Chapter 5: Analysis of Media Messages about Genetics

Introduction

Americans receive most of their information about science from the media (Hopkins, 1998; Conrad, 2001; Geller et al., 2002; Tambor et al., 2002; Young, 2002; Ten Eyck and Williment, 2003). While advances in the science of genomics have clarified a number of important questions about the relationship between genes and environment, they also have consequences for the relationship of science to the public good. How the scientific community explains significant breakthroughs to the public has nontrivial impacts on the society's quality of life Weigold, 2001). On the other hand, the fact of the matter is that even medical professionals get much of their information about genomics from the media (Geller et al., 2003; Smart, 2003). According to Condit (2004), the media – not scientists or clinicians – provide the majority of public information about genomics.

Scholars of the topic agree that the media, perhaps more than any other slice of culture, have a significant impact on public discourse about the science of genetics and related issues (Hopkins, 1998; Conrad, 2001; Ten Eyck and Williment, 2003). In addition to informing the public, the media also may have a role in illuminating important issues that scientists or other supportive sources may gloss over, even to the point of prompting policy change (Shuchman, 2002; Holtzman et al., 2005). One reason that media influence on genomics discourse is so strong is that the public has neither an experiential basis nor sufficient science education about genomics to make reasoned decisions (Ten Eyck and Williment, 2003).

Although thousands of news stories about the promise and possibilities (both positive and negative) of genomics have been published since the 1990 announcement about the sequencing of the human genome, relatively little is known about the nature of media coverage (Cappella et al., 2005). And what is known was either published in response to the sequencing discovery, has concentrated on discerning the scientific accuracy of media coverage, or has focused on narrower concerns such as particular diseases and conditions. What is missing from the literature, we believe, is a contemporary, comprehensive, and systematic account of how the media covers genomics. As such, how the public understands (or misunderstands) science has a profound effect on its support for, or resistance to, a particular set of policies and programs.

As part of a larger project on genetic services policy, we conducted a content analysis of nearly 900 articles about genomics from 13 newspapers over a four-month period in 2006. Our goal was to capture a snapshot of what a typical media consumer might learn about genetics from reading their local newspaper. Our analytic approach is based on two related conceptual pillars. The first is what Hale (2007) terms "second-level agenda setting" and the second is framing (Goffman, 1974; Reese et al., 2005). In particular, we are interested in which genomics-related issues were covered. What prominence were they accorded? More importantly, how is genetics portrayed in the news? What frames were used to convey messages about genomics? What is the prevalence and the nature of frame elements such as messengers, attribution of responsibility

and the like (Iyengar, 1991)? In short, examining not only *what* genomics issues the media present to the public, but *how* these issues are presented, is useful to policymakers as they attempt to understand public sentiment around these complex issues.

The next section of this paper summarizes existing research literature on the coverage of genomics in the media. We then describe our methods and present our results. In the final section, we conclude with a discussion of the implications of our findings for public attitudes about genomics issues, and how these attitudes might affect the use of genetic services.

Background

Because of the concern that biased or inaccurate reporting can distort public opinion, a number of researchers have focused on the accuracy of the reporting of genomics research (Conrad, 2001; Shuchman, 2002; Bubela and Caulfield, 2004; Cappella et al., 2005; Holtzman et al., 2005). While most of these studies concluded that accuracy in reporting of *facts* is reasonable, many authors note that the media are very selective in the *topics* they choose to cover (Conrad, 2001; Petersen, 2001; Condit et al., 2002; Geller et al., 2003; Ten Eyck and Williment, 2003).

A good example of media coverage focusing on a specific issue is the Ten Eyck and Williment study. These researchers explored the differences in coverage between genomics issues relating to food and those relating to medicine by conducting a content analysis of almost 3,000 articles from the *New York Times* and the *Washington Post* from 1971 (NYT) and 1977 (WP) to 2001. They speculated that the less contentious coverage of medical issues relates to the fact that the public has more comfort and experience with technology in medicine than in food, and more trust in physicians and medical researchers (who "protect" us in the former area) than in government officials and corporate researchers (who oversee developments in the latter). While there is some implicit concern about second-level agenda setting in this study, there is not a systematic examination of framing.

Examples of an issue-specific focus can be found in Hoffman-Goetz and Friedman (2005), who examined seven mainstream papers and twenty-five ethnic papers for coverage of genomics issues relating to cancer, as well as Conrad and Markens (2001), who focused on coverage of the purported discovery of the "gay gene". Other studies have focused on the valence of the coverage. For example, Conrad (2001) found a positive frame in the coverage of genomics issues in the U.S. in the mid-1980s. Petersen (2001) reported a similarly positive frame in Australian print media coverage in the late 1990s. And some researchers have focused on contextual variables such as region; LTG Associates (2001), for instance, found both a large number of and a significant amount of geographic variation in genomics articles in 2001. There was relatively less coverage in the ethnic press, with the exception of an African-American publication in Chicago.

Racine et al. (2006) represent one of the few studies to call attention to framing (and to do so longitudinally). The authors examined the evolution of the media frames used in coverage of genomics discoveries in 749 articles in the Quebec press between 1992 and 2001. These authors found that the discourse of promise that characterized press coverage shortly after the human genome discovery gave way to public concern as ethical issues began to surface. However, as research successes increased and as public funding helped to institutionalize genomics research

in Quebec, the ethical frame gave way to an economic frame, during which time coverage increased in volume and in optimism.

Framing Genomics

The concept of frames is widely cited in the scholarly literature as an important cognitive tool that allows people to make sense of the world around them (Goffmann, 1974; Snow and Benford, 1988; Schank, 1990; Gilliam and Iyengar, 2000). Lippmann's famous quote, "the way in which the world is imagined determines at any particular moment what men will do" (1921:16), was perhaps the first formulation to connect mass communications to public attitudes and preferences. Frames refer to "an interpretive schemata that simplifies and condenses the 'world out there'" (Snow and Benford, 1992:137). These narratives can be conveyed through several frame elements including values, messengers, stories, visuals, and numbers. As Charlotte Ryan pointed out, "Every frame defines the issue, explains who is responsible, and suggests potential solutions. All of these are conveyed by images, stereotypes, or anecdotes" (1991:59); put differently, frames promote a particular definition, interpretation, or evaluation of an issue (Entmann, 1993).

Iyengar (1991) provides a useful conceptual tool for understanding how responsibility for social issues can be attributed in media coverage. His work discerns between episodic coverage (focusing on discrete events and individual actors), which he demonstrates leads to individual level attribution of responsibility, and thematic coverage (detailing broader trends, context, and environment), which leads to societal attribution. Likewise, the tone of media coverage can play an important role in the presentation of public issues in the news. Cognitive linguists distinguish between reasonable tone (e.g., engaged, interactive) and rhetorical tone (e.g., polemic, defensive) in public narratives (Bales, 2002). Not surprisingly, rhetorical tone leads to little public understanding.

Framing is important in understanding public perceptions about genetics and genetic services exactly because it directs people's thinking, and ultimately, action. As noted earlier, in lieu of an experiential basis to make judgments about genomics, people must rely on other sources to get useful information about the issue. And, as a wide body of literature in the social science attests, the media becomes an important part of the calculus for public thinking about social issues. Thus it is not simply a matter of the extent of media coverage of genomics (second-level agenda setting); it is the very nature of that coverage (framing) that is significant for public understanding. Therefore, in addition to discovering what is covered and how often, we are interested in the following frame elements: attribution of responsibility (episodic v. thematic frames); messengers (who speaks?);

This study adds to our understanding by examining print media coverage of a wide range of genetics issues in the United States during the four-month period from October 2005 through January 2006. The study was conducted in the context of an exploration of the integration of genetic services into clinical practice. Thus, we are specifically interested in how the portrayal of genetics and genomics in the media might influence how people view genetic services.

Methods

We conducted a content analysis of articles in 13 newspapers (2 national papers and 11 regional

papers) over the four-month period of October 2005 through January 2006.[1] The content of all 13 papers was searched and retrieved electronically using Proquest Newspapers. We searched the database for articles containing the following keywords: genomics; genetics; cloning; family history; gene; DNA; and pharmacology. These keywords are broader than but generally consistent with those used by other authors to locate genomics articles in the media (Ten Eyck and Williment, 2003).

We identified 1,041 articles that met our initial criteria. We eliminated duplicate articles and articles in which the keyword was used as a popular culture reference (e.g., "…Stephani set out to break free of not only No Doubt's shadow but also of blood-sucking *clones* like Ashlee Simpson and Kelly Clarkson…(emphasis added)" (Vaziri, 2005)). A total of 896 articles remained.

The project team created a codebook with 215 variables, including most of the variables used by Bubela and Caulfield (2004) and Ten Eyck and Williment (2003). Four coders read and coded all 896 articles. Inter-coder reliability was assured through training sessions at the beginning of the process and periodic checks throughout the coding process. Our inter-coder agreement was in the range reported for other studies in the literature (Condit, Ofulue, and Sheedy, 1998; Tambor et al., 2002).

Our code book originally contained 90 topic variables capturing the widest possible range of issues addressed by the articles. On the rule of parsimony, these were collapsed into seven broad categories that captured the spirit of the full range while creating sample sizes that were meaningful for analysis. The final topic categories are listed in Table 1 with their definitions. A complete list of topics and codes is available from the authors.

Table 1: Topic

Topics	
Forensics	all Legal from Supply of Services: forensics
Social	all Employment issues all Bioethics from Demand: health insurance life insurance from Social: discrimination privacy race disparities

[1] The newspapers are: the *Atlanta Journal-Constitution*, the *Boston Globe*, the *Advocate* of Baton Rouge, the *Chicago Tribune*, the *Houston Chronicle*, the *New York Times*, the *Orange County Register*, the *San Francisco Chronicle*, the *Salt Lake Tribune*, the *Seattle Post-Intelligencer*, the *Washington Post*, *USA Today* and the *Wall Street Journal*.

Cultural	all other Social issues (except discrimination, privacy, race, disparities)
Cloning	all Cloning subtopics (143 = 92% of cloning primary + secondary; 61 = 87% of primary)
Clinical	all Diseases all Supply of Services except forensics all Suppliers all Technology from Demand: consumers patients

We selected our study period to be current and sufficiently lengthy to yield a target of roughly 1,000 articles. However, we discovered that a dominant news topic during our study period was the scandal surrounding the alleged falsified data used by a South Korean cloning researcher. Because of the possibility that the relatively heavy coverage of this event might unduly bias the results, we conducted our analysis both with and without the 89 articles about this event.

Results

Table 2 shows the distribution of our final sample of 896 articles over the 13 newspapers we selected. Thirty-one percent appeared in national papers (*USA Today*, *Wall Street Journal*, *New York Times*); nearly half (47.9%) appeared in just three newspapers: *New York Times*, *Washington Post*, and *Chicago Tribune*.

Table 2: Distribution of Articles

Newspaper Name	Number of Articles	Percent
Atlanta Journal-Constitution	42	4.7
Boston Globe	77	8.6
Baton Rouge Advocate	44	4.9
Chicago Tribune	128	14.3
Houston Chronicle	93	10.4
New York Times	171	19.1
Orange County Register	24	2.7
San Francisco Chronicle	37	4.1
Salt Lake Tribune	27	3.0
Seattle Post-Intelligencer	16	1.8

The Washington Post	130	14.5
USA Today	42	4.7
Wall Street Journal	65	7.3
Total	896	100.0

Our analysis focuses on five questions related to the coverage of genetics in the media:

- What genetics issues are covered?
- How prominent is the coverage?
- How are these issues covered?
- How is responsibility depicted?
- What is the tone of the coverage?
- Whose voices are heard?
- How does coverage vary by topic?

What is covered?

From Table 3 it is clear that the primary topic of the majority of articles fell into one of two categories: clinical (33.1%) and forensics (22.9%). In addition, there were roughly 100 articles (11%) in each of three other categories: social, cultural, and research. Only 8.1% and 3.9% of articles fell into the cloning and government activities categories, respectively.

Eliminating the 89 articles about the South Korean research scandal primarily affects the social category (42 of 101 articles in that category are eliminated) and the cloning category (43 of 73 articles in that category are eliminated). The concentration of the remaining articles in the forensics and clinical categories is increased as evidenced in the third column of Table 3.

Table 3: Topics

Primary Topic	**Number of Articles**	**Percent**	**Without South Korea articles**	**Percent**
Forensics	205	22.9	205	25.4
Social	101	11.3	59	7.3
Cultural	94	10.5	92	11.4
Cloning	73	8.1	30	3.7
Clinical	297	33.1	296	36.7
Government Activity	35	3.9	35	4.3
Research	91	10.2	90	11.2
Total	896	100.0	807	100.0

Table: Importance of Coverage

Page Placement: Page Article Appears On	**Number of Articles**	**Percent**
First Page	223	25.2
Pages 2-3	150	17.0
Pages 4 and Higher	511	57.8
Total	884	100.0

Story Length	**Number of Articles**	**Percent**
100-500 Words	312	35.9
501-1000	364	40.8
More than 1000	208	23.3
Total	893	100.0

Origin of Story:	**Number of Articles**	**Percent**
Staff Only	552	70.1
Wire Only	131	16.6
Combination Staff & Wire	105	13.3
Total	788	100

Story Type: Type Classification	**Number of Articles**	**Percent**
Episodic Only	352	39.5
Thematic Only	333	37.3
Partially Episodic & Partially Thematic	207	23.2
Total	892	100.0

How is genetics covered?

Coverage of genetics is generally in a positive or neutral tone. The figures in Table 4 indicate that the tone of only 25.3% of all articles indicates a problem. When the articles about the South Korean research scandal are eliminated, this figure drops to 20.7%. In 32.5% of all articles, attribution of responsibility for the problem (or benefit) is assigned to a specific group or person. Most frequently, responsibility is attributed to the research community and the medical profession. Responsibility is attributed to the affected individual in only 6.5% of the articles.

Fifteen percent of the articles are editorials or opinion pieces. Recommendations about a future course of action are made in 32.2% of all articles. Among those, 84.1% recommend promoting genetics and only 15.9% recommend curbing genetics activities. These numbers are only

slightly affected by eliminating the South Korean articles: 33.2% contain recommendations, of which 84.4% recommend promoting genetics activities.

Table 4: Type of Coverage

Tone of Article	Number of Articles	Percent
Problem or Problem with some Benefit	223	25.3
Neutral	280	31.8
Benefit or Benefit with some Problem	378	42.9
Total	881	100.0

Attribution of Responsibility in Article	Number of Articles	Percent
Yes, Responsibility Attributed	291	32.5
Responsibility Not Attributed	605	67.5
Total	896	100.0

Opinion or Editorial Article	Number of Articles	Percent
Yes	134	15.0
No	762	85.0
Total	896	100.0

Type of Recommendation Made in Article	Number of Articles	Percent
Curb + Curb with Reservations	45	5.1
Promote + Promote with Reservations	238	27.1
None (No Recommendations)	596	67.8
Total	879	100.0

How prominent is coverage of genetic services?

Coverage of genetics is relatively prominent, as evidenced by the figures in Table 5. A quarter of all identified articles appeared on page 1 of a news section with another 17% on pages 2 or 3. More than half of all articles (60.5%) had at least some thematic aspect to the coverage (39.5% were purely episodic) and 70.1% were written by the newspaper's own staff. Only 16.6% were stories taken strictly from a wire service. Nearly a quarter exceeded 1,000 words in length.

Table 5: Prominence of Coverage

Page Placement:

Page Article Appears On	Number of Articles	Percent
First Page	223	25.2
Pages 2-3	150	17.0
Pages 4 and Higher	511	57.8
Total	884	100.0

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Whose voices are heard?

There were three dominant sources for the genetics articles in our sample: academics, government officials, and industry representatives (see Table 6). Non-profit organizations and those affected by the story's events provided input into 21.5% and 22.8% of all articles respectively. Consumers were rarely used as sources (3.8%).

Table 6: Sources

Source Type	Number of Articles	Percent of Articles[1]
Consumer	34	3.8
Non Profit	193	21.5
Person Affected	204	22.8
Industry	304	33.9
Government	357	39.8
Academic	367	41.0

[1] Indicates the number of articles with 1 or more of the source type. Articles can have more than one source type.

How does coverage vary by topic?

How is the topic covered? Given the wide range of topics, it is not surprising that coverage varies significantly across topic area. Table 7 presents the results of a crosstab analysis of an article's topic with its tone. While only 6.7% of the articles about forensics have a problem tone, nearly half of the articles about cloning (47.9%) and social issues (49.5%) do. However, these results are heavily influenced by the articles about the South Korea event. When these articles are removed, the percentage of social articles that have a problem tone drops to 36.2% and the percentage of cloning articles with a problem tone drops to 23.3%. The forensics category is unaffected as none of the articles in this category related to the South Korean affair.

On the benefit side, more than half the articles about forensics and research portray these issues in a positive light, as do nearly half the articles about clinical issues. When the South Korean articles are removed, 63.3% of the articles about cloning have a benefit tone.

Cultural issues appear to be covered reasonably neutrally, with more than half the articles bearing no evidence of either positive or negative tone. The coverage of governmental activity related to genetics is equally split between problem, benefit, and neutral tone.

Attribution of responsibility also varies by topic. Attribution is more likely to occur for articles about social issues (56.5%), cloning (53.4%), or government activities (57.1%). When the articles about the South Korean event are removed, the figures for social issues (39.0%) and cloning (36.7%) are closer to the overall average of 28%. Responsibility is much less likely to be attributed to any party for articles about forensics (25.4%) or cultural issues (19.1%). Neither of these figures is significantly affected by removing the articles about the South Korean researcher.

Table 7: Crosstab of Topics with Tone of Article

Topic		Tone			
		Problem or Mostly Problem	Benefit or Mostly Benefit	Neutral	Total
Forensics	Count	13	105	77	195
	% within Topic	6.7%	53.8%	39.5%	100.0%
	% within Tone	5.8%	27.8%	27.5%	22.1%
	% of Total	1.5%	11.9%	8.7%	22.1%
Social	Count	49	20	30	99
	% within Topic	49.5%	20.2%	30.3%	100.0%
	% within Tone	22.0%	5.3%	10.7%	11.2%
	% of Total	5.6%	2.3%	3.4%	11.2%
Cultural	Count	19	25	49	93
	% within Topic	20.4%	26.9%	52.7%	100.0%
	% within Tone	8.5%	6.6%	17.5%	10.6%
	% of Total	2.2%	2.8%	5.6%	10.6%
Cloning	Count	35	23	15	73
	% within Topic	47.9%	31.5%	20.5%	100.0%
	% within Tone	15.7%	6.1%	5.4%	8.3%
	% of Total	4.0%	2.6%	1.7%	8.3%
Clinical	Count	76	146	73	295
	% within Topic	25.8%	49.5%	24.7%	100.0%
	% within Tone	34.1%	38.6%	26.1%	33.5%
	% of Total	8.6%	16.6%	8.3%	33.5%
Government Activity	Count	11	11	13	35
	% within Topic	31.4%	31.4%	37.1%	100.0%
	% within Tone	4.9%	2.9%	4.6%	4.0%
	% of Total	1.2%	1.2%	1.5%	4.0%
Research	Count	20	48	23	91
	% within Topic	22.0%	52.7%	25.3%	100.0%
	% within Tone	9.0%	12.7%	8.2%	10.3%
	% of Total	2.3%	5.4%	2.6%	10.3%
TOTALS	Count	223	378	280	881
	% within Topic	25.3%	42.9%	31.8%	100.0%
	% within Tone	100.0%	100.0%	100.0%	100.0%
	% of Total	25.3%	42.9%	31.8%	100.0%

Whereas approximately 15% of all articles are editorials or opinion pieces, only 7.8% of forensics articles fall into this category. Nearly 25% of articles about cultural issues are op-ed pieces, as are 40.0% of articles about government activity. With regard to recommendations, articles about forensics and cultural issues are less likely than average to contain recommendations (24.4% and 19.4% respectively compared with 32.2% of all articles); articles about clinical issues are more likely to contain recommendations (38.8%), 87.6% of which are to promote genetic activities. Articles about government activities are also more likely to contain recommendations (48.4%), with 75.0% recommending promotion. These figures are unaffected by removing the articles about the South Korean researcher.

How prominent is coverage of the topic? There are no significant differences across topics in story placement, length, or origin. Stories about forensics and cloning are much more likely to receive episodic coverage (53.0% and 50.7% respectively compared with 39.5% overall), whereas coverage of clinical and government activities is more likely to be largely thematic (33.1% and 40.0% respectively compared with 23.2% overall).

Who speaks about the topics? The sources used to inform stories about the various genetic topics differ. Table 8 presents the pattern of sources by topic. Forensics articles are most often informed by government officials and affected parties, rarely by academics. Articles about social issues are sourced by industry representatives and academics, less often than average by government officials. Articles about cultural issues present many voices. More often than average, these articles present the voice of affected parties, less often than for other topics they present the voices of government officials and academics. Articles about cloning are more likely to be informed by academics, and much less likely by government officials or affected parties. Articles focused on clinical services present the voices of academics, industry representatives, and government officials. Articles about research activities are informed by very similar voices, although they are less likely to include those of affected parties. Finally, articles about government activities are, unsurprisingly, largely sourced by government officials.

Table 8: Topic and Source

	Government		**Industry**		**Non Profit**		**Academic**		**Consumer**		**Person Affected**	
	#	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**
Forensics	159	77.6	54	26.4	43	21.0	15	7.3	4	2.0	77	37.6
Social	20	19.8	45	44.6	21	20.8	71	70.3	3	3.0	17	16.8
Cultural	14	14.9	34	36.2	20	21.3	30	31.9	5	5.3	28	29.8
Cloning	10	13.7	25	34.2	18	24.7	49	67.1	3	4.1	2	2.7
Clinical	101	34.0	106	35.7	62	20.9	149	50.2	10	3.4	66	22.2
Government	22	62.9	6	17.1	8	22.9	8	22.9	4	11.4	5	14.4
Research	31	34.1	34	37.4	21	23.1	45	49.5	5	5.5	9	9.9

Discussion

Genetics continues to be a prominent topic of discourse in the print media. In the four months of our study period, nearly 900 articles appeared in 13 newspapers across the country. Half the stories focused on two dominant uses of genetic technology: forensics and clinical services. Discussions of social, cultural, and research issues were somewhat less prominent, with even less focus on government activities and cloning. Many of the articles about the more contentious social and cloning issues related to the scandal about falsified research results by a South Korean researcher that surfaced during our study period.

Especially when the articles about the South Korean event are removed, newspaper coverage of genetics is generally supportive and prominent, as evidenced by the tone and placement of coverage as well as the widespread use of staff writers and positive editorials. Discourse about forensics and clinical services is particularly positive, indicating widespread support for the primary applications of genetic technology. Public acceptance of these applications of genomics is implied by the largely observational coverage of these two topic areas. There are few op-ed pieces about forensics. Coverage is more event-driven as evidenced by the high percentage of episodic articles.

Coverage of the cultural issues raised by genetics, while less prominent than coverage of forensics, is more discussion-based; the higher percentage of opinion and editorial articles on these topics and lower percentage of recommendations indicates that discussion of the issues continues with no clear resolution.

The concerns over ethical and social issues prominent in the Quebec print media in the early 1990s (Racine et al., 2006) were either never shared by Americans, or have dissipated here as well. Although the public discourse about genomics will likely continue to evolve, the path to increased use of genetic services and their increasing integration into clinical practice seems virtually assured.

References

Bales, Susan Nall. “Topic: Taking Tone Seriously as a Frame Cue.” *Kids Count E-Zine*. FrameWorks Institute. Issue 17. October 2002.

Bubela, T.M., & Caulfield, T.A. (2004) Do the print media “hype” genetic research? A comparison of newspaper stories and peer-reviewed research papers. *Canadian Medical Association Journal*. 170(9), 1399–1407.

Cappella, J.N., Lerman, C., Romantan, A., & Lemi B., (2005) News about Genetics and Smoking: Priming, Family Smoking History, and News Story Believability on Inferences of Genetic Susceptibility to Tobacco Addiction. *Communication Research*, 32, 478-502.

Condit, C., (2004) Science reporting to the public: Does the message get twisted?. *Canadian Medical Association Journal*. 170(9), 1415–1416.

Condit, C.M., Achter, P.J., Lauer, I., & Sefcovic, E. (2002) The changing meanings of “Mutation:” A contextualized study of public discourse. *Human Mutation*, 19, 69-75.

Condit, C.M., Ofulue, N., &. Sheedy, K.M., (1998) Determinism and Mass-Media Portrayals of Genetics *American Journal of Human Genetics*, 62, 979-984.

Conrad P. (2001) Genetic optimism: framing genes and mental illness in the news. *Culture, Medicine and Psychiatry*, Jun, 25(2), 225-47.

Conrad, P.; Markens, S. (2001) Constructing the "gay gene" in the news: optimism and skepticism in the U.S. and British press. *Health*, 5(3), 373-400.

Culture and Media in Genetics Content, A preliminary investigation of newspaper coverage of topics related to genetics using a keyword search. (2001) LTG Associates, Inc., www.ltgassociates.com

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm., *Journal of Communication*, 43(4), 51-58.

Geller G., Bernhardt B.A. Holtzman N.A. (2002) The media and public reaction to genetic research. *Journal of the American Medical Association*, 287(6), 773.

Geller G, Tambor ES, Bernhardt BA, Rodgers J, Holtzman NA. (2003) Houseofficers' reactions to media coverage about the sequencing of the human genome. *Social Science & Med*icine, 56(10), 2211-20.

Gilliam, F., & Iyengar, S. (2000) Prime suspects: the influence of local television news on the viewing public, *American Journal of Political Science*, 44, 560-73.

Goffman, E. (1974) Frame Analysis: An Essay on the Organization of Experience. Cambridge: Harvard University Press.

Hoffman-Goetz, L., & Friedman, D.B., (2005) Disparities in the Coverage of Cancer Information in Ethnic Minority and Mainstream Mass Print Media, Ethnicity & Disease, 15,(2), 332–340.

Holtzman NA, Bernhardt BA, Mountcastle-Shah E, Rodgers JE, Tambor E, Geller G. (2005) The quality of media reports on discoveries related to human genetic diseases. Community Genetics 8(3),133-44.

Hopkins PD. (1998) Bad copies. How popular media represent cloning as an ethical problem. Hastings Center

Report, Mar-Apr; 28(2), 6-13.

Iyengar, S. (1991). Is Anyone Responsible? How Televison Frames Political Issues. London: Univ. of Chicago Press.

Lippmann, W. (1921) Public Opinion. New York: The Free Press.

Petersen A. (2001) Biofantasies: genetics and medicine in the print news media. Social Science & Medicine, 52(8), 1255-68.

Racine, E., Gareau, I., Doucet, H., Laudy, D., Jobin, G., & Schraedley-Desmond, P. (2006) Hyped biomedical science or uncritical reporting? Press coverage of genomics(1992-2001) in Quebec. Social Science & Medicine, 62, 1278-1290.

Ryan, C. (1991) Prime Time Activism: Media Strategies for Grass Roots Organizing. Boston: South End Press.

Schank, R. (1990) Tell Me A Story: Narrative and Intelligence. Evanston: Northwestern University Press.

Shuchman M. (2002) Journalists as change agents in medicine and health care. *Journal of the American Medical Association,* 287(6),776.

Smart A., (2003) Reporting the dawn of the post-genomic era: who wants to live forever? Sociology of Health & Illness, 25(1), 24-49.

Snow, D & Benford, R., (1988) Ideology, Frame Resonance, and Participant Mobilization. International Social Movement Research. 1, 217.

Snow, D.A., & Benford R.D,. (1992) Master Frames and Cycles of Protest. In AD Morris and CMC Mueller, (Eds) Frontiers in Social Movement Theory (pp. 456-472). New Haven: Yale Univ. Press.

Tambor ES, Bernhardt BA, Rodgers J, Holtzman NA, Geller G. (2002) Mapping the human genome: an assessment of media coverage and public reaction Genetic Medicine,4(1), 31-6.

Ten Eyck, T. A.; Williment, M. (2003) The national media and things genetic: coverage in The New York Times (1971-2001) and The Washington Post (1977-2001), Science Communication, 25(2), 129-152.

Vaziri, A., (2005). Step aside, Ashlee, Kelly and all you clones: Gwen Stefani has something to show you. San Francisco Chronicle. October 20.

Weigold, M. F. (2001). Communicating science: A review of the literature. Science Communication, 23, 164-193.

Young J.S. (2002)MSJAMA. Mass media and medicine: challenges and opportunities. *Journal of the American Medical Association,* 287(6),772.

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