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Lost in Translation? A Comparison of Cancer-Genetics Reporting in the Press Release and its Subsequent Coverage in Lay Press¹

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Abstract

Understanding how genetic science is communicated to the lay public is of great import, given that media coverage of genetics is increasing exponentially and that the ways in which discoveries are presented in the news can have significant effects on a variety of health outcomes. To address this issue, this study examines the presentation of genetic research relating to cancer outcomes and behaviors (i.e., prostate cancer, breast cancer, colon cancer, smoking and obesity) in both the press release ($N = 23$) and its subsequent news coverage ($N = 71$) by using both quantitative content analysis and qualitative textual analysis. In contrast to earlier studies reporting that news stories often misrepresent genetics by presenting biologically deterministic and simplified portrayals (e.g., Mountcastle-Shah et al., 2003; Ten Eych & Williment, 2003), our data shows no clear trends in the direction of distortion toward deterministic claims in news articles. Also, other errors commonly attributed to science journalism, such as lack of qualifying details and use of oversimplified language (e.g., “fat gene”) are observed in press releases. These findings suggest that the intermediary press release rather than news coverage may serve as a source of distortion in the dissemination of science to the lay public. The implications of this study for future research in this area are discussed.

Keywords

Genetics; Press Release; Lay Press; Science Communication; Science Journalism

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Introduction

Understanding how science is communicated to the lay public is of great import, given its impact on matters of both personal and public health (Lee & Scheufele, 2006). U.S. news media serve a critical health education service in the provision of timely, accurate information. Consumed by a majority of Americans, news media is often cited as a primary source of health information (Geller, Bernhardt, & Holtzman, 2002; National Science Foundation, 2002). Prior research involving representation of science in print media suggests that coverage is often exaggerated and inaccurate, thus preventing lay audiences from adequately understanding science reporting in mainstream media (Bubela & Caufield, 2004; Conrad, 1997; Kua et al., 2004; Singer, 1990). However, relatively little attention has been paid to the press release as an intermediary source in the dissemination of science news to the general public in terms of its quality and accuracy of representation.

An area of science that has received increasing media attention involves genetics (Cappella, Lerman, Romantan, Baruh, 2005; Condit et al., 1998; Conrad & Weinberg, 1996; Gaskell & Bauer, 2001; Nelkin & Lindee, 1995). Topical content analyses demonstrate exponential growth in incidence of reporting regarding matters of genetics and health (Cappella et al., 2005; Mountcastle-Shah et al., 2003; Parrot et al., 2004; Ten Eyck & Williment, 2003). For example, Cappella et al. report that *each year* approximately 8,000 stories about genetics and health are disseminated to the American public.² [[check with Danielle re more accurate updates]] Many print and broadcast stories offer gene-based explanation for a variety of diverse health outcomes (Bernhardt & Cameron, 2003; Cappella et al. date; Parrot et al., 2004; Silva, 2005).

This increased public attention to genetics has created widespread concern that “hyped” reporting on genetics is resulting in a public ideology that is increasingly biologically deterministic (Condit et al., 1998; Lippman, 1992, 1993; Nelkin, 2001). Nelkin & Lindee (1995) label this trend, conveyed through “images and narratives of the gene in popular culture,” genetic essentialism” (p. 2). They argue “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). Examples of genetic determinism are widespread in the popular press and, according to Hubbard and Wald (1993), have been on the upswing since the 1970s.

This deterministic reporting is worrisome in that the ways in which genetics research is presented in the news can have significant effects on an individual’s perception of risk (Condit & Parrot, 2004), genetic determinism (Condit & Condit, 2001), and health behaviors (Cappella et al., 2005; Frosch, Mello, & Lerman, 2005). Media coverage focusing on the negative aspects of genetic discoveries may lead audiences to fear their application and have an adverse impact on utilization of genetic services or involvement in genetic research (Caufield, 2000; Geller et al., 2002; Melzer & Zimmern, 2002). Those who have deterministic attitudes about genes may make less effort to engage in disease screening tests

²Based on a content analysis of 20 U.S. major newspapers, 3 U.S. major broadcast news networks, and the Associated Press from the period between 1997 and 2003.

and disease preventive behaviors, whereas those who underestimate the role of gene may more actively go through screening tests and engage in more healthy behaviors (Cappella et al., 2005; Parrot et al., 2004).

This study investigates the accuracy of science reporting in the context of genetics by examining U.S. newspaper coverage resulting from announcements made within the scientific community between July 2004 and June 2007. To this end, we identify slippages and inconsistencies in causal language that occur between the press release and subsequent newspaper coverage, under the assumption that inaccurate or exaggerated coverage found in newspaper coverage may, in part, be attributed to the intermediary press releases.

Literature Review

Early studies on the accuracy of science reporting in mass media included scientists' evaluations of news stories based on their own work (e.g., McCall & Stocking, 1982; McCall, 1988; Tankard & Ryan, 1974; Tichenor, Olien, Harrison, & Donohue, 1970). The most common errors reported include omission of critical information, misquoting, simplifying headlines, and missing context information. However, it has been argued that asking scientists to evaluate science journalism can be subjective and biased, due to the existence of different standards between science journalists and scientists (Carsten & Illman, 2002; McCall, 1988). Certain types of errors, such as changes in language, are susceptible to scientists' own biases. To redress this issue, the following studies began to adopt more systematic comparative content analysis in their identification of the discrepancies as science-related information travels from laboratory to lay press.

Comparison of Original Science with Subsequent Press Coverage

Singer (1990) conducted comparative content analytic work across different sources of science information in this area. Selecting stories appearing from September 1 to December 31, 1984 in the 15 media channels, Singer (1990) investigated what errors science journalists commit in covering science. Unlike previous studies, science coverage was coded by the researcher. After coding these stories according to 11 dimensions (i.e., inaccurate reference to published source, substantially different statements, change of emphasis, misleading headlines, translation, less precise formulation, assimilation of speculation to fact, omission of important results/qualifying details, details of methods, and resulting overgeneralization), Singer found that 40% of stories included statements that were significantly different from the original science articles. Additionally, in 45% of the stories, emphasis changed and 18% of news coverage included the presentation of journalists' speculations as scientific fact.

More closely related to our topic, focusing on genetic research in the news, Conrad (1997) conducted a small, case study, showing some differences between newspaper articles and one gene-related JAMA article on the relationship between a specific gene and alcoholism. Interestingly, eight months later, JAMA published a second study whose findings counter those from the first article. Conrad notes, however, that newspapers and newsmagazines did not afford as much attention to the second study as they did to the first. Furthermore, some newspapers were found to cover the latter as confirming the former. Based on these findings, Conrad concluded that news coverage of science sometimes distort scientific facts.

In addition, there has been a series of research in terms of cancer-related information. For example, using the standards and procedures set by Singer (1990), Moyer, Greener, Beauvais, and Salovey (1995) assessed US magazines and newspaper articles on breast cancer and mammography from June 1, 1990 to May 31, 1992. They found that although among the total 116 stories, 113 identified citations to the original science article, only 60 articles were traceable. Also, of these 60 stories they identified 42 inaccuracies based on their comparison with the original science articles. Likewise, MacDonald and Hoffman-Goetz (2002) conducted the same kind of study with regard to Ontario daily newspaper articles regarding cancer in Canada. They also reached the conclusion that cancer information in newspapers is sometimes inaccurate and fails to mobilize people to adopt healthy lifestyle behaviors and screening behaviors.

Surprisingly few systematic studies have expanded their examination of science journalism to include the press release as a possible source of distortion. This is an area of research deserving closer scrutiny, given that developments within the science community are afforded more media attention when accompanied by a press release. In their efforts to compare press release content against originating science publications, Woloshin and Schwartz (2002) highlight limitations and potential conflicts of interest originating with the press release. Based on expert coders' evaluations of press releases, they found that only 22% of press releases about industry-funded research revealed their funding source and that only 23% of press releases mentioned research caveats.

A review of extant literature indicates that our understanding of how science information flows to the lay public is incomplete. The current study aims to address the research gap in two significant ways. First, the few studies investigating the communication of science via mass media that exist have focused on the comparison of reporting between original science articles and public press coverage. To the best of our knowledge, only a handful of studies have considered the role of the intermediary press release. When investigating distortion, the "middle-man" is an essential component.

Second, we investigate slippages and inconsistencies in causal language in both the press releases and newspaper article using the source's central claims as our unit of analysis. Previous studies treated a whole article as their analysis unit and conducted overall assessments of similarity between sources. Unlike these studies, the present study extracts key claims from each source in order to more accurately and objectively pinpoint possible discrepancies between different sources of genetic information.

Methods

Sample

In order to identify qualified news stories reporting on gene/cancer-outcome discoveries, articles were retrieved through the archives on Nexis.com using the following search terms: (NOCAPS (gene) OR genetic!) AND prostate cancer AND NOT (modified OR corn OR rape OR murder OR Lewinsky OR crime OR crops). Articles sampled were from all major U.S. newspapers published between July 2004 and June 2007. Identical searches were conducted for each of five cancer-outcomes: prostate cancer, breast cancer, colon cancer,

obesity, and smoking. Exclusion terms were used to eliminate the high return of articles that discussed technologies relating to genetically modified foods or the use of genetic information in a non-health context (see Cappella, Mittermaier, Weiner, Humphreys, & Falcone, 2007 for more information on selection of search terms).

Once the search syntax retrieved a list of articles, we limited the sample to news stories that received press coverage in more than one news source, to those that did not discuss multiple research efforts within a single article³ and to stories that contained traceable reference information to published research.

We then obtained all corresponding press releases from institution web sites and EurekAlert! or PRNewswire, electronic archives of releases for science writers. If original research findings discussed in news articles did not appear in a traceable press releases, the article was discarded. In total, twenty cases consisting of news article(s) and press release(s) were identified (see Appendix A).

Coding

We extracted the central claim(s) of each article and press release using criteria developed through an iterative process. A central claim was operationally defined as a sentence that expresses a gene-outcome relationship. The sentence had to be a statement (not a question) and had to express a gene-outcome relationship in humans (not animals or plants). The expression of the gene-outcome relationship in a central claim was also required to include a verbal link between the gene and the outcome. An example of a valid central claim is: “U-M scientists say fused genes trigger the development of prostate cancer,” with *fused genes* as the gene-phrase, *trigger* as the verbal link and *prostate cancer* as the outcome. We also coded verbs for framing language (using a 5-point scale ranging from “probabilistic” to “deterministic”). A sample set of five cases was consensus coded by the authors. Inter-coder agreement was quite high, for both claim identification (97.1%) and framing language classification (84.8%). All points of disagreement were resolved before researchers coded remaining articles.

In addition, we developed a more subjective coding scheme in order to capture important conceptual and contextual differences between information presented in the press release and information presented in related news coverage. Each claim was compared against all others to determine whether it could be classified as being present in both sources (i.e., press release and news article) or whether the claim was unique. Codes used to make these distinctions were created by classification of data into a priori categories drawn from the literature (see Singer, 1990; Tankard & Ryan, 1974) including <overgeneralization/simplification>, <assimilation of speculation into fact>, <contradiction>, and <level of specificity/qualifying information>. In order to assess reliability, five cases containing 109 claims were coded by two independent coders. Overall agreement was 79.8%.

³This was done in order to avoid difficulties in attributing claims to particular studies.

Analysis

All claims within each case that were coded as being present in both the case's press release(s) and its accompanying news articles were matched with all other claims within the case. This resulted in matched pairs, consisting of one central claim from the case's press release(s) and one central claim from the case's news articles. Matched pairs were then reviewed in order to determine whether their claims were comparable on the basis of verb-object agreement between the press release claim and the news article claim. Frequencies were run on verb similarity of matched pairs determined to be comparable, thus providing information regarding similarity of framing language used by the press release and the news article.

An accompanying qualitative textual analysis of unique central claims was performed in order to elucidate subtle, and not-so-subtle, shifts in meaning (Altheide, 1996). That is, claims not expressed in *both* the press release and an accompanying news article were examined within the context of the press release or news article in which they appeared. Separate analysis of these claims is valuable because it allows for a more nuanced understanding of (a) what types of information supplied by the press release are not being used by journalists; (b) what types of information, not presented in the press release, are being introduced into the lay press; and (c) how these differences between information presented in the press release and information presented in the general press contribute to shifts in scientific meaning.

Results

Analysis was based on 20 cases consisting of 23 press releases and 71 news articles. Three cases contained more than one press release and the average case had between three and four news articles. A total of 375 central claims were identified; 113 in press releases and 262 in news articles. Just over half (54.7%) of all central claims were coded as being present in both sources, while the remaining portion (45.3%) were unique to the source in which they were originally reported. Nearly 80% of claims that were coded as unique were introduced in the news article ($N = 134$); the remaining claims were only present in the press release ($N = 36$).

Central claims coded as being present in both sources were paired against the other press release/news article claims within the same case. For comparison's sake, only pairs that were similar in terms of both sentence object (e.g., cancer outcome) and verb forms (e.g., action versus existence/possession) were analyzed ($N = 369$). Among these pairs of comparison, 34.4% ($N = 27$ pairs) of the press release claims were found to use language that was more deterministic, whereas 33.1% ($N = 22$) of the time newspaper claims used more deterministic verb forms. A third of all pairs (32.5%; $N = 120$) included press release claims and news claims that used comparable causal language. While there are no clear trends in the direction of distortion toward deterministic or probabilistic claims, two thirds of the time when there is a clear shared claim, there is a change in one direction or another from the press release to the article.⁴

Central claims coded as being dissimilar to other claims ($N = 170$) in the news article(s) and press release(s) were reviewed qualitatively. Using a priori categories derived from a review of the literature, central claims were coded as being unique if they met one of the following five criteria: *presence of qualifications/level of specificity*, *overgeneralization/simplification*, *assimilation of speculation to fact*, *overgeneralization*, and *contradiction*. Below, descriptive examples of claims that illustrate each of these categories are provided. By extension, these examples are illustrative of the ways in which two sources create alternative representations of the original science.

Presence of qualifications/level of specificity

The majority of claims were considered unique because of variation involving presence (or absence) of qualifications including, but not limited to: background information, methodology, study limitations, and risk/benefit analysis.

An example of news coverage omitting facts about relevant past research and methodology follows. When scientists identified a set of genes that may be involved in breast cancer's spread to the lungs, Memorial Sloan-Kettering Cancer Center (MSKCC) issued a press release that coincided with the publication of study results in the journal *Nature*. Press release material provides information about an earlier study in which the same team of scientists identified a gene pattern in breast cancer cells that spread *to the bone*. This background knowledge provides a frame of reference for acknowledging that "the latest work shows that genes that prompt breast tumors to spread to the lungs are almost entirely different from [the previously identified set], with only six genes in common" (MSKCC, 2005). Of the press coverage resulting from this press release, only a *Newsday* story titled, "Cancer cells' need to roam; Scientists track breast tumor genes that somehow communicate to target other organs," provides any content that would allow readers the perspective to contextualize the presented findings (Ricks, 2005a).⁵

The MSKCC press release also details study methodology. Essentially, scientists were able to identify the pattern of cancer cells showing a propensity for migrating to the lung when a cell line from a breast cancer patient was *transplanted into mice*. Again, only the *Newsday* article discloses that the findings are based on a non-human sample.

The omission of qualifications is not limited to coverage in the lay press. In fact, news articles often included information not found in the press release. A press release issued by Harvard School of Public Health (2006) promotes its discovery of a gene variation associated with increased risk for obesity, identified "by testing 86,604 single nucleotide polymorphisms (SNPs), or DNA sequence variations, for an association to body mass index (BMI), a surrogate measurement for obesity." Barring an extensive review of the statistical technique used for analysis, the press statement is not forthcoming with contextual information (i.e., study limitations) necessary for accurate interpretation of the study's findings. Five of the seven resulting news articles, on the other hand, caution readers about

⁴Because we did not use sampling techniques to extract press releases and newspaper articles, no inferential statistics were conducted for this analysis.

⁵This story also ran in the Orlando Sentinel (Ricks, 2005b). These are essentially the same article, reprinted under a different headline. Ricks is a reporter for *Newsday*.

generality (e.g., “Like all scientific findings, [the evidence presented] needs to be confirmed by others,” Wade, 2006) and interpretability (e.g., “Scientists still need to pinpoint *how* the genetic variant affects weight,” Smith, 2006).

Other examples of omitting qualifying statements include a *USA Today* story that excluded precautions of the National Cancer Institute on the limited generality of findings (e.g., the study is based on a convenience sample, $N = 22$) and the set of articles from *Chicago Tribune*, *Los Angeles Times* and *Newsday* that did not disclose limitations involved with a progressive admixture mapping technique used by researchers at Dana Farber Cancer Institute.

Overgeneralization/Simplification

Central claims were also coded as unique in the event that they made overgeneralizations. An example of this can be found in the following comparison: In a 2005 press release titled, “U-M scientists say fused genes trigger the development of prostate cancer,” the principal investigator of a study run by the University of Michigan’s Medical School comments on the significance of their most recent findings: “The data in our study provides tantalizing evidence that gene fusion is the causative agent – the initiating event – in prostate cancer” (University of Michigan Health System, 2005). In the next day’s *USA Today*, a story headlined “Findings identify likely origins of prostate cancer,” by Szabo (2005). Its lead sentence states: “Researchers have found a set of genes that may play a key role in prostate cancer – a discovery that *doctors* are hailing as a *major breakthrough* that *changes the way they think* about the genetic roots of the disease” (Szabo, 2005).

A form of simplification that was frequently used throughout our sample, although not always resulting in a claim being coded as unique, involved the use of terminological short cuts such as “cancer gene.” In the present sample, ten out of twenty cases contained claims that expressed the relationship between genetics and health outcomes in the form “outcome-gene” (e.g., breast cancer gene, cancer-causing gene). The shorthand, which suggests a simplistic Mendelian single gene model, was also applied to more complex outcomes (e.g., the use of “fat gene” or “hunger gene” with regard to obesity). Of the ten cases using the “outcome-gene” term, its usage originates in the press release 70% of the time.

Assimilation of speculation to fact

A central claim could be coded as unique if it presented preliminary findings as if they were scientifically sound evidence. Let us refer to the earlier example, involving the discovery of a set of genes linking breast cancer’s spread to the lungs. The press release, drafted by the sponsoring institution, posited that the findings “shed new light” on the biology of breast cancer metastasis while also acknowledging the possibilities for advances in treatment and prognostic tools.

In contrast, coverage in the public press declared, “The finding is considered a landmark because *it is proof that specific genetic signature exists for each type of cancer* and the organ it spreads to” (Ricks, 2005a). According to the press release, the original science did not provide definitive empirical evidence on any accounts. In fact, it presents data in its

infancy. In addition to assimilating speculation to fact, this example also provides further illustration of overgeneralization. The original research focused specifically on metastases in breast tumors; any claims extending the findings beyond breast cancer and/or its metastases to the lungs are unwarranted and unsupported by the research.

Another example of assimilating speculation into fact includes *The Baltimore Sun* reporting that Johns Hopkins researchers had “deciphered the genetic code of breast and colon tumors” (Bor, 2006). According to the press release, while their research approach “holds great promise for providing an understanding of the genomic contributions to cancer...the findings are just the beginning” (National Institutes of Health, 2006).

Contradiction

Finally, central claims containing content contradictory to that appearing in other sources from a particular case were coded as being unique. As an example, one press release highlights the significance of recent findings, noting that “it had been previously assumed that genes that dictate metastases to specific organs did not exist,” (MSKCC, 2005). A *Newsday* article, published the next day, tells a different story: “We always knew that specific tumors went to certain sites, but we didn’t know which genes dictated where they went,” (Ricks, 2005a).

In a case involving research on genetic susceptibility to prostate cancer, press releases were issued by both the Journal of the National Cancer Institute (JNCI, 2004) and the Translational Genomics Research Institute (TGen, 2004). Each presents quite contradictory material about the international study and its findings. According to the TGen release researchers “zeroed in on *three* different regions of the genome containing genes that may make men more vulnerable [to prostate cancer].” Conversely, the JNCI release reports the study identified *five* chromosomal regions. In addition to discrepancies of how many genome regions are implicated in study findings, the TGen release includes a quote from one of published study’s lead authors, describing how the study “shows that hereditary prostate cancer genes exist...” (TGen). The JNCI release does not express the same level of confidence, declaring that while “no genes that confer prostate cancer susceptibility have been found to date” the chromosomal regions identified in the study are “likely to harbor prostate susceptibility genes” (JNCI).

Discussion

The analysis presented here compared central claims made by both press releases and public press coverage of cancer-related genetics research. After filtering out claims that were unique to one source within each case and eliminating pairs of press release – news article claims that were dissimilar in terms of verb form and object, the remaining pairs were compared on the basis of framing language. Earlier studies contend that news stories often misrepresent genetics by presenting biologically deterministic and simplified portrayals (e.g., Mountcastle-Shah et al., 2003; Ten Eych & Williment, 2003). In contrast to these findings, our data shows no clear trends in the direction of distortion toward deterministic claims in news articles. Worth noting, however, is that in a clear majority of cases (67%)

where there is a clear shared claim between a press release and its resultant news coverage there is a change in one direction or another.

Over 40% of claims expressing a gene-outcome relationship were not present, or similarly expressed, in both press release and news article. A variety of reasons for the mismatch were explored, the most common being omission of qualifications. In line with earlier findings (e.g., Kua et al., 2004; Singer, 1990), the present analysis confirmed that claims within the press release often emphasize methodology, history or the sociological environment of the research, while claims presented to lay public in news accounts provide little direct contextual information (e.g., “what has to happen before the finding is viewed as established knowledge”; Rowan, 1999, p. 206). Notably, the press releases studied here also committed errors of omission, failing to highlight study limitations or conflicts of interest.

Professional constraints oblige journalists to be highly selective in their efforts to condense the substantial amounts of scientific data presented within research reports. They may choose to omit information, by way of background information or description of methodology that they deem to be less crucial to public understanding of the science. In a similar fashion, communications staffs for journals and research institutions also make decisions in their attempts to generate hype about the research they are promoting.

The provision or omission of qualifications (e.g., details about past, related research, information about study methods, relevant information about results) are consequential to how a reader interprets a particular set of findings. In studies of focus-groups confronted with stories about a medication for patients with acquired immunodeficiency syndrome (AIDS), Rogers (1999) points out that participants wanted to know “where this new information fit into the bigger picture of what came before and what was next. Without such context, they had difficulty making sense of the information and deciding just how important it was in the larger scheme of things” (191).

Aside from economizing, science journalists are charged with communicating highly technical material to an audience of non-experts. Science journalists, then, employ methods of simplification (e.g., metaphorical language) to present content in a way that audiences will understand (Condit, 2007). To illustrate, a *Newsday* reporter uses simile to make an abstract science phenomenon more lucid: “There is what [the researcher] calls “crosstalk” between the cancer and the waiting - and vulnerable - environment of the lung. Think of this devastating communication as a predator sweet-talking its prey into a deadly trap,” (Ricks, 2005a). While it is sometimes difficult to envisage the ways in which simplification can affect a reader’s understanding, there certainly exist instances that illustrate how it can contribute to unintended and misguided interpretation (e.g., “We have discovered the Rosetta Stone of cancer” in McEnery, 2006).

Fifty percent of the twenty cases examined in this study expressed the relationship between genetics and health outcomes in the form “outcome-gene” (e.g., breast cancer gene; cancer-causing gene). Such a finding is not unusual. In his own descriptive research, Conrad (1997) reviews widespread press coverage of scientific research, published between 1991 and 1993, implicating genetics in the development of homosexuality. He notes that, in spite of explicit

statements of how unlikely it was that a single gene could determine sexuality, the press adopted the term “gay gene.” Media terminology can yield wider dissemination of images of complex disease as genetically driven phenomena, thus “[privileging] genetics in the public discourse and [reinforcing] ideas of genetic essentialism” (Conrad, p. 150).

In accordance with the notion that media often present data as “scientifically sound evidence rather than as preliminary findings with still uncertain validity” (Schwartz, Woloshin, & Baczek, 2002, p. 2863), our analysis finds that both news articles and press releases introduce data as clear-cut facts, excluding minor details and subtleties of the research thought to be inconsequential to public understanding. On the contrary, errors of assimilating speculation to fact, as well as the others uncovered during this analysis, are significant. Regardless of whether adequate source information is provided within a news article, few readers seek out the original scientific sources, thereby restricting the public’s interpretation to the one presented in the media (McInerney et al., 2004).

This study has a few limitations. First, our study was limited in that it only considered news coverage that was directly related to peer-reviewed articles. As a result, our study may under-represent stories flowing from other sources such as abstracts from scientific meetings which often go unpublished (Schwartz, Woloshin, & Baczek, 2002). Second, the nature of qualitative analysis introduces bias. Our coding scheme, although determined to be reliable, involved perceptions of the researchers that are subject to interpretation, as is any perception of an involved participant (Tankard & Ryan, 1974). Also, our study is limited to a specific field of science, involving communication of genetics research relating to cancer outcomes and behaviors. It is possible that, given the nature of our topic, patterns in reporting are not generalizable to other specific issues or to science reporting in general.

The dual approach adopted in this study produces a richly detailed picture of changes and continuities in the flow of information between sources. While this study, comparing the press release(s) and ensuing news coverage, is certainly instructive, it also illuminates the need for future research. A necessary next step would involve systematic assessment of the entire process by which scientific knowledge is communicated to the lay public as it moves from publications in science journals to lay press through the intermediary press release.

According to Zehr (2000), science news coverage should be characterized by uncertainty and controversy; others argue this should be the case even more so with genetic information (Dillard et al., 2004; Vlek, 1987). A number of studies have criticized news coverage on genetics and health for being inaccurate and unfair (Ransonhoff & Ransonhoff, 2001; Schwartz et al., 1999). In contrast, the data presented in this study indicate that journalists may not always be the primary source of oversimplified, biologically deterministic, or exaggerated claims. As Woloshin & Schwarz (2002) point out, press releases serve as a direct means of communication between science and medical journals and news media, thereby providing “an opportunity for journals [or research institutions] to influence how the research is translated into news” (p. 2858). Our data raise interesting questions about the role of the press release in “hyping” science to lay publications; those studied here often fail to highlight study limitations and use suggestive or exaggerated language. The press release

may very well be a source of distortion in the communication of science news and more research is needed to elucidate its influence.

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Appendix A: Case description and composition

Case #1: Genes that cause breast cancer to spread to other organs

(07/28/05)

Minn, A.J., Gupta, G.P., Siegel, P.M. et al. (2005, July). Genes that mediate breast cancer metastasis to lung. *Nature*, 436, 518–524.

- Memorial Sloan-Kettering Cancer Center press release
- Newsday
- Chicago Sun Times
- Orlando Sentinel
- Wall Street Journal

Case #2: U of Michigan gene (10/28/2005)

Tomlins, S.A., Rhodes, D.R., Perner, S. et al. (2005, October). Recurrent Fusion of TMPRSS2 and ETS Transcription Factor Genes in Prostate Cancer. *Science*, 310, 644–648.

- University of Michigan Health System press release
- Detroit News
- USA Today
- Detroit Free Press
- Baltimore Sun
- newsday

Case #3: Prostate cancer in young black males (08/22/06)

Freedman, M., Haiman, C.A., Patterson, N. et al. (2006, September 19). Admixture mapping identifies 8q24 as a prostate cancer risk locus in African-American men. *Proceedings of the National Academy of Sciences of the United States of America*. 103 (38), 14068–14073.

- Harvard Medical School press release
- Chicago Tribune
- Los Angeles Times
- Newsday

Case #4: Binge eating gene (03/07/06)

Hudson, J.I., Lalonde, J.K., Berry, J.M. et al. (2006). Binge-Eating Disorder as a Distinct Familial Phenotype in Obese Individuals. *Archives of General Psychiatry*. 63, 313–319.

- McClean Hospital press release
- Newsday
- Washington Post

Case #5: Smoking Taste Gene

Cannon, D.S., Baker, T.B., Piper, M.E. et al. (2005). Associations between phenylthiocarbamide gene polymorphisms and cigarette smoking. *Nicotine & Tobacco Research*, 7 (6), 853–858.

- University of Wisconsin-Madison press release
- Kansas City Star
- Pittsburgh Post Gazette
- Journal Sentinel, Milwaukee

Case #6: Cancer risk higher among African Americans (06/07/06)

Carey, L., Perou, C.M., Livasy, C.A. et al. (2006, June 7). Race, Breast Cancer Subtypes, and Survival in the Carolina Breast Cancer Study. *Journal of the American Medical Association*, 295 (21), 2492–2502.

- University of North Carolina School of Medicine press release
- JAMA and Archives Journals press release
- Atlanta Journal Constitution
- Chicago Tribune
- Daily News
- New York Times

- Newsday (NY)
- Philadelphia Daily News

Case #7: Prostate Susceptibility

Gillanders, E.M., Bao-Li Chiang, J.X., Lange, E.M. (2004). Combined Genome-Wide Scan for Prostate Cancer Susceptibility Genes. *Journal of the National Cancer Institute*. 96 (16), 1240–1247.

- Journal of the National Cancer Institute press release
- The Translational Genomics Research Institute press release
- Arizona Republic (x2)

Case #8: Healthy lifestyle and colon cancer (12/14/05)

Park, Y., Hunter, D.J., Spiegelman, D., et al. (2005). Dietary Fiber Intake and Risk of Colorectal Cancer. *Journal of the American Medical Association*. 294(22), 2849–2857.

- JAMA and Archives Journals press release
- Baltimore Sun
- Boston Globe

Case #9: Breast cancer death higher among African Americans (10/23_4/06)

Woodward, W.A., Huang, E.H., McNeese, M.D. et al. (2006). African-American Race is Associated with a Poorer Overall Survival Rate for Breast Cancer Patients Treated with Mastectomy and Doxorubicin-based Chemotherapy. *Cancer*, 107 (11), 2662–2668.

- University of Texas M.D. Anderson Cancer Center press release
- Chicago Sun Times
- Newsday (NY)

Case #10: Damaged Gene link (10/10–16/06)

Seal, H., Thompson, D., Renwick, A. et al. (2006, November). Truncating mutations in the Fanconi anemia J gene BRIP1 are low-penetrance breast cancer susceptibility alleles. *Nature Genetics*, 38 (11), 1239–1241.

- National Cancer Research Institute press release
- Milwaukee Journal Sentinel
- Orlando Sentinel
- newsday

Case #11: Black women with family history of breast cancer less likely to get genetic counseling (04/13/05)

Armstrong, K., Micco, E., Carney, A. et al. (2005, April). Racial Differences in the use of BRCA1/2 Testing Among Women with a Family History of Breast or Ovarian Cancer. *JAMA*, 293 (14), 1729–1736.

- JAMA and Archives Journal press release
- Philadelphia Inquirer
- Newsday

Case #12: Increased risk for black men (05/08/06)

Amundadottir, L.T., Sulem, P., Gudmundsson, J. et al. (2006, June). A common variant associated with prostate cancer in European and African populations. *Nature Genetics*, 38 (6), 652–8.

- deCode genetics press release
- Houston Chronicle
- Kansas City Star
- The New York Times
- Philadelphia Daily News
- San Jose Mercury News
- Washington Post
- Newsday

Case #13: Colon cancer tumors crack genetic code (09/08/2006)

Sjjoblom, T., Jones, S., Wood, L.D. et al. (2006, October). The Consensus Coding Sequences of Human Breast and Colorectal Cancers. *Science*, 314, 268–274.

- NIH/National Human Genome Research Institute press release
- Plain Dealer
- Baltimore Sun
- Charlotte Observer

Case #14: Genetic Effect of smoking (4/12/07)

Li, Y., Langholz, B., Salam, M. T., & Gilliland, F. D. (2005, April). Maternal and grandmaternal smoking patterns are associated with early childhood asthma. *Chest*, 127 (4), 1232–1241.

- University of Southern California press release

- Chicago Sun Times
- NY Times
- St. Petersburg Times

Case #15: Smoking Gene

Bailey-Wilson, J. E., Amos, C. I., Pinney, S. M., Petersen, G. M., de Andrade, M. et al. (2004). A major lung cancer susceptibility locus maps to Chromosome 6q23–25. *American Journal of Human Genetics*, 75, 460–474.

- NIH/National Human Genome Research Institute press release
- Denver Post
- Cincinnati Enquirer

Case #16. Common obesity gene

Herbert, A., Gerry, N. P., McQueen, M. B., Heid, I. M., Pfeufer, A. et al. (2006, April). A common genetic variant is associated with adult and childhood obesity. *Science*, 312, 279–283.

- Harvard School of Public Health press release
- Buffalo News (New York)
- The New York Times
- The Boston Globe
- Newsday (New York)
- The Washington Post
- San Jose Mercury News (California)
- THE SAN FRANCISCO CHRONICLE (California)

Case #17: African American Women (8/9/04)

Jones, B. A., Kasl, S. V., Howe, C. L., Lachman, M., Dubrow, R. et al. (2004, September). African American/White differences in breast carcinoma: p53 alterations and other tumor characteristics. *Cancer*, 101 (6), 1293–1301.

- Yale University press release
- John Wiley & Sons, Inc. press release
- Journal Sentinel
- Atlanta Journal Consti.
- Washington Post
- Sun Sentinel

- Hartford Courant

Case #18: Cluster of Cardiovascular risk factors (10/21/04)

Wilson, F.H., Hariri, A., Farhi, A., et al. (2004). A Cluster of Metabolic Defects Caused by Mutation in a Mitochondrial tRNA. *Science*, 306, 1190–1194.

- Howard Hughes Medical Institute press release
- Orlando Sentinel
- Detroit News
- Grand Rapid Press (Michigan)
- Washington Post

Case #19. Appetite-enhancing hormone

Zhang, J. V., Ren, P., Avsian-Kretchmer, O., Luo, C., Rauch, R. et al. (2005, November). Obestatin, a Peptide encoded by the Ghrelin gene, opposes Ghrelin's effects on food intake. *Science*, 310, 996–999.

- Stanford University Medical Center press release
- The Atlanta Journal-Constitution
- The Kansas City Star
- The New York Times
- San Jose Mercury News (California)

Case #20: mom/baby obesity

Whitaker, R.C. (2004). Predicting Preschooler Obesity at Birth: The Role of Maternal Obesity in Early Pregnancy. *Pediatrics*, 114 (1), 29–36.

- Mathematica press release
- Grand Rapid Press (MI)
- Star Ledger