

Determinism and Mass-Media Portrayals of Genetics

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Summary

Scholars have expressed concern that the introduction of substantial coverage of “medical genetics” in the mass media during the past 2 decades represents an increase in biological determinism in public discourse. To test this contention, we analyzed the contents of a randomly selected, structured sample of American public newspapers ($n = 250$) and magazines ($n = 722$) published during 1919–95. Three coders, using three measures, all with intercoder reliability $>85\%$, were employed. Results indicate that the introduction of the discourse of medical genetics is correlated with both a statistically significant decrease in the degree to which articles attribute human characteristics to genetic causes ($P < .001$) and a statistically significant increase in the differentiation of attributions to genetic and other causes among various conditions or outcomes ($P < .016$). There has been no statistically significant change in the relative proportions of physical phenomena attributed to genetic causes, but there has been a statistically significant decrease in the number of articles assigning genetic causes to mental ($P < .002$) and behavioral ($P < .000$) characteristics. These results suggest that the current discourse of medical genetics is not accurately described as more biologically deterministic than its antecedents.

Introduction

For several decades, scholars have expressed concern that the growth in our knowledge and understanding of human biology pushes us ever further into a reductionistic worldview in which human agency, social structure, culture, and free will are erased by deterministic formulas that describe human beings as mere animals responding to the iron laws of physics and evolution (Kaye

1997, p. 182). Recent dramatic developments in human genetics research have escalated these concerns, and scholars from all parts of the academy have begun to critique both public and scientific discourse about genetics, for its reductionistic biologism and consequent physical determinism (Lippman 1992; Smith 1992; Hubbard and Wald 1993; Nelkin and Lindee 1995; Peters 1997). As Ashkenas (1997) has noted, however, these critiques have not systematically characterized the deterministic components of the public discourse about genetics across time but instead have relied on highly subjective anecdotal impressions. Appropriate public-education programs on human genetics—and appropriate public policies to address the ethical issues that surround human genetics—require accurate assessments of the nature of the information that is disseminated to the public via the mass media. This study offers a description of the trends, across this century, in the deterministic contents of public discourse about genetics.

There is widespread concern that the increased public attention to genetics that has occurred in recent years is resulting in a public ideology that is ever more biologically deterministic. Dorothy Nelkin and Susan Lindee (1995) have provided the most thoroughly developed assertion that this trend exists, and they have labeled it “genetic essentialism.” They argue that “the images and narratives of the gene in popular culture reflect and convey a message we will call genetic essentialism. Genetic essentialism reduces the self to a molecular entity, equating human beings, in all their social, historical, and moral complexity, with their genes” (p. 2). Nelkin and Lindee (1995) argue that genetic essentialism is pervasive in the mass media, and their book constitutes a catalogue of examples of salutary, deterministic, and discriminatory discourse about genetics. Nelkin and Lindee do not clearly indicate whether they believe that genetic science itself is inherently deterministic, but they insist that popular discourse about genetics slides into an accounting for human characteristics that assigns causality solely to genes. They indicate that “the popular appeal of genetics—focusing on the ‘oracle of DNA,’ the ‘blueprint of destiny’—lies partly in its image as a predictive science: a means to uncover predispositions. . . . in the quest to identify genetic predispositions, however, the statistically driven concept of correlation is often reduced to ‘cause’” (pp. 164–168).

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The biologist Ruth Hubbard and her coauthor Elijah Wald (1993) agree with Nelkin and Lindee. They refer to genetic essentialism as reductionism, and they argue that "the myth of the all-powerful gene is based on flawed science that discounts the environmental context in which we and our genes exist. It has many dangers, as it can lead to genetic discrimination and hazardous medical manipulations" (p. 6). Hubbard and Wald cite examples of genetic determinism from the popular press and argue that hereditarian thought has been on the upswing since the 1970s.

Many other scholars, including the medical professional Abby Lippman (1992) and the theologian Ted Peters (1997), have concurred with these arguments. However, the basis for these concerns remains largely anecdotal. Nelkin and Lindee rested their claims about the increasing genetic essentialism of popular discourse on a collection of materials that was large but was selected to support their central thesis. They made no apparent effort to provide comparative data across time. None of the other scholars writing about genetics has provided even that level of research with regard to the contents of public discourse about genetics. Given the centrality and criticality of genetics and its impacts on our vision of ourselves, a systematic description and analysis of the deterministic contents of mass-media discourse about genetics is clearly needed.

Methods

There can be little doubt that statements that defend, rely on, or presume genetic determinism exist in substantial numbers in popular discourse. It is more difficult, however, to assess their relative dominance and the degree to which this mode of discourse has increased or decreased, across time, as the revolution in human genetics research has gained increased public funding and attention. To ascertain these features, we collected systematic samples of mass magazines, congressional discourse, major newspapers, and television news coverage. Because they offer the largest, most systematic, and most rigorous sample, the data from the mass magazines are here reported in detail. Similarities to and differences from other media will be noted.

Popular U.S. magazines were surveyed in the following manner. *Reader's Guide to Periodical Literature* listings for 1919-95 were divided according to 5-year time blocks (hereafter called "pentades"). For each pentade, a total of 50 articles listed under the headings "heredity," "genes," "eugenics," "defectives," "sterilization," and "genetics" (and variants and subheadings of these) were selected. In some earlier pentades, somewhat fewer than 50 articles were available. In the later pentades, as many as 250 articles were available (owing, at least in part, to the enormous expansion in the number of magazines

covered by the *Reader's Guide*); in these periods, articles were numbered serially, and 50 articles were selected by means of a random-numbers table. Articles from scientific publications (e.g., *Science*) and from popular science magazines (e.g., *Omni* and *Popular Science*) were excluded from the sample.

A coding system was developed to measure three components of genetic determinism: the *degree* of genetic (or hereditary) determinism in the articles, the *type of feature* to which genetic causality was attributed, and the degree to which genes were attributed different levels of influence for various types of conditions (*differentiation*). The coding system was verified by three paid coders, who operated independently. Intercoder reliability rates were established, at 90% for degree, 85% for type, and 87% for differentiation, over 20% of the discourse (dispersed across various periods, to insure that reliability remained constant with changing discourse patterns).

Visual inspection of the data identified four time periods with distinctive profiles. In the following analyses, these time periods are represented by 2 pentades each, to produce parallel periodization and approximately similar numbers of articles, within the framework provided by the indexing practices of the *Reader's Guide*. Period 1, the era of eugenics, was ~1900-35 and is here represented by the 2 pentades that include 1919-31. Period 2, the era in which genetics was normalized as a replacement for eugenics, was ~1940-55 and is here represented by the 2 pentades that include 1945-54. Period 3, an era during which discoveries in molecular biology gained central attention and during which genetic counseling began to gain widespread public attention, was 1956-84 and is here represented by the 2 pentades that include 1967-76. Period 4, the era of "medical genetics" proper, was 1985-95 and is here represented by those pentades (this era provided the limit case that required constriction of prior discourse blocks to 2 pentades each, for parallelism). In all cases, deviation from exact 5-year blocks results from changes in the indexing procedures of the *Reader's Guide*. The trends reported below are relatively continuous; that is, alternate blocking of years generally produces similar results.

Results

The general trends indicate that, contrary to the claims of the critics, there has not been a significant increase, over time, in the level of determinism in the public discourse about heredity and genetics. Instead, statistical analysis of these data verifies that more-recent discourse about genetics has become somewhat less deterministic; however, careful attention to the details of these features is necessary. Assessment of the relative dominance of genetic determinism depends on the type of measure used

and on one's interpretation of the optimal description of the role of genes in human outcomes.

Degree of Determinism

To measure the degree of determinism, coders scored each article as either attributing human outcomes to the gene only, attributing outcomes to the gene and to other factors, or explicitly opposing assignment of causal influence to the gene. Because Lamarckism was a seriously debated topic in some pentades, the coders recorded whether an explicitly pro- or anti-Lamarckian position was taken. These positions are grouped from high in determinism (rated "3") to low in determinism (rated "1"). Thus, an article that said that "heredity is the sole potent determiner of the behavior of children" would be scored as highly deterministic, whereas an article that said that "genes influence human outcomes along with environmental concerns" would be scored as moderate in genetic determinism. Articles that deny any role to the gene would be scored as lowest in genetic determinism.

This coding scheme provides only a broad measure of degree of determinism, since articles within any given category may include a substantial range of statements. Typically, articles make between zero and five explicit statements about the causal influences of genes and/or environment. If only one of these statements in an article explicitly attributes influence to the environment, whereas all other statements attribute influence to the gene, the article would be assigned to the middle category (2; gene + environment). Therefore, a rating of 2 (gene + environment) should not be interpreted as signifying equivalent emphasis on genetic and environmental factors but merely as signifying that both types of factors are explicitly acknowledged.

The results indicate that deterministic contents have not increased over time and have in fact decreased during the most recent period. The changes in the relative determinism across the time periods are statistically significant ($\chi^2[6N = 262] = 18.06, P < .001$) (see table 1). These trends include the disappearance of a high degree of polarity, in the early eugenics period (period 1), in favor of more uniformly genetically deterministic accounts in period 2 (primarily attributable to an enormous shift from pro- to anti-Lamarckism) and in period 3, followed by a statistically significant decrease in mean genetic determinism between periods 3 and 4 ($t[129] = -2.19, P < .030$). These data suggest that recent media attention to genetics has not been accompanied by increased determinism.

Given the breadth of the "genes and environment" category, it might be suggested that the negative change in emphasis cited by the critics had occurred via a relative shift within this category. Qualitative analysis (C. M.

Condit, unpublished data) does not indicate a major change in relative emphasis, either from gene to environment or the reverse. Although there have been substantial changes in the qualitative framing of the role of genetics across these eras, these qualitative changes remain within a rather stable assignment of relative influence to genes and environment, bracketed within broad variance among articles within each period. A quantitative measure that attests to this relative stability is the articles' affective positivity toward genetics, which was surprisingly similar in time periods 1, 3, and 4 (mean rating on the 1–3 scale was 2.61 for period 1, 2.89 for period 2, 2.60 for period 3, and 2.60 for period 4 [intercoder reliability 80%]).

Although the lack of increase in determinism is fairly clear, it is more difficult to offer a definitive interpretation of the relative dominance of genetic determinism within these periods of discourse. The most frequently employed discourse throughout all periods has assigned causality both to genes and to other factors (see table 1). However, in most time periods, causal force is attributed solely to genes in approximately one third of the articles, whereas articles that deny any role for genes are virtually absent. Whether this is an appropriate balance or whether it instead represents excessive determinism will depend on one's own view of the role of genes. Moreover, qualitative assessment of the various models employed in these periods also bears on judgments about the appropriateness of the portrayals.

Types of Characteristics

Perhaps surprisingly, change in the types of characteristics that have been attributed to genetic causes has also been in a more progressive direction. Table 2 indicates that there has been no statistically significant shift in the attribution of physical characteristics (e.g., height, weight, hair color, eye color, or disease) to genetic causes. However, there have been statistically significant reductions in attribution of mental characteristics (e.g., intelligence, mental illness, or mental retardation) ($\chi^2[3N = 288] = 14.95465, P < .001$) and behavioral characteristics (e.g., personality, criminal propensities, or moral actions) ($\chi^2[3N = 288] = 40.35814, P < .001$) to genetic causes. There has been an increase in ambiguous statements (e.g., genetics is the "secret of life") ($\chi^2[3N = 288] = 10.39133, P < .015$). Overall, across time, coders found a consistent trend in which fewer statements were made that attributed mental and behavioral characteristics to genetic causes. In the two most recent time periods, these trends were statistically significant only with regard to ambiguous characteristics ($\chi^2[1N = 453] = 4.28479, P < .038$). Much of the shift away from the attribution of mental and behavioral characteristics to genes occurred between the middle two

Table 1

Relative Degree of Genetic Determinism in Mass Magazines

ARTICLES WITH STATEMENTS THAT	TIME PERIOD			
	1 (1919-31)	2 (1945-54)	3 (1967-76)	4 (1985-95)
Oppose genetic influence (or pro-Lamarckian)	7 (8.4%)	1 (2.1%)	0 (0%)	0 (0%)
Attribute influence to both genes and environment	51 (61%)	28 (58%)	41 (55%)	41 (73%)
Attribute influence to genes only (or anti-Lamarckian)	25 (30%)	19 (40%)	34 (45%)	15 (27%)

NOTE.— $\chi^2 = 18.05857$ ($P < .006$), calculated across all three conditions in all four time periods.

time blocks (period 2, 1945-54, vs. period 3, 1967-76). This finding is important; those unfamiliar with the history of public discourse about heredity and genetics often presume that attributions of behavioral and mental characteristics to genes represent a recent "expansion" of genetic attributions, whereas such broad attributions extend back to the earliest eras here surveyed and were in fact more prominent in earlier eras. Crime, "imbecility," and promiscuity were regularly attributed to primarily hereditary causes, in the decades before 1965; however, in terms of absolute representation, a focus on physical characteristics dominated through all four time periods.

Differentiation

Critics of genetic discourse tend not to make distinctions between statements that link genes to features that are most appropriately described as genetic (e.g., eye color) and features that are more obviously multifactorial (e.g., the ability to play a Saint-Saens piano study). Some critics make no such distinction because they believe that all mentions of genetic causality are problematic (or even errant [Smith 1992]). However, for those who believe that some attribution of genetic influence to human outcomes is appropriate (e.g., Cranor 1994), a measure of the degree to which popular discourse makes such distinctions seems to be an important tool. Table 3 reports the degree to which magazine articles differentiated among conditions, assigning some characteristics or traits greater degrees of genetic causation and others lower degrees of genetic causation. In all periods, nondifferentiation is most prominent. However,

in a subset of articles, nondifferentiation can be attributed to the fact that only one characteristic is addressed. Moreover, changes across the four time periods are significant ($\chi^2[3N = 288] = 15.88410$, $P < .001$), and the trend is clearly toward increasing differentiation. That is, across time, magazine articles were making finer distinctions among the relative degrees of genetic influence on various types of conditions. This would appear to represent an increasing sophistication about both the probabilistic character of genetics and the partiality of its role (see Condit 1997).

Other Media

Sample design for newspapers, news programs, and congressional discourse is insurmountably problematic in a variety of ways. There are no consistent national indexes for newspapers that span these time periods; indexing of single newspapers varies widely and, for most newspapers, is relatively recent. Recorded news programs (obtained from the Vanderbilt Television News Archives, Vanderbilt University Library, Nashville) are also confined to recent eras. Regrettably, congressional discourse before the 1990s is very poorly indexed. These limitations prevent a controlled comparison of discourse in these media across time. Therefore, data collected from these other media are here used only to assess the degree to which mass magazines are representative of the broader range of public discourse. These data indicate that newspapers are more deterministic in tone than are magazines; mean degree of determinism in the magazine sample was 2.32, whereas mean degree of determinism in the newspaper

Table 2

Types of Characteristics Attributed to Genetic Causation, in Mass Magazines

ARTICLES WITH STATEMENTS THAT LINK GENES TO	TIME PERIOD				χ^2	<i>P</i>
	1 (1919-31)	2 (1945-54)	3 (1967-76)	4 (1985-95)		
Physical features	64 (65%)	38 (58%)	68 (65%)	55 (59%)	1.670	.644
Mental features	63 (64%)	25 (38%)	52 (50%)	37 (40%)	14.955	.002
Behavior	48 (49%)	13 (20%)	14 (14%)	16 (17%)	40.358	.000
Ambiguous qualities	19 (19%)	23 (35%)	25 (24%)	35 (38%)	10.39	.015

NOTE.—Percentages in columns do not add up to 100% because categories are not mutually exclusive.

Table 3

Differentiation among Degrees of Genetic Causation for Various Types of Traits, in Mass Magazines

	TIME PERIOD			
	1 (1919-31)	2 (1945-54)	3 (1967-76)	4 (1985-95)
Articles with differentiation	5 (5%)	10 (15%)	17 (16%)	24 (26%)

NOTE.— $\chi^2 = 15.8841$ ($P < .001$), calculated across both conditions in all four time periods.

sample was 2.47. Similarly, across time, levels of differentiation in magazines trended from 5% to 26%, whereas levels in newspapers trended from 2% to 5%. Newspapers also do not show the decrease in determinism, across time, that was observed in the magazine sample. However, they show similar patterns with regard to types of characteristics attributed to genetic causes.

The discourse of the *Congressional Record*, although surprisingly sparse, was also more deterministic (at least as indexed). Television news programs were present only in the two most recent time periods. Compared with magazines, they show less differentiation and a somewhat greater tendency to attribute traits to genes alone rather than to genes in combination with other factors (mean degree of determinism 2.55). There was no statistically significant change, across time, in degree or differentiation, in television news programs, but types of characteristics attributed to genetic causes were similar to those in the magazines. Generally, therefore, popular magazines have evolved, to become less deterministic in tone, while other media have remained static. However, all media show similar patterns in the types of characteristics attributed to genetic influence.

The less genetically deterministic character of the mass magazines may be attributable to their particular functions in public communication. Newspapers and television news tend to report immediate events, whereas magazines tend to discuss those events in larger frameworks. That newspapers are more representative of public impressions of genetics is not self-evident. Newspapers, through their narrow focus on immediate discoveries and events, appear more often to report only the activity of the genes. However, when space limitations are eased, as in magazines, representations that include environmental factors are more common, which suggests that the broader public understanding includes environmental influences. Moreover, when audiences are exposed to "gene-only" discourse, they nonetheless tend to interpret that discourse in a nondeterministic fashion (Condit and Williams 1997), which suggests that the dominant public vision may be the vision represented in the magazines and that short newspaper articles are read as subcomponents of the dominant frame. It remains of potential concern that truncated newspaper reports might, over time, reconstitute the dominant public understandings in a narrower way. Whatever the relative

importance of different media and the relative balance of genetic and environmental attributions within each medium, trends across time do not indicate an increase in genetic determinism in any of these media, especially during the most recent time period.

Discussion

Taken as a whole, this systematic study of the character and degree of genetic determinism in popular media does not support statements by critics that contemporary attention to genetics represents an increasingly biologicistic determinism. In mass magazines, the trend in public discussions about genetics is away from a reductionistic genetic determinism or genetic essentialism. In other media, the trend is relatively static. These findings do not bear on whether the current balance of treatment is appropriate. However, this study suggests that public translations of scientific research on human genetics can be accompanied by the development of public vocabularies that recognize the ways in which genetic factors exert influence on human outcomes without portraying those factors either simplistically or as all-powerful. Public education efforts should encourage development of such vocabularies.

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