when you thought you would.</p>

*Table 1. Adversity Vignettes.*

## First-generation college students and adversity: Mechanisms of coping compared to continuing-generation college students

### *Anticipated response.*

Participants were asked to indicate how they thought they would respond if they were in each scenario. We created response options based on the COPE Inventory, which measures a broad range of coping responses (Carver, Scheier, Weintraub, 1989). Response options fell into two categories: engagement responses and disengagement responses. Options reflecting engagement were a) “*Immediately find the resources I need to deal with the situation,*” and b) “*Think about the situation and what I could do differently.*” Options reflecting disengagement were a) “*Remove myself from the situation,*” b) “*Try to distract myself from the situation by socializing or working more,*” and c) “*Wait and hope that the situation resolved itself.*” Participants were asked to select all of the responses they anticipated using for each scenario.

## **Results**

### *Analytic strategy.*

For analyses, we collapsed responses according type of adversity (social, financial, and academic) and calculated the sum of anticipated engaging and disengaging responses for each type of adversity. For example, if a participant predicted that they would find the resources they’d need to handle that scenario for two of the three financial vignettes, their sum for the find resources behavior would be two for financial adversity. We ran an independent samples t test for each type of vignette predicting the total number of engaging and disengaging responses participants from participants’ generation status

### *Responses to Social Adversities*

When faced with social adversities, FGs and CGs did not differ in their likelihood of responding with any of the disengaging responses (i.e., removing themselves from a situation, waiting and hoping the situation resolved itself, and distracting themselves socially),  $ps > .05$ . However for the engaging responses, CGs were more likely to anticipate thinking about what they could do differently ( $M = .73$ ,  $SD = .57$ ) than FGs ( $M = .43$ ,  $SD = .50$ ),  $t(200) = 3.19$ ,  $p < 0.01$ ; but FGs and CGs were equally likely to anticipate finding the resources they needed to deal with the problem,  $p > .05$ .

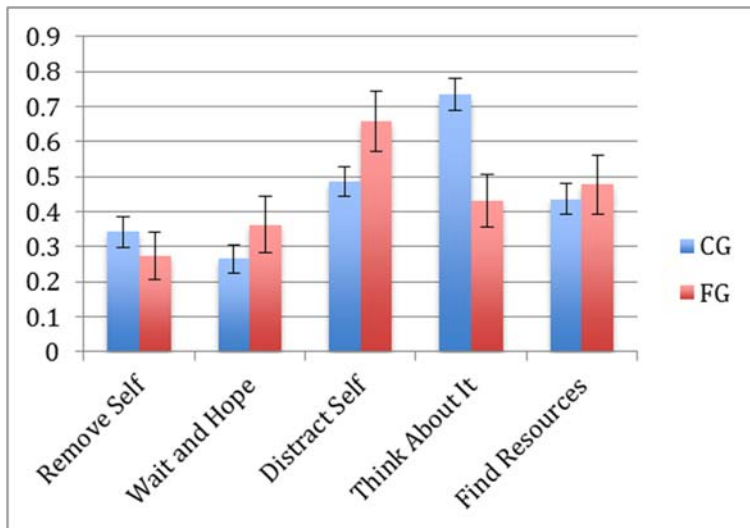
### *Responses to Financial Adversities*

When faced with financial adversities, FGs and CGs did not differ in the likelihood for responding with either of the engaging re-

ponses (i.e., think about what they could do differently, find the resources they need),  $ps > .05$ . However, for disengaging responses FGs were more likely to remove themselves from the situation ( $M=.58$ ;  $SD=.69$ ) than CGs ( $M=.36$ ;  $SD=.50$ ),  $t(87.1) = 2.39$ ,  $p= 0.02$ ; but were equally likely to anticipate waiting and hoping the situation resolved itself, and distracting themselves socially,  $ps > .05$ .

*Responses to Academic Adversities*

There were no generation status differences in any of the engaging or disengaging behaviors in the academic adversity scenarios, all  $ps > .05$ .



*Figure 1. Responses to Social Adversities.* When faced with social adversity, CGs were more likely to think about what they could do differently,  $t(200) = 3.19$ ;  $*p < 0.01$

First-generation college students and adversity: Mechanisms of coping compared to continuing-generation college students

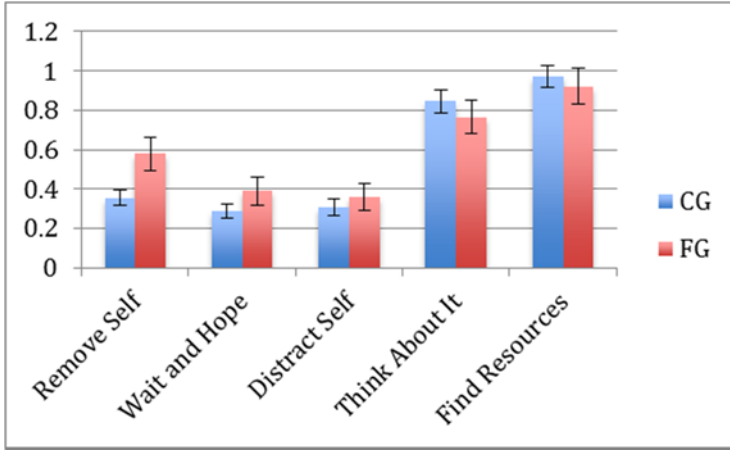


Figure 2. Responses to Financial Adversities. When faced with financial challenges, FGs were more likely to remove themselves from the situation,  $t(87.1) = 2.39$   $*p = 0.02$

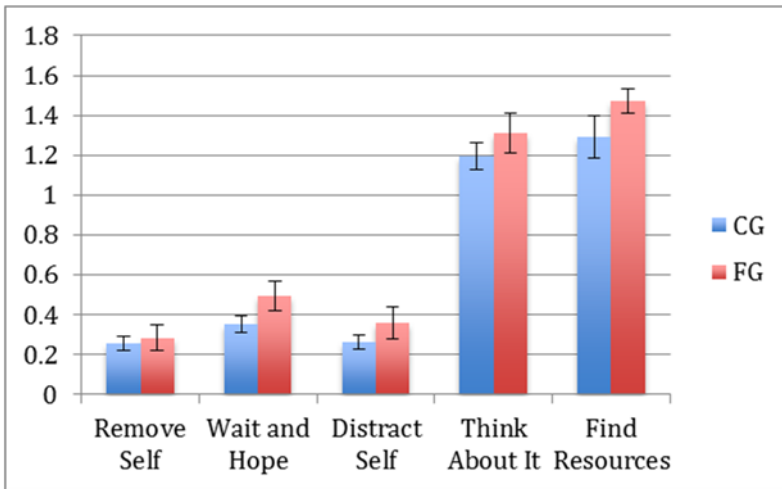


Figure 3. Responses to Academic Adversities. When faced with academic challenges, FGs and CGs did not differ in their anticipated responses, all  $ps > .05$

**Discussion**

Our research question sought to find out how FGs deal with adversity. On many of the adversity scenarios FGs anticipated coping



responses were not statistically different than CGs. To detect a medium sized effect, which is  $d=.5$  with power  $=.8$ , we would need 64 participants per cell, and we had 68 FGs and 201 CGs, thus sufficient numbers were met. However, aligning with our predictions, CGs were more likely to anticipate engaging the situation by thinking about the situation and what they could do differently when faced with social adversity. This maps onto the CG independent model of self as it encourages people to find ways to assert agency and control over their outcomes (Markus, et al. 1991). When faced with financial adversity, FGs' were more likely to disengage from the adversity by anticipating they would remove themselves from the situation. This tendency also aligns with the interdependent normative behavior of accepting one's situation, rather than trying to change it (Markus, et al. 1991; Snibbe, et al. 2005). Furthermore, FGs historically have lived with lesser financial means, thus making it more likely that they have "learned" how to cope with financial adversity that more often than not doesn't change no matter what they do. Finally, and perhaps most importantly, FGs and CGs do not differ in coping styles when faced with academic adversity. Both FGs and CGs anticipated responding in more engaging behavior when faced with academic adversity. Contrary to Tough's assumption that FGs are just retreating from challenge in college this evidence suggests that FGs are engaging when faced with academic adversity (Tough, 2014).

As this study is exploratory there remain many questions. A replication or more expansive version of this study would do well to understand FGs' behavior throughout college. As graduation rates among FGs are less than 50% this could show the differences between FGs who make it to the end. Perhaps those FGs who fare well in the university setting come in with very independent attitudes. On the other hand, as FGs persist through their college career perhaps they gradually becoming more independent, and those that adapt to the independent setting remain most successful.

Presently interventions have shown that if universities address the cultural mismatch FGs experience by changing their materials to reflect a more interdependent model of self FGs academically benefit greatly (Stephens, et al. 2012). For example Stephens, Townsend, Hamedani, Destin, & Manzo introduced a Difference-Education Intervention (2014) to encourage FGs to increase their engagement with university resources. In this intervention, first-year students listened to a panel of college students speak about their college experiences (control condi-

## First-generation college students and adversity: Mechanisms of coping compared to continuing-generation college students

tion), but in the experimental condition, panelists also spoke about how their different socioeconomic backgrounds influenced their success in the university and the strategies they used to overcome challenges they faced. Stephens, et al. (2014) found that FGs in the difference education condition used more university resources (e.g., meeting with a professor outside of class), which in turn predicted higher end of year GPA (Stephens, et al., 2014). That is, FGs who used more independent strategies for dealing with challenges performed better in college than those who used fewer independent strategies. This intervention shows that FGs *can* change their behavior to better fit the ways that universities expect them to deal with challenges, and that doing so benefits their academic performance in college.

The Difference-Education Intervention shows a way that universities can meet FGs halfway. Universities can do this by validating FGs personal background and experiences, and teaching them about how they're expected to deal with challenges. Another way universities can meet FGs halfway is to better understand how FGs normally deal with challenges. If universities understood the behaviors FGs engage in when they face challenges in college, universities could adapt their culture to be more compatible and culturally appropriate for ways FGs deal with challenge. As middle-class universities across American begin to recruit more and more FGs, they are also struggling to find ways to ensure their admitted FG population adapts to the college culture and, more importantly, eventually graduate (Pappano, 2015). By seeking to understand rather than change FGs' coping strategies, universities could not only become aware of ways FGs currently cope with challenge, but also devise new ways to meet FGs halfway with these challenges, working with FGs in a way that appreciates and utilizes their cultural background. Creating interventions that acknowledge and build on FGs' values and current coping skills could lead to lower dropout rates, and one day greater FG numbers at universities (Stephens, et al., 2012; Stephens, et al. 2014).

### *Conclusion*

For first-generation college students, making it to the university is a feat. Only 1 of every 6 students on most universities' campuses is a first-generation college student (Stephens, et al., 2012). These low numbers, coupled with the culture shock that many FGs experience when their interdependent upbringing clashes with universities' emphasis on independence, leave many FGs wondering whether they even belong at the university in the first place (Johnson, et al., 2011). Despite an in-

creased understanding of the academic and psychological challenges FGs face in college, no previous research has investigated how FGs cope with the numerous challenges they face in the university setting. Understanding the nuances of FGs' coping strategies could help universities to better equip themselves to serve the FG population and aid in creating culturally appropriate interventions if and when FGs are faced with adversity. These interventions could decrease the achievement gap, and politicians could confidently and with evidence say that expanding access to education is truly a step toward ending inequality.

## References

- Bowen, W. G., Kurzweil, M. A., Tobin, E. M., & Pichler, S. C. (2005). *Equity and excellence in American higher education*. Charlottesville: University of Virginia Press.
- Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach.. *Journal of Personality and Social Psychology*, 56, 267-283
- Johnson, S. E., Richeson, J. A., & Finkel, E. J. (2011). Middle class and marginal? Socioeconomic status, stigma, and self-regulation at an elite university. *Journal of Personality and Social Psychology*, 100(5), 838-852.
- Lareau, A. (1987). Social Class Differences in Family-School Relationships: The Importance of Cultural Capital. *Sociology of Education*, 60(2), 73.
- Lareau, A. (2003). *Unequal childhoods: Class, race, and family life*. Berkeley: University of California Press.
- London, H. B. (1989). Breaking Away: A Study of First-Generation College Students and Their Families. *American Journal of Education*, 97(2), 144-170.
- Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, 98(2), 224-253.
- Martin, J. (2012). Academic buoyancy and academic resilience: Exploring 'everyday' and 'classic' resilience in the face of academic adversity. *School Psychology International*. 488-500.
- Martin, J., Marsh, W. (2008). Academic Buoyancy: Towards an understanding of students' everyday academic resilience. *Journal of School Psychology*. 53-83.
- Miller, P. J., Cho, G. E., & Bracey, J. R. (2005). Working-Class Chil-

## First-generation college students and adversity: Mechanisms of coping compared to continuing-generation college students

- dren's Experience through the Prism of Personal Storytelling. *Human Development*, 48(3), 115-135.
- Pappano, L. (2015, April 8). First-generation students unite. *The New York Times Magazine*.
- Pascarella, E. T., Pierson, C. T., Wolniak, G. C., & Terenzini, P. T. (2004). First-Generation College Students: Additional Evidence on College Experiences and Outcomes. *The Journal of Higher Education*, 75(3), 249-284.
- Pickett, L., Gardner, L., Knowles, M., 2004
- Remarks by the President in State of the Union Address. (2010, January 27). Retrieved March 09, 2016, from <https://www.whitehouse.gov/the-press-office/remarks-president-state-union-address>
- Rheinschmidt, M. L., & Mendoza-Denton, R. (2014). Social class and academic achievement in college: The interplay of rejection sensitivity and entity beliefs. *Journal of Personality and Social Psychology*, 107(1), 101-121.
- Riggs, L. (2014, Dec. 31). First-Generation College-Goers: Unprepared and Behind. *The Atlantic*.
- Snibbe, A. C., & Markus, H. R. (2005). You Can't Always Get What You Want: Educational Attainment, Agency, and Choice. *Journal of Personality and Social Psychology*, 88(4), 703-720.
- Stephens, N. M., Fryberg, S. A., & Markus, H. R. (2010). When Choice Does Not Equal Freedom: A Sociocultural Analysis of Agency in Working-Class American Contexts. *Social Psychological and Personality Science*, 2(1), 33-41.
- Stephens, N. M., Hamedani, M. G., & Destin, M. (2014). Closing the Social-Class Achievement Gap: A Difference-Education Intervention Improves First-Generation Students' Academic Performance and All Students' College Transition. *Psychological Science*, 25(4), 943-953.
- Stephens, N. M., Townsend, S. S., Hamedani, M. G., Destin, M., & Manzo, V. (2015). A Difference-Education Intervention Equips First-Generation College Students to Thrive in the Face of Stressful College Situations. *Psychological Science*, 26(10), 1556-1566.
- Stephens, N. M., Townsend, S. S., Hamedani, M. G., Destin, M., & Manzo, V. (2015). A Difference-Education Intervention Equips First-Generation College Students to Thrive in the Face of

- Stressful College Situations. *Psychological Science*, 26(10), 1556-1566.
- Stephens, N. M., Markus, H. R., & Townsend, S. S. (2007). Choice as an act of meaning: The case of social class. *Journal of Personality and Social Psychology*, 93(5), 814-830.
- Stephens, N. M., Fryberg, S. A., Markus, H. R., Johnson, C. S., & Covarrubias, R. (2012). Unseen disadvantage: How American universities' focus on independence undermines the academic performance of first-generation college students. *Journal of Personality and Social Psychology*, 102(6), 1178-1197.
- Stephens, N. M., Markus, H. R., & Phillips, L. T. (2014). Social Class Culture Cycles: How Three Gateway Contexts Shape Selves and Fuel Inequality. *Annual Review of Psychology Annu. Rev. Psychol.*, 65(1), 611-634.
- Tough, P. (2014, May 18). Who Gets to Graduate? *The New York Times Magazine*.
- Watson, D., & Clark, L. A. (1988). THE PANAS-X Manual for the Positive and Negative Affect Schedule - Expanded Form. Retrieved from <http://www2.psychology.uiowa.edu>

## First-generation college students and adversity: Mechanisms of coping compared to continuing-generation college students

### Acknowledgements

I'd like to thank the Ronald E. McNair program for not only funding me, but for offering me practical and emotional support throughout my research process. Thank you to Dr. Todd Sperry, Cyndi Lopez, and Princess Simekha for always being available, pushing us even when we felt like we couldn't work any longer, and for believing in each of us so genuinely. I'd also like to thank the University of Washington's (UW) Psychology Advising Department, specifically Carrie Perrin who has provided an unlimited amount of support and directed me to the numerous resources UW has to offer. Finally I'd like to thank my mentors Dr. Yuichi Shoda and Laura Brady. Thank you for constant patience, guidance, and for being so invested in my future. I am a better scholar for knowing each of you.

Alicia Mendez Sawers

Psychology, Dr. Yuichi Shoda, and Laura Brady

[Alicia.Sawers@gmail.com](mailto:Alicia.Sawers@gmail.com)

My research interests include child maltreatment, specifically child sexual abuse and intergenerational trauma. In the fall of 2016 I will start at Rutgers University in New Jersey in pursuit of a PhD of Social Work.



# **“All of this Belongs to Us:” Land, Horses, and Indigenous Resistance on the Yakama Indian Reservation, 1900-1950**

**Jennifer Smith**

## **Abstract**

*Contentious debates among Natives and non-Natives concerning the fate of wild horses on Yakama tribal lands in Washington State have waxed and waned for more than a century. Beginning at the turn of the twentieth century the Yakima Indian Agency welcomed non-Indian sheep and cattle ranchers onto tribal lands, often against Native wishes, taxing rangelands, and facilitating widespread overgrazing. By the 1920s, agency concerns over the continued economic stability of non-Indian ranching operations, resulted in efforts to gain access to communal tribal grazing lands that sustained Yakama horse herds. Because of this, agency officials orchestrated systematic assaults on Yakama horses, citing horses as the primary culprits of overgrazing and land degradation. However, Yakamas showed little interest in removing their horses from tribal lands at the behest of agency officials, and instead vehemently opposed non-Native encroachment on communal grazing lands. Through an interrogation of archival material, conducting interviews, and reviewing scholarly sources across disciplines, I argue that Yakamas and non-Natives used wild horses as a terrain of struggle, whereby asserting competing claims to Indigenous lands and resources. Thus, examining wild horses as a tool of Indigenous resistance during the early twentieth century provides a useful lens for understanding the many forms of Native opposition to colonial hegemony, while simultaneously drawing attention to problematic and archaic tropes employed by non-Natives in an effort to justify consistent intervention into tribal affairs.*

## **Introduction**

The horse is very important to our culture and traditions. We always want to have a number of those. However, the dilemma we are facing is that these wild horses, or feral horses, are causing severe degradation to the natural resources of our land.<sup>1</sup>

<sup>1</sup>Kevin Taylor, “They Eat Horses, Don’t They? Bucking the Slaughterhouse Ban on Horses,” *Indian Country Today Media Network*, November 13, 2013, accessed on August 14, 2014,



-Harry Smiskin, Yakama Nation Tribal Chairman,  
2013.

Over the last decade, skyrocketing wild horse populations on the Yakama Indian reservation on the eastern side of Washington State have placed increased pressure on sensitive ecosystems, destroying traditional root and berry patches and depriving other wildlife of grazing resources.<sup>2</sup> Because of this issue, in recent years members of the Confederated Tribes and Bands of the Yakama Nation publically declared their intent to implement management practices directed at reducing herds to a manageable size. However, this decision to reduce herd sizes did not come easily or without contest: as many Yakamas recognize, horses play “a traditionally intricate role in [Yakama] society.”<sup>3</sup> To complicate matters, many non-Indians and animal advocacy groups have voiced strong opposition to herd management efforts on tribal lands, claiming wild horses as “historically revered symbols of freedom to the American people.”<sup>4</sup> Not surprisingly, as Yakama plans for herd reduction began to circulate on social media, angry animal advocacy groups and their supporters flocked to Facebook and Twitter, criticizing the tribe for their “deplorable moral bankruptcy and departure from traditional...cultural values.”<sup>5</sup> While non-Indians find their attacks on Yakamas warranted, feelings of imperialist nostalgia that drive non-Indian interventions in tribal affairs fail to acknowledge the complex shared histories between the Yakamas, settlers, horses, and land.<sup>6</sup>

<http://indiancountrytodaymedianetwork.com/2013/11/13/they-eat-horses-dont-they-bucking-slaughterhouse-ban-horses-152209..>

<sup>2</sup>Ibid; In an effort to respect the wishes of the Confederated Tribes and Bands of the Yakama Nation, I have adopted their preferred spelling of “Yakama,” which will be used throughout this essay with the exception of quotations and citations that contain the alternative spelling of Yakima.

<sup>3</sup>Ibid.

<sup>4</sup>Scott Beckstead (Representative of the Humane Society of the United States) in discussion with the author, August 2014.

<sup>5</sup>“Tragedy Unfolds for Tribal Horses in the Pacific Northwest,” *American Wild Horse Preservation Campaign*, June 12, 2014, accessed August 17, 2014: <http://www.wildhorsepreservation.org/media/tragedy-unfolds-tribal-horses-pacific-northwest>. For analysis of the current dispute over wild horses on Yakama lands, see Jennifer Smith, “Where the Wild Horses Roam: Cross Cultural Debate over the fate of Wild Horses on Yakama Tribal Lands,” 2014.

<sup>6</sup>In 1989, Anthropologist Renato Rosaldo (p.107) defined imperialist nostalgia as “a pose of innocent yearning both to captures people’s imaginations and to

## “All of this Belongs to Us:” Land, Horses, and Indigenous Resistance on the Yakama Indian Reservation, 1900-1950

The current polarized debate over the management of wild horses on Yakama tribal lands is not contemporary in origin, but rather the resurgence of a historically contentious issue that has waxed and waned for over a century. In the early 1900s, the Yakima Indian Agency opened reservation lands for the grazing of domestic cattle and sheep belonging to non-Indian ranchers.<sup>7</sup> By the 1920s, however, crowded ranges, coupled with lax administrative oversight, resulted in widespread overgrazing and land degradation. Concerned that dwindling rangelands might alienate ranchers, Yakima Agency employees sought to encroach upon un-allotted tribal lands that many Yakamas relied upon for grazing their horses and cattle. As a means to warrant this advancement, overzealous agents identified “worthless” Indian horses as the primary culprits of rangeland destruction, systematically targeting herds for elimination. However, many Yakamas strongly opposed horse eradication campaigns, seeking to keep their lands and their horse herds intact. As such, from the 1920s through the 1940s, Yakamas and agency employees made wild horses a terrain of struggle through which they asserted competing claims to tribal lands and resources. While horses serve as a longstanding source of contestation for Yakamas and non-Indians, the underlying issue remains a need for Indigenous peoples to legitimize their sovereignty in the face of non-Indians who seek to undermine it.

### **Tribal Background**

In the pre-reservation era, Yakamas hunted and gathered in and around the Columbia Plateau, consuming a diet rich in berries, roots, salmon, and game. Through their acquisition of horses from the Shoshone and Flathead around 1730, Yakamas increased their mobility,

conceal its complicity with often brutal domination,” resulting in imperial societies lamenting the loss of what they have transformed. For a deeper explanation of the concept, see “Imperialist Nostalgia,” *Representations*, no. 26, University of California Press: 107–22.

<sup>7</sup>Established in 1859, the Yakima Indian Agency is an extension of government oversight located on the Yakama Indian Reservation that came about as part of the 1855 Treaty with the Yakamas. In order to ensure Natives complied with the requirements that came about because of the shift to reservation living, the agency also assisted in the indoctrination of Natives in Euro-American farming and practices. Originally located in Fort Simcoe, WA, the agency relocated to Toppenish, WA in 1922. The spelling of “Yakima” is used throughout this essay in referencing the Yakima Indian Agency, as it remains the spelling used in archival documents.

expanding the seasonal range and diversifying subsistence resources.<sup>8</sup> Additionally, adopting horses allowed Yakamas to gather and transport surplus materials and subsistence resources that promoted extended periods of tribal prosperity.<sup>9</sup> By the mid-nineteenth century, however, horses transcended a utilitarian role in Yakama culture, becoming a recognized measure of wealth and prestige that fostered intertribal connectedness across much of the Pacific Northwest. As anthropologist Helen Schuster notes, horses became a “common feature at trades, gatherings, horse races, and social activities.”<sup>10</sup> Overall, the shift to a semi-equestrian lifestyle in the early eighteenth century enhanced Yakama society, increasing food security and autonomy while enabling the preservation of important regional kinship ties and political alliances. The transition to reservation living in the latter half of the nineteenth century, however, challenged Yakamas’ independence through the fundamental disruption of traditional modes of living.

By the mid-1850s, the United States set its sights on acquiring the vast lands of the Columbia Plateau. Motivated by a series of recent legislation designed to clear the way for Indian removal in the West, the federal government remained determined to extinguish Indigenous land rights through treaties, placing Plateau Indians on reservations.<sup>11</sup> Yakamas, however, found the thought of ceding land to white settlers highly disconcerting. In her recent work *Land Divided by Law*, historian Barbara Leibhardt-Wester argues that Yakamas “did not want to give up their lands and feared ... [it] would disrupt their economies or even destroy their entire way of life.”<sup>12</sup> This concern was not without merit, as many Yakamas maintained extensive networks of exchange and communication with tribes throughout the Pacific Northwest, many of whom were experiencing the consequences of similar negotiations.<sup>13</sup> In fact, by the time Governor Isaac Stevens reached tribes on the Plateau, he was near the end of his whirlwind treaty tour, having already

<sup>8</sup>Francis Haines, "The Northward Spread of Horses among the Plains Indians," *American Anthropologist* 40, no. 3 (1938): 433.

<sup>9</sup>Helen H. Schuster, "Yakima Indian Traditionalism: A Study in Continuity and Change," (Ph.D. diss., University of Washington, 1975), 196-199.

<sup>10</sup>*Ibid*, 199.

<sup>11</sup>Andrew Fisher, *Shadow Tribe: The Making of Columbia River Indian Identity* (Seattle, WA, University of Washington Press, 2010), 44.

<sup>12</sup>Barbara Leibhardt-Wester, *Land Divided by Law: The Nation as Environmental History, 1840-1933* (New Orleans, LA, Quid Pro Books, 2014), 62-64.

<sup>13</sup>Schuster, *Yakima Indian Traditionalism*, 27-44.

## “All of this Belongs to Us:” Land, Horses, and Indigenous Resistance on the Yakama Indian Reservation, 1900-1950

negotiated treaties with Northwest tribes such as the Duwamish, Makah, and Puyallup.<sup>14</sup> Stevens sought to complete his mission by combining distinct and separate bands of Plateau Indians into tribes. In May of 1855, Governor Stevens encouraged the assembly of a small number of delegates to act on their behalf at the Walla Walla Treaty Council.<sup>15</sup> As a result, the diverse Indigenous population of the Columbia Plateau became subject to Euro-American conceptions of tribal configuration that depended upon the construction of a homogenous Indian identity to which treaties and Euro-American law could be universally applied.

### The Rise of the Yakama Nation

The Confederated Tribes and Bands of the Yakama Nation emerged as the result of contested and questionable treaty negotiations. Signed by fourteen tribal delegates, the 1855 treaty ceded more than 10 million acres of land in exchange for \$200,000, a guarantee of special provisions, and a 1.2 million acre reservation on the eastern side of Washington State.<sup>16</sup> The promise of monetary compensation and special provisions in exchange for land, however, offered many Yakamas little solace. Cash played a minimal role in tribal economic transactions and the nature of the special provisions only bolstered Yakamas' fear that ceding land would undermine their way of life.<sup>17</sup> Ultimately, Euro-Americans imagined themselves shaping Indians into model citizens through indoctrination in the fundamental tenets of Euro-American society, and this transformation began with a shift to yeoman farming. However, aside from cultivating small camas root and potato patches, Yakamas had little interest in becoming farmers or conforming to Euro-American expectations of civilized living.<sup>18</sup> Nevertheless, concern quickly shifted to anger as tensions between encroaching settlers and Yakamas erupted in warfare in the fall of 1855, delaying congressional treaty ratification and the Yakamas' move to reservation lands until

<sup>14</sup>Thomas C. Galligan Jr. and Michael T. Reynvaan, "Pacific Northwest Indian Treaty Fishing Rights," *U. Puget Sound L. Rev.* 5 (1981): 99.

<sup>15</sup>Fisher, *Shadow Tribe*, 44-47.

<sup>16</sup>"Treaty with the Yakima, 1855," in *Indian Affairs: Law and Treaties*, vol. II, ed. Charles J. Kappler (Washington D.C., Government Printing Office, 1904), 698-702.

<sup>17</sup>Fisher, *Shadow Tribe*, 99-102.

<sup>18</sup>*Ibid.*

1859.<sup>19</sup>

Yakamas began the transition to reservation living in 1859, bringing with them large herds of Indian horses and some previously acquired cattle.<sup>20</sup> Determined to continue pursuing customary subsistence resources and maintaining widespread intertribal relationships, Yakamas frequently left the reservation, returning at their discretion. Their refusal to stay within reservation boundaries, however, served as a source of consistent frustration for the newly formed Yakima Indian Agency charged with the supervision of reservation inhabitants.<sup>21</sup> For Euro-Americans, lines drawn on a map demarcated fixed borders on the physical landscape. To Yakamas, however, borders were permeable, and their retention of horses fostered much of their continued mobility. As a result, these perceived boundary infractions exacerbated the negative feelings many agency employees harbored toward the Indian-horse relationship, reinforcing a belief that horses “enabled the Indian to indulge in the ruling propensity to roam and neglect whatever would tend to civilize him.”<sup>22</sup> In short, horses offered increased mobility that made it difficult for agency employees to complete the process of assimilating Yakamas into Euro-American society.

Unfortunately for Yakamas, civilizing the “savages” remained a pervasive theme in Euro-American discourse throughout the latter half of the nineteenth century. Consequently, by the 1880s, government officials and Indian reformers determined the reservation system ineffective in its aims to transform Indians into good citizens and farmers. Through the creation of the 1887 Dawes Allotment Act, Euro-Americans could reconcile their competing desires to assimilate Natives with their need to expropriate Indian lands for white settlement. Veiled as a promising solution to the Indian problem, the Dawes Act conferred citizenship upon Indians who would accept and cultivate private tracts of land, while renouncing tribal ties.<sup>23</sup> More specifically, the government believed that breaking up reservation land into 160-acre parcels

<sup>19</sup>Schuster, *Yakima Indian Traditionalism*, 234-238.

<sup>20</sup>*Ibid.*, 239-244.

<sup>21</sup>Fisher, *Shadow Tribe*, 62-65.

<sup>22</sup>Orlan J. Svingen, "Reservation Self-Sufficiency: Stock Raising vs. Farming on the Northern Cheyenne Indian Reservation, 1900-1914," *Montana: The Magazine of Western History* 31, no. 4 (1981): 16.

<sup>23</sup>Alexandra Harmon, *Indians in the Making Ethnic Relations and Indian Identities around Puget Sound* (Berkeley: University of California Press, 1998), 138.

## “All of this Belongs to Us:” Land, Horses, and Indigenous Resistance on the Yakama Indian Reservation, 1900-1950

distributed amongst male heads of households would instill within Indians an appreciation for private land ownership.<sup>24</sup> Given the tenuous nature of previous land dealings with the federal government, however, many Yakamas remained rightfully wary. Immersion in federal Indian policies only promised to further fracture Indigenous communities, while providing the government with means to catalogue and control Indian lands.<sup>25</sup>

As many Yakamas predicted, the Dawes Act granted government officials a license to classify tribal lands in ways that aligned against Indian interests. By categorizing land as agricultural, timber, mineral, and grazing, officials effectively minimized Indian control, while simultaneously increasing their own.<sup>26</sup> Yakamas frequently questioned this new system, concerned that breaking up reservation lands based on resource content encouraged the encroachment of white settlers.<sup>27</sup> These concerns became more pressing at the turn of the twentieth century, as the government grew discouraged by the failure of the Dawes Act to encourage Indians to abandon tribal ways. Because of this, in the decades that followed, reservation lands became subject to unwelcome advancements, as the Yakima Agency allowed Indian interests to take a backseat to the interests of the government and white ranchers.

### Whose Land Is It Anyway?

Cattle and sheep ranching composed the principal industries of settlers in the eastern half of Washington State at the turn of the twentieth century.<sup>28</sup> As these industries grew, gaining access to enough pasturage to support the nutritional needs of domestic livestock became more competitive. This presented a dilemma for many settlers: how does one become a successful rancher without a substantial land base?

<sup>24</sup>Joshua L. Reid, *The Sea Is My Country: The Maritime World of the Makahs, an Indigenous Borderlands People* (New Haven: Yale University Press, 2015), 138.

<sup>25</sup>Leibhardt-Wester, *Land Divided by Law*, 74-75.

<sup>26</sup>*Ibid.*, 82-83.

<sup>27</sup>Minutes of Yakama Tribal Council meeting, White Swan, Washington, Feb. 15, 1887, Charles Relander Papers, Box 115, folder 18, Yakima Valley Regional Library, Yakima, Washington.

<sup>28</sup>Grant Harris, "Grazing Lands of Washington State," *Rangelands* 13, no. 5 (1991): 222-224.

For many, the answer lay in the prime grazing lands found within the boundaries of the Yakama Indian Reservation. Thus, ranchers began to place pressure on the Yakima Agency to open reservation rangelands for the grazing of domestic cattle and sheep. By 1904, ranchers saw their efforts come to fruition, as the government effected legislation on the reservation that set aside 150,000 acres of grazing lands and timber for Yakama use, leaving over 200,000 acres of reservation lands available for lease under the permit system to local ranchers.<sup>29</sup> While the leasing of reservation lands went against the fundamental principles of the Dawes Act—allowing settlers to make use of Indian land failed to lead them down the path to civilization—government officials and Yakima Agency employees saw little purpose in letting good land go to waste, especially when so many settlers stood to benefit from its use.<sup>30</sup>

Administered through the Forestry and Grazing division of the Yakima Indian Agency, employees initially distributed leasing permits on reservation lands in short increments based on season, location, and type of livestock.<sup>31</sup> By 1910, however, the Yakima Agency noticed an increased demand for grazing land, ripe for exploitation. As a result, choice-grazing lands became leasable in three- to five-year increments through sealed bidding.<sup>32</sup> Even though bids remained anonymous, it was not long before ranchers began to voice their dissatisfaction for the new system, threatening to take business elsewhere if the agency refused to meet their needs. As an example, in 1912, prominent sheep rancher Dan Smythe cautioned that if the agency failed to grant him satisfactory range, “it will be impossible to graze...on this Reserve.”<sup>33</sup> Smythes’ threat, although only one of many that year, likely proved troubling for the agency, as large-scale stockmen generated essential

<sup>29</sup>Leibhardt-Wester, *Land Divided by Law*, 80-84.

<sup>30</sup>*Ibid.*, 86-87. Yakima Agency employees often referred to as “Indian agents.” were government employees who remained responsible for the maintenance and day-to day operations on the Yakama reservation. This included, but was not limited to, administering grazing leases, dispensing money and food rations to Yakamas, and making detailed reports to the Bureau of Indian Affairs in Washington, D.C. For a more detailed general description of the BIA, see Cathleen Cahill, *Federal Fathers and Mothers: A Social History of the United States Indian Service, 1869-1933*.

<sup>31</sup>*Ibid.*, 89.

<sup>32</sup>*Ibid.*

<sup>33</sup>Dan Smythe (Pendleton, OR) to Yakima Indian Agency [Fort Simcoe, WA] February 28, 1912, Grazing Administrative Records, 1910-1923, Folder 1, Box 176, National Archives (Seattle, WA).

## “All of this Belongs to Us:” Land, Horses, and Indigenous Resistance on the Yakama Indian Reservation, 1900-1950

revenue that absorbed much of the reservations’ operational costs. Yakamas, however, resented the presence of men like Smythe, as ranching operations impinged upon their own grazing needs and, in many respects, violated terms of their treaty.

Pursuant to the terms of Section 3 within the 1855 treaty with the Yakamas, the leasing of Indian lands remained subject to approval by the tribal council.<sup>34</sup> In spite of this, agency employees regularly bypassed such protocol, granting grazing permits without tribal consent.<sup>35</sup> Yet, the council was not oblivious to this usurpation of Indian authority, asserting they “should be the party to decide grazing conditions on the reservation.”<sup>36</sup> In response to tribal complaints concerning grazing on reservation lands, agency employees became defensive, deferring the blame to central offices in Washington, D.C. However, agency files tell a far different story. In a 1917 report to the Commissioner of Indian Affairs, reservation Superintendent Don Carr warned that if Yakamas controlled the reservation grazing system, “such a course would be disastrous in the way of the efficient use of grazing area.”<sup>37</sup> Ultimately, the Yakima Indian Agency and its numerous employees sought to maintain a paternalistic role over tribal affairs, buttressed by the continued espousal of subversive rhetoric designed to portray Indigenous peoples as incapable of making decisions in the best interest of their own communities. By doing so, the agency remained free to distribute reservation lands in ways that advanced government interests.

In spite of agency disregard, Yakamas continued to be very vocal in their opposition to non-Indian livestock grazing. In 1918, for instance, the tribal council made a series of complaints to local agency employees and government officials in Washington, D.C., regarding non-Indian sheep and cattle destroying important root and berry patches. In response to these objections, Assistant Commissioner of Indian

<sup>34</sup>“Treaty with the Yakima, 1855.”

<sup>35</sup>E.B. Merritt (Fort Simcoe, WA) to the Secretary of the Interior [Washington D.C.] July 20, 1916, Grazing Administrative Records, Folder 2, Box 176.

<sup>36</sup>L. V. McWhorter (Fort Simcoe, WA) to the Department of the Interior, Office of Indian Affairs [Washington D.C.] June 8, 1909, Grazing Administrative Records, Folder 3, Box 176.

<sup>37</sup>Don M. Carr (Fort Simcoe, WA) to the Department of the Interior, Office of Indian Affairs [Washington D.C.] February 20, 1918, Folder 02128-04-0700, National Archives (Washington D.C) accessed November 7, 2015, <http://congressional.proquest.com/histvault? q=00128-024-0700>.



Affairs E.B. Merritt chided, “Do you think we ought to let the grazing lands go to waste when the government needs...to supply food ... in order that Indians may go and get roots out of the pasture?”<sup>38</sup> Through 1855 treaty negotiations Yakamas secured their right to gather roots and berries. Yet, in the eyes of many Euro-Americans, especially government officials, Indians occupied a unique position as wards of the federal government who desperately needed Euro-American encouragement to abandon problematic and uncivilized practices.<sup>39</sup> This rationale allowed government officials to justify restricting Yakamas’ access to tribal lands. Moreover, it ensured the government’s ability to continue exploiting indigenous land and resources to feed and clothe American soldiers and citizens during the First World War.

Throughout history, wars have given rise to periods of famine and instability; World War I was no different.<sup>40</sup> However, it must have seemed strange to many Yakamas that Indians— not yet acknowledged as legal citizens — should be responsible for providing lands for animals used to sustain American citizens, while being deprived of their own subsistence needs. Thus, as World War I ended and the economy temporarily stabilized, the need for animal products to feed and clothe soldiers and families in a war-torn economy dissipated.<sup>41</sup> Despite this change, grazing on the Yakama reservation intensified, displacing Indian livestock as domestic cattle and sheep continued to monopolize grazing resources.

The 1855 treaty guaranteed Yakamas the right to pasture their horses and cattle on open and unclaimed reservation lands. However, as grazing areas increased in size to meet ranchers’ needs, Indian grazing lands diminished.<sup>42</sup> These shrunken lands failed to provide enough resources to support tribal members’ horses and cattle, leading them to travel beyond borders in search of food. These boundary breaches aroused angry responses from ranchers, especially toward horses. In

<sup>38</sup>E.B. Merritt (Washington D.C.) to Tribal Council [Fort Simcoe, WA] May 17, 1918, Folder 02128-04-0700, National Archives (Washington D.C) accessed November 7, 2015, <http://congressional.proquest.com/histvault?q=00128-024-0700>.

<sup>39</sup> “Treaty with the Yakima, 1855.”

<sup>40</sup> Avner Offer, *The First World War, an Agrarian Interpretation* (Oxford [England]: New York: Clarendon Press; Oxford University Press, 1989) 38-52.

<sup>41</sup> Ibid.

<sup>42</sup> E.B. Merritt to Tribal Council.

## “All of this Belongs to Us:” Land, Horses, and Indigenous Resistance on the Yakama Indian Reservation, 1900-1950

1918, Chief Si-sa-se-lit Palmer lamented, “Indians have few...horses. When we turn them on the range where people are running sheep and other things, they tell us they will take our horses.”<sup>43</sup> Worried that some harm might befall their horse herds, Yakamas grew increasingly cautious, afraid to allow herds to roam too far without adequate supervision. Native horses were not the only animals to venture outside of grazing areas, however; as growing numbers of cattle and sheep exceeded the carrying capacity of their ranges, they too went in search of food. As historian Andrew Fisher explains, however, many ranchers “did not feel inclined to ponder their own hypocrisy or to share range with...Indians.”<sup>44</sup> Overall, ranchers on the Yakama reservation shared a common belief that paying for rangelands entitled them to an elevated status over Indians. The Yakima Indian Agency likely shared ranchers’ sentiments, as evidenced by the ways in which agency employees responded to widespread overgrazing that threatened to undermine the continued success of non-Indian livestock operation.

The introduction of large numbers of cattle and sheep by the Yakima Indian Agency in the first few decades of the twentieth century fundamentally altered the landscape of the reservation, placing undue pressure on land and depriving Yakamas of access to resources essential for their own subsistence and the subsistence of their animals.<sup>45</sup> Despite this, agency employees and ranchers continued to increase range loads, paying little attention to the deteriorating condition of the land. As the situation worsened, reaching an apex around 1920, agents sought to protect the economic interests of ranchers by intensifying efforts to decrease tribal land holdings to compensate for damaged ranges. However, siphoning additional tribal lands would not come without resistance, and agents sought out a feasible means of justification for their actions. Having a longstanding disdain for Indian horses—referring to them as worthless and wasting resources—agency employees cited Indian horses as the primary culprits of overgrazing, calling for their

<sup>43</sup> Ibid.

<sup>44</sup> Andrew Fisher, “The 1932 Handshake Agreement: Yakama Indian Treaty Rights and Forest Service Policy in the Pacific Northwest,” *The Western Historical Quarterly* 28, no. 2 (1997): 196.

<sup>45</sup> Kathleen A. Dwire, Bruce A. McIntosh, and J. Boonie Kauffman, “Ecological Influences of the Introduction of Livestock on Pacific Northwest Ecosystems,” in *Northwest Lands, Northwest Peoples: Readings in Environmental History*, ed. Dale D. Goble and Paul W. Hart (Seattle, WA, USA: University of Washington Press, 2012), 314.

immediate removal and eradication. Over the next two decades, Indian opposition to horse elimination created opportunities to undermine the efforts of the Yakima Indian Agency designed to deprive them of their horses and, ultimately, their lands.

### The Indian Horse Problem

Wild horses residing on tribal lands in the early twentieth century were likely the descendants of Indian horses that accompanied Yakamas to the reservation in the 1860s.<sup>46</sup> Long recognized as “hardy, and capable of shifting with but little food,” plateau horses remained adaptable and able to thrive in the semi-arid eastern Washington climate.<sup>47</sup> However, the same durability that earned these horses praise and admiration served as a source of exasperation for agency employees, many of whom likely saw the presence of wild horses as akin to a rodent infestation in need of extermination. Moreover, to many Euro-Americans, Indian horses epitomized everything a horse should not be. They lacked the looks, speed, and traceable lineage of the Thoroughbred horses whites preferred, and their small size and unpredictable nature made them unsuitable for the rigors of farm work.<sup>48</sup> In short, as overgrazing and land degradation on the reservation became of more imminent concern, agents espoused a heavy anti-horse rhetoric, hoping to promote the widespread removal of Indian horses from valuable reservation grazing land.<sup>49</sup> The determination of agents to remove horses from grazing lands, however, was met with equally strong resistance as Yakamas fought to retain decision-making authority over the fate of horses and tribal lands.

By the 1920s, the relationship between Yakamas and horses considerably shifted. Heavily utilized throughout much of the nineteenth century, the advent and availability of alternative forms of

<sup>46</sup> “A.J. Splawn Tells How the Yakimas Secured their Horses,” *The Yakima Herald*. (North Yakima, W.T. [Wash.]), 22 May 1907. *Chronicling America: Historic American Newspapers*. Lib. of Congress, accessed November 9, 2015, <http://chroniclingamerica.loc.gov/lccn/sn88085523/1907-05-22/ed-1/seq-12/>

<sup>47</sup> George Gibbs, *Indian Tribes of Washington Territory* (Fairfield, Wash.: Galleon Press, 1967), 10-11.

<sup>48</sup> Svigen, “Reservation Self-Sufficiency,” 18.

<sup>49</sup> Frank B. Lenzie (Spokane., WA) to Milton A. Johnson [Toppenish, WA], November 17, 1936, Miscellaneous Correspondence Indian Office and Spokane, 1934-1939, Folder 2, Box 91, National Archives (Seattle, WA).

“All of this Belongs to Us:” Land, Horses, and Indigenous Resistance  
on the Yakama Indian Reservation, 1900-1950

transportation replaced the tribes' dependence on horses for mobility, making their presence more sentimental than practical. As a testament to this, the prevailing argument for retaining large herds of horses simply remained, “these horses belong to us Indians...they just belong here.”<sup>50</sup> Yakamas and horses shared a history that spanned close to two centuries, built on respect and reverence, as well as a mutual dependence on the other for survival. Horses came to the Yakamas during a time when periods of famine endangered survival, allowing for the gathering of surplus resources and ushering in a period of stability.<sup>51</sup> Because of this, many Yakamas continued to hold horses in high esteem, seeking to repay them for their service through ensuring horses had grass to eat and lands to roam. In short, the agency's targeting of Indian horses for eradication likely seemed unnecessarily egregious, placing additional strain on an already fragile relationship between the tribe, agency, and ranchers.

Although Yakima Agency employees insisted that horse eradication remained necessary to repair lands damaged by consistent overgrazing, the practice of perpetuating state-sanctioned acts of violence against Indian horses to weaken Native resistance is evident as far back as the mid-nineteenth century. As a nascent United States sought to expand its territorial holdings through clearing a path for settlement in the West, military forces frequently encountered powerful equestrian tribes, often proving difficult to bring under the hegemonic control of the United States. However, as military officers soon discovered, “nothing can more effectively cripple the Indians than to deprive them of their animals.”<sup>52</sup> To test this theory, in 1858 United States military forces slaughtered two hundred Palouse horses on the Washington-Idaho border, as officers argued large herds slowed their advancement and hindered war efforts.<sup>53</sup> Similarly, historian Colin Calloway describes a brutal scene in 1874, when United States military forces launched an assault on groups of Kiowa, Cheyenne, and Comanche, slaughtering over fourteen hundred of their horses in the Palo Duro Canyon.<sup>54</sup> Although

<sup>50</sup> Schuster, *Yakima Indian Traditionalism*, 299.

<sup>51</sup> *Ibid.*

<sup>52</sup> Clifford E. Trafzer, and Richard D. Scheuerman, *Renegade Tribe the Palouse Indians and the Invasion of the Inland Pacific Northwest* (Pullman, Wash.: Washington State University Press, 1986), 90.

<sup>53</sup> *Ibid.*, 89.

<sup>54</sup> Colin G. Calloway, *Our Hearts Fell to the Ground: Plains Indian Views of How the West Was Lost* (Boston: Bedford Books of St. Martin's Press, 1996), 12.

military officers actively engaged in acts of violence against Indian horses that devastated many Native communities, agency employees on the Yakama reservation likely had little interest in getting their hands bloodied through participation in a mass slaughter of Indian horses, and instead outsourced the violence to meat processing plants or canning facilities.<sup>55</sup>

While agency employees avoided participating in the violence against Indian horses, they took little issue with orchestrating campaigns intended to eradicate large herds. In fact, in 1924 the Yakima Agency enlisted the help of the King County Humane Society to petition government officials in Washington, D.C., to sanction the killing of fifteen thousand Yakama horses.<sup>56</sup> Initially veiled as concern for the well-being of the animals, as many suffered from starvation and cruelty at the hands of ranchers, the joint proposition deftly shifted to justifying the mass killing so that the “range could be rented to grazing stock.”<sup>57</sup> Rangelands and grazing resources on much of the reservation continued to suffer from serious depletion. Thus, agents preached the need for emergency conservation efforts, the mainstay of which relied upon the removal of horses.<sup>58</sup> In order for grazing on the reservation to remain a lucrative business venture, Indian horses needed to be cleared from unallotted lands so that cattle and sheep could be relocated and overgrazed lands restored. This plan, however, relied on Indian cooperation that might only occur if agency employees could convince Yakamas that

<sup>55</sup> “Indians Check Horse Canning Scheme,” *Evening Star* (Washington, D.C.), 19 Dec. 1903. *Chronicling America: Historic American Newspapers*. Lib. of Congress, <http://chroniclingamerica.loc.gov/lccn/sn83045462/1903-12-19/ed-1/seq-35/>, (accessed November 9, 2015).

<sup>56</sup> It is important to note that the Humane Society has evolved concerning the welfare of animals considerably since the 1920s. The rise of the modern day animal rights and welfare movement has origins in the 1960s. For a more in-depth discussion of the rise of animal advocacy in the late twentieth century, see Frans de Waal, “Anthropomorphism and Anthropodenial: Consistency in our Thinking about Humans and Other Animals,” 260-268.

<sup>57</sup> “Wild Ponies Declared a Nuisance,” *American Indian* (Seattle, WA) August 21, 1925, Lucullus V. McWhorter Collection, Manuscripts, Archives, and Special Collections, Washington State University (Pullman, WA), accessed November 9, 2015: <http://content.libraries.wsu.edu/cdm/ref/collection/mcwhorter/id/220>.

<sup>58</sup> Yakama Tribal Council (Fort Simcoe, WA) to the Department of the Interior, Office of Indian Affairs [Washington, D.C.] January 18, 1925, Folder 002128-024-0776, accessed November 7, 2015, <http://congressional.proquest.com/histvault?q=0012128-024-0776>

## “All of this Belongs to Us:” Land, Horses, and Indigenous Resistance on the Yakama Indian Reservation, 1900-1950

their horses exacerbated poor land and grazing conditions. This would be no easy task, however, and as Superintendent Don Carr had noted a few years earlier, any previous attempts to reduce wild horses had been met with staunch Indian opposition.<sup>59</sup>

Ultimately, Yakamas showed little interest in disposing of Indian horses at the behest of the Yakima Agency. Nor did they see any reason to alter their stance on increasing grazing lands for the benefit of ranchers. To the contrary, in 1925 the Tribal Council went above the Yakima Agency to Washington, D.C., in an effort to effect changes to the current grazing system in place on reservation lands. Addressed to the Committee on Indian Affairs, tribal delegates petitioned to prohibit “the grazing of sheep on unallotted land,” with encroaching ranchers made to pay grazing fees until the offending stock was removed.<sup>60</sup> Unlike horses and cattle, sheep are opportunistic grazers, content eating grasses, shrubs, and brush.<sup>61</sup> Because of this, virtually all vegetation remained subject to sheep consumption, exacerbating already pressing environmental concerns. Continuous ungulate grazing and habitation wreaked havoc on reservation rangelands, removing native grasses, as well as creating trails and trampling vegetation.<sup>62</sup> Moreover, ungulates are selective grazers, eating more flavorful species of plants, and allowing cheatgrass to flourish, in turn reducing the biodiversity of available plant life.<sup>63</sup> Agency employees were not ignorant to the fact that sheep and cattle were equally as devastating to rangelands as horses, if not more so. Acknowledging the impact of livestock grazing, however, comprehensively stood to significantly weaken the Yakima Agency’s argument in favor of widespread horse elimination.

The Indian horse problem was not isolated to the Yakama reservation, but rather affected horse-laden reservations across the country. In 1934, John Colliers’ New Deal came to the Navajo Indian

<sup>59</sup> Don M. Carr (Fort Simcoe, WA) to J.H. Henson [Glenwood, WA] November 29, 1918, Grazing Administrative Records, Folder 3, Box 176.

<sup>60</sup> Yakama Tribal Council to the Department of the Interior, Office of Indian Affairs.

<sup>61</sup> Dwire, McIntosh, and Kauffman, *Northwest Lands, Northwest Peoples*, 317.

<sup>62</sup> The term “ungulate” refers to an animal with hooves, either odd or even toed, such as horses, rhinos, cattle, and sheep. For a more detailed definition, see Marsha Weisiger, *Dreaming of Sheep in Navajo Country*, 132-134.

<sup>63</sup> Dwire, McIntosh, and Kauffman, *Northwest Lands, Northwest Peoples*, 317-320.

Reservation seeking to effect large-scale stock reduction as a means to repair depleted ranges, while simultaneously preparing Diné for long-term stewardship of the range.<sup>64</sup> While government livestock reduction efforts on Navajo lands did not single out a specific ungulate, looking to reduce sheep, goat, and horse herds to more manageable numbers, soil conservationists and New Dealers alike felt “eliminating worthless horses must be the first step towards better range management.”<sup>65</sup> As historian Marsha Weisiger describes, however, many Diné openly rebelled against horse elimination, some going so far as to hide herds from government officials for fear they would confiscate them.<sup>66</sup> Although New Deal stock reduction did not evolve from concerted non-Indian efforts to confiscate Navajo lands, it forced upon the Diné an American system of valuing livestock that remained incompatible with traditional understandings of the role of livestock in the Diné world.<sup>67</sup> Ironically, Colliers’ New Deal boasted a promise of Indian self-determination; in an effort to promote conservation, however, Collier actually hindered Diné efforts at autonomy and long-term land and community preservation.<sup>68</sup> The push for horse eradication sponsored by Euro-American officials on the Yakama and Diné reservations share many striking similarities. Yet, what makes Yakamas’ resistance to horse eradication so interesting is that much of the focus on Pacific Northwest Indian resistance has centered on retaining access to fishing rights. While Yakamas remained vocal advocates for the retention of treaty fishing rights, their resistance to horse removal served multiple purposes, thwarting white encroachment and asserting tribal autonomy while shaping tribal responses to the New Deal.

Like the Diné, the Yakama Nation ultimately rejected the New Deal, seeing no reason to obtain government permission to practice tribal autonomy.<sup>69</sup> Ultimately, a temporary increase in government intervention in tribal land matters, many Yakamas believed, would only aggravate current tensions. Land and horses, it seems, formed the crux of many heated interactions between Yakamas and agency officials. Thus, as word spread concerning the livestock catastrophe in Navajo country,

<sup>64</sup> Marsha L. Weisiger, *Dreaming of Sheep in Navajo Country* (Seattle, WA, USA: University of Washington Press, 2011), 12-20.

<sup>65</sup> *Ibid.*, 157.

<sup>66</sup> *Ibid.*, 44-49.

<sup>67</sup> *Ibid.*, 29.

<sup>68</sup> *Ibid.*, 23-29.

<sup>69</sup> Schuster, *Yakima Indian Traditionalism*, 265-269.

## “All of this Belongs to Us:” Land, Horses, and Indigenous Resistance on the Yakama Indian Reservation, 1900-1950

Yakamas grew more determined to undermine the efforts of officials to divest them of the land and resources that remained rightfully theirs. In 1936, Yakima Agency Range Supervisor Frank B. Lenzie, vexed by the lack of Indian cooperation in horse removal efforts, reached out to the Agronomy and Range Soil Conservationist, Liter E. Spence, in an effort to “secure some authority that would permit [agents] to eliminate horses from the reservation.”<sup>70</sup> Concerned that the continued presence of horses threatened the livelihood of sheep and cattle ranchers, Lenzie, and the agency more generally, grew tired of waiting for Yakamas to approve herd eradication and instead hoped to obtain governmental authority to bypass any approval needed from the Tribal Council. Council members, however, quickly caught wind of Lenzie’s underhanded tactics, reminding both agency employees and government officials that reservation lands had been set aside for the exclusive use of the Nation. The council members offered an alternative solution to rangeland problems, calling for a marked reduction in the grazing seasons and the number of permits issued to non-Indian ranchers.<sup>71</sup>

By the mid-1940s, Yakamas recognized the power in resisting the demands to remove their horse herds. If there continued to be a lack of compliance on their behalf, the Yakima Agency could not move forward with herd eradication efforts or premeditated land grabs. This fundamental realization helped to restore some of the tribal autonomy lost throughout the chaotic transition to reservation living. Despite this, many Yakamas were not blind to the fact that range horses lacked few natural predators and were steadily increasing in numbers. This growing awareness did not negate the fact that Yakamas wanted the power to decide the most effective way to manage tribal lands and resources. While livestock grazing by non-Indian ranchers in the early twentieth century did in fact generate income that helped to maintain some reservation operations, the environmental consequences and fragmentation of Indian land left a lasting impact on the reservation. As a result, in 1950 the Yakama Tribal Council approved a measure to create a

<sup>70</sup> Frank B. Lenzie (Spokane, WA) to Liter E. Spence [Washington, D.C.] November 11, 1936, Miscellaneous Correspondence Indian Office and Spokane, 1934-1939, Folder 2, Box 91, National Archives (Seattle, WA).

<sup>71</sup> Tribal Council (Fort Simcoe, WA) to the Department of the Interior, Office of Indian Affairs [Washington, D.C.] March 11 1937, Folder 002427-029-0738, accessed November 7, 2015, <http://congressional.proquest.com/histvault?q=002427-029-0738>.



program where Indians engaged in the roundup of wild horses, trained them to ride, and attempted to adopt out horses to homes off the reservation.<sup>72</sup> Although moving beyond the sentimental attachment to Indian horses likely seemed far overdue to agency employees, for Yakamas the timing made sense. For decades Yakamas fought to have their voices heard, and with an eye towards self-determination, renegotiating the relationship between horses and land constituted the next step forward.

## Conclusion

Beginning in the eighteenth century, horses played an important role in Yakama culture, making meaningful contributions that earned them the reverence and respect of many Yakamas and securing space for their existence on tribal lands. By the turn of the twentieth century, however, the rise of non-Indian livestock grazing and encroachment placed Indian horses and lands in jeopardy, as the Yakima Agency and ranchers sought to erase wild horses from the reservation landscape. Although the debate over the fate of wild horses grew increasingly contentious over the course of the 1920s to 1940s, the issue goes far deeper than determining the worth of Indian horses. Euro-Americans had long adopted a problematic rhetoric grounded in ideas of racial superiority premised on beliefs that white settlers were entitled to the land and resources the country had to offer. Hence, Yakamas' resistance to horse eradication and land encroachment challenged dominant ideologies and threatened to deprive Euro-Americans of lands they felt entitled to control. Nevertheless, Yakamas remained focused on subverting the authority of reservation agents and government officials in an effort to foster the growth of tribal sovereignty. Yakamas would see their efforts—and the efforts of Native communities across the nation—come to fruition in the latter half of the twentieth century, as a series of protests, campaigns, and legislation brought about long overdue changes for Indigenous people in the United States.

Recent responses to Native attempts to manage wildlife resources on tribal lands are indicative of the influence that convoluted historical narratives and Native stereotypes continue to have over the dominant culture. Accusations that the proposed reduction of range

<sup>72</sup> Minutes, Timber and Grazing Committee Meeting, Yakima Indian Reservation (Toppenish, WA), January 25-26, 1950, Tribal Records, 1897-1950, Folder 7, Box 289, National Archives (Seattle, WA).

## “All of this Belongs to Us:” Land, Horses, and Indigenous Resistance on the Yakama Indian Reservation, 1900-1950

horses on tribal lands is in contradiction to traditional Native beliefs reflect the ways in which non-Indians see Indigenous people as incompatible with the modern world. Moreover, these accusations ignore the efforts Yakamas made throughout the first half of the twentieth century to protect wild horse herds, much to the chagrin of the government and agency employees. As times have changed, technology has advanced, and the role of the horse as a mode of transportation has diminished, however, Yakamas view their relationship with the horse through a different lens. Horses remain important to many Yakamas, but the cultural significance of the horse must be weighed against their environmental impact. The damage resulting from long-term overgrazing and land management will likely take years to repair, and with an increase in wild horses estimated at twelve to twenty-five percent each year, failure to manage herd sizes proves harmful for both land and horses. Nevertheless, as long as non-Indians continue to rely on archaic and problematic tropes to question the competency of Indigenous peoples to make meaningful decisions in their best interests, Native communities face continued threats to their ability to maintain and manage important tribal lands and resources.

### References

- “A.J. Splawn Tells How the Yakima Got Their Horses.” *Yakima Herald*. (North Yakima, W.T. [Wash.]), 22 May 1907. *Chronicling America: Historic American Newspapers*. Lib. of Congress. <http://chroniclingamerica.loc.gov/lccn/sn88085523/1907-05-22/ed>.
- Beckstead, Scott. Interview by the Author. By Telephone, August 14, 2014. Kent, WA.
- Calloway, Colin G. *Our Hearts Fell to the Ground: Plains Indian Views of How the West Was Lost*. Bedford Series in History and Culture. Boston: Bedford Books of St. Martin's Press, 1996.
- Charles Relander Papers. Yakima Valley Regional Library. Yakima, Washington.
- Galligan Jr., Thomas C., and Michael T. Reynvaan. "Pacific Northwest Indian Treaty Fishing Rights." *U. Puget Sound L. Rev.* 5 (1981): 99- 101.
- Gibbs, George. *Indian Tribes of Washington Territory*. Fairfield: Ye Galleon Press, 1967.
- Fisher, Andrew H. "The 1932 Handshake Agreement: Yakamas Indian

- Treaty Rights and Forest Service Policy in the Pacific Northwest." *The Western Historical Quarterly* 28, no.2 (1997): 187-217.
- . *Shadow Tribe: The Making of Columbia River Indian Identity*. Emil and Kathleen Sick Lecture-book Series in Western History and Biography. Seattle: Center for the Study of the Pacific Northwest in Association with University of Washington Press, 2010.
- Dwire, Kathleen A., McIntosh, Bruce A., and Kauffman, J. Boonie. "Ecological Influences of the Introduction of Livestock on Pacific Northwest Ecosystems." In *Northwest Lands, Northwest Peoples: Readings in Environmental History*, ed. Dale D. Goble and Paul W. Hart. Seattle: University of Washington Press. 2012.
- Grazing Administrative Records, 1910-1923. Yakima Indian Agency. Records of the Bureau of Indian Affairs. Record Group 75. National Archives—Pacific Alaska Region. Seattle, WA.
- Haines, Francis. "The Northward Spread of Horses among the Plains Indians." *American Anthropologist* 40, no. 3 (1938): 429-37.
- Harmon, Alexandra. *Indians in the Making Ethnic Relations and Indian Identities around Puget Sound*. American Crossroads: 3. Berkeley: University of California Press, 1998.
- Harris, Grant A. "Grazing Lands of Washington State." *Rangelands* 13, no. 5 (1991): 222-27.
- "Indians Check Horse Canning Scheme." *Evening Star*. (Washington, D.C.), 19 Dec. 1903. *Chronicling America: Historic American Newspapers*. Lib. of Congress. <http://chroniclingamerica.loc.gov/lccn/sn83045462/1903-12-19/ed>.
- Indian Delegations to Washington, Yakima [Reservation/Agency, Fort Simcoe, Washington (Later Toppenish Washington)] National Archives, Washington D.C. Record Group 75, Bureau of Indian Affairs, Entry 121: Central Classified Files, 1907-1939, Decimal Number 056, <http://hv.proquest.com/historyvault/hv.jsp?pageid>.
- Miscellaneous Correspondence, 1942-1949. Yakima Indian Agency. Records of the Bureau of Indian Affairs. Record Group 75. National Archives—Pacific Alaska Region. Seattle, WA.
- Miscellaneous Correspondence, Indian Office and Spokane, 1934-1939. Yakima Indian Agency. Records of the Bureau of Indian Af-

“All of this Belongs to Us:” Land, Horses, and Indigenous Resistance  
on the Yakama Indian Reservation, 1900-1950

- fairs. Record Group 75. National Archives—Pacific Alaska Region, Seattle, WA.
- Offer, Avner. *The First World War, an Agrarian Interpretation*. Oxford: New York: Clarendon Press; Oxford University Press, 1989.
- Reid, Joshua L. *The Sea Is My Country: The Maritime World of the Makahs, an Indigenous Borderlands People*. Henry Roe Cloud Series on American Indians and Modernity. 2015.
- Rosaldo, Renato. 1989. “Imperialist Nostalgia.” *Representations*, no. 26. University of California Press: 107–22.
- Svingen, Orlan J. “Reservation Self-Sufficiency: Stock Raising vs. Farming on the Northern Cheyenne Indian Reservation, 1900-1914.” *Montana: The Magazine of Western History* 31, no. 4 (1981): 14-23.
- Schuster, Helen H. “Yakima Indian Traditionalism: A Study in Continuity and Change.” Ph.D. Dissertation, University of Washington, 1975.
- Taylor, Kevin. “They Eat Horses, Don’t They? Bucking the Slaughterhouse Ban on Horses,” *Indian Country Today Media Network*, November 13, 2013. Accessed on August 14, 2014. <http://indiancountrytodaymedianetwork.com/2013/11/13/they-eat-horses-dont-they-bucking-slaughterhouse-ban-horses-152209>.
- Trafzer, Clifford E., and Scheuerman, Richard D. *Renegade Tribe the Palouse Indians and the Invasion of the Inland Pacific Northwest*. Pullman: Washington State University Press, 1986.
- “Tragedy Unfolds for Tribal Horses in the Pacific Northwest.” *American Wild Horse Preservation Campaign*, June 12, 2014, accessed August 17, 2014: <http://www.wildhorsepreservation.org/media/tragedy-unfolds-tribal-horses-pacific-northwest>.
- Tribal Council Records, 1897-1957. Yakima Indian Agency. Records of the Bureau of Indian Affairs. Record Group, 75. National Archives—Pacific Alaska Region. Seattle, WA.
- “Wild Ponies Declared a Nuisance.” *American Indian* (Seattle, WA) August 21, 1925, Lucullus V. McWhorter Collection. Manuscripts, Archives, and Special Collections. Terrell Library. Washington State University (Pullman, WA).
- Weisiger, Marsha L. *Dreaming of Sheep in Navajo Country*. Weyerhaeuser Environmental Book. Seattle: University of Washington Press, 2011.
- Wester-Leibhardt, Barbara. *Land Divided by Law: The Yakamas Indian*

*Nation as Environmental History, 1840-1933*. New Orleans:  
Quid Pro Books. 2014.

United States, and Kappler, Charles Joseph. *Indian Affairs: Laws and  
Treaties*. U.S. Govt. Print. Off., 1904.

### **Acknowledgements**

I would like to take a moment to say thank you to my mentor, Professor María Elena García, from the department of the Comparative History of Ideas (CHID). Her support and guidance has not only made this project possible, but opened doors that I never knew existed. There are truly no words that can fully express my gratitude to Professor García; she is both an amazing scholar and person. I would also like to thank the Ronald E. McNair Post Baccalaureate program for giving me the tools to advance toward my ultimate goal of earning a Ph.D. in History and providing me with a platform to publish my work. Finally, I would also like to thank the Early Identification Program and McNair Scholars Program at the University of Washington for providing me with funding to complete my research through the 2015-2016 Presidential Scholarship; I am truly grateful and honored.

Jennifer M. Smith  
History and CHID, Professor María Elena García  
Jms89@uw.edu

I am particularly interested in exploring the complex and often overlooked forms of Indigenous resistance to colonial hegemony and look forward to beginning my Ph.D. in History, beginning in fall, 2016.

“All of this Belongs to Us:” Land, Horses, and Indigenous Resistance  
on the Yakama Indian Reservation, 1900-1950