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## *Limited Precision in Print Media Communication of West Nile Virus Risks*

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*The emergence of West Nile virus in the United States provides an opportunity to examine the effectiveness with which the print media communicate risks associated with a specific health threat. The authors surveyed articles on West Nile virus published in major North American newspapers in the year 2000 to assess the efficacy of risk communication related to this disease. They found that articles generally presented risk information with a low degree of contextual precision; that is, information was generally more qualitative than quantitative, and quantitative information that was present generally did not provide the relative context of a denominator. Therefore, the information provided was of limited usefulness to readers, in that it was insufficient to help readers make personal decisions required to reduce overall personal risk while minimizing personal cost. Their findings suggest that there is a distinct need for the media to provide more precise information about health risks.*

**Keywords:** *West Nile virus; encephalitis; infectious disease; risk communication; public education*

*In the summer of 1999, West Nile virus, a mosquito-borne flavivirus related to St. Louis encephalitis, was first detected in North America in New York City (Peterson and Roehrig 2001). The range of West Nile virus in North America has steadily expanded since that time. It had been detected in four*

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states by the end of 1999, twelve states by the end of 2000, and twenty-seven states and one Canadian province by the end of 2001. In North America from 1999 to 2001, there were 149 confirmed human cases of severe illness caused by West Nile virus, 18 of which resulted in death (Centers for Disease Control and Prevention 2002). As of 30 November 2002, the ArboNET surveillance network reported 3,389 cases of West Nile virus illness in North America for 2002, 201 of which resulted in death (Centers for Disease Control and Prevention 2002). The recent emergence and spread of West Nile virus in the United States emphasize the importance of communicating information about health risks to the public. The importance of risk communication has been further highlighted by incidents of anthrax-based bioterrorism (Enserink 2001) in the United States. Risk communication is critical in assisting people to make informed lifestyle, consumer, and voting choices; in minimizing unnecessary anxiety; and in ensuring that individual and societal resources are focused on higher magnitude risks and not unduly invested in lower magnitude risks (Covello et al. 2001; Covello, McCallum, and Pavlova 1989; Covello, Sandman, and Slovic 1991). As a source of information about health risks, the news media are critically important because many members of the public base their impressions about risks primarily on information presented in the media (Fischhoff 1985a, 1995; Kitlinger and Reilly 1997).

Risk-magnitude information varies along a continuum of contextual precision, with a low degree of contextual precision holding little informational value for the public and a high degree of contextual precision holding greater value (Griffin 1999; Resnik 2001). For example, the qualitative phrase *somewhat risky* communicates little useful information, whereas the quantitative phrase *five people died* communicates slightly more, and the precise quantitative phrase *five out of one hundred thousand people died* communicates much more. Given the inherent desirability of understanding relative risk (i.e., the magnitude of one risk in comparison with that of another) for decision making regarding appropriate level of concern and appropriate level of resource allocation, it is most informative and useful for citizens to understand the relative likelihood that an individual or population will be affected by a specific threat, that is, for citizens to understand the relative risk (Covello, Sandman, and Slovic 1991; Roche 2002). Assessment of relative risk is based on understanding the known or likely incidence of an effect (the numerator) and the size of the population within which the effect is, or is likely to be, observed (the denominator). For example, the phrase *five out of one hundred thousand people died* communicates information about both the numerator and the denominator and thus provides useful, contextual information concerning relative risk (Griffin 1999). There are numerous possibilities as to what exact denominator might be used to communicate the

magnitude of risks associated with West Nile virus, but this is not valid justification to omit denominator information entirely. We suggest that it is essential for those reporting on health risks to include some form of appropriate denominator, to provide context (see Griffin 1999; Lynn and Bond 1992).

There is substantial literature investigating risk perception and risk communication (see, e.g., Coleman 1993; Covello 1992; Fischhoff 1995; Fischhoff, Bostrom, and Quadrel 2000; Hornig 1990; Johnson 1999; Lundgren and McMakin 1998; Pechmann 2001; Sjoeborg 1998; Slovic 1986, 1987, 2000; Walker 1995) but little published work examining the completeness and level of precision with which the news media present information on specific public health threats. It is important that the news media provide precise risk-magnitude information about vector-borne infectious diseases such as West Nile encephalitis, St. Louis encephalitis, and eastern equine encephalitis. Such precise information can help the public to take reasonable precautions against diseases that can impose large personal and economic costs, diseases that may also increase in frequency in the United States if global climate change continues (Epstein 2000; Hubalek and Halouzka 1999). Such information can also educate the public and help individuals avoid levels of anxiety and concern that are out of proportion with actual risk.

Stories in the news media traditionally provide information about the “who, what, when, where, and why” of a topic (Hattis 1989). However, in a more general sense, media stories should provide information about a subject that the public really needs to know and wants to know (Arkin 1989; Fischhoff 1985a; Lesley 1982; Resnik 2001), stories that answer the critical question, as aptly framed by Griffin (1999), “So what?” With regard to an emerging infectious disease such as West Nile encephalitis, readers will benefit from at least three categories of information. First, what is the risk of the reader being affected by the disease? That is, what is the probability that the reader will be seroinfected with, become acutely ill from, and/or die of the disease, and how do those risks compare with other risks (e.g., the risk of dying of the flu)? Second, what are the symptoms of the disease, so that the reader can seek medical attention if he or she experiences those symptoms? Third, what can the reader do to reduce his or her risk of infection with the disease? Articles on health issues can have a range of different objectives, but all have the responsibility to communicate information regarding the magnitude of the described threat, the symptoms of the threat, and measures that can reduce the chance of being affected by the threat. To do so would generally take only a few sentences and would satisfy the needs of readers for essential, relevant information.

To examine the effectiveness with which the print media provided information on these questions, we conducted a Lexis-Nexis Academic Universe

Database search for articles published on West Nile virus in major newspapers and magazines in 2000. The data from our analysis allowed us to examine the frequency with which the print media reported useful information about West Nile virus. These data reveal the efficacy with which the media presented information about West Nile virus risks and can provide a baseline for evaluating future improvements in public communication of risk regarding infectious disease.

### *Method*

We searched for articles published in major newspapers in 2000 using the keywords *West Nile virus*, under the “General News” subheading of the “News” primary heading on the Lexis-Nexis Web site. Three hundred fifty-nine newspaper articles met criteria of subject matter (focusing on West Nile virus), geography (published in North America), word count (containing more than 250 words), and uniqueness (if the same article was published twice, only one version was analyzed). Of year 2000 newspaper articles with keywords *West Nile virus*, *West Nile encephalitis*, or *West Nile fever*, 95 percent used the term *West Nile virus*, whereas only 3 percent used the term *West Nile encephalitis*, and only 3 percent used the term *West Nile fever*. Therefore, articles including the keywords *West Nile virus* were deemed to provide a comprehensive picture of newspaper coverage of that topic.

Two coders conducted the analysis. Both had extensive postdoctoral and/or postgraduate experience with scientific data management and analysis, and both trained carefully for this particular coding task. A check sheet was designed prior to the study, tested in a pilot study, and then refined to increase category comprehensiveness. During the study, coders read articles, highlighting occurrences of information in predetermined content categories with a highlighter pen, and then checked these categories in the appropriate boxes of a code sheet. Data from the code sheets were then transferred to a data summary spreadsheet, which was used to calculate descriptive statistics.

A nominal quantification system was used, and the unit of analysis was any mention of information in selected information categories. Content categories were as follows: (1) qualitative-level information (nonnumerical phrases about risk, such as *dangerous*), (2) numerator-level information (data on numbers of individuals affected, such as “seven people died”), (3) number/population-level information (numerator/denominator information on numbers of individuals affected/size of population potentially affected, such as “2 percent of county residents were seroinfected” or “a one in three hundred thousand chance of seroinfection”), (4) risk comparison information

(mention of comparisons of the risks associated with West Nile virus with any other risks, such as the risk of dying from the flu), (5) symptom information (any mention of symptoms of West Nile virus illness), (6) mosquito source–reduction information (any mention of reducing/eliminating stagnant pools of water in which mosquitoes breed), and (7) personal protection information (any mention of methods of personal protection from mosquito bites, such as wearing long sleeves or applying insect repellent).

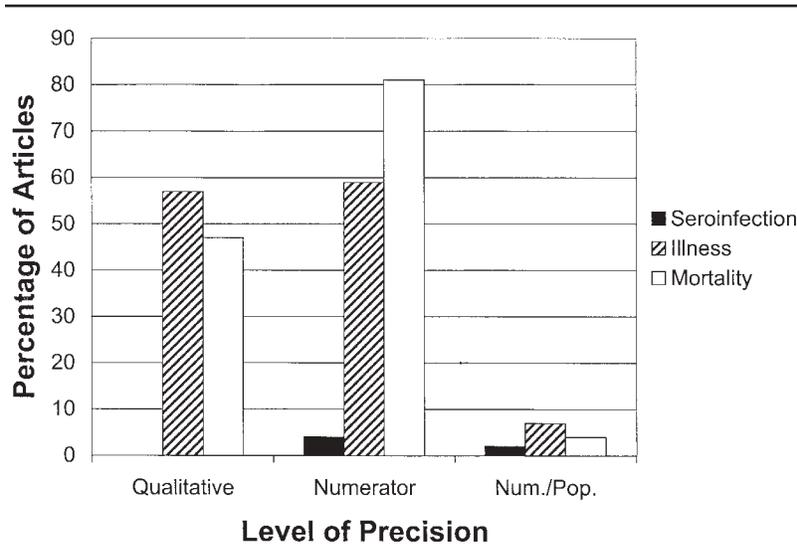
The risk assessment content categories (categories 1-3 above) were tabulated into the following effect subcategories: unspecific (e.g., mention of unspecified risks or effects, such as mention of *cases* of West Nile virus, a word that is unclear about level of effect), seroinfection (direct mention of the word *seroinfection*, *seropositive*, or *infection*), acute illness (direct mention of hospitalization or specific acute effects, such as muscle pains), and mortality. That is, there were boxes on the code sheet for qualitative assessment of seroinfection risks, numerator-level assessment of seroinfection risks, and so on.

The categories used were simple, straightforward, and easy to code accurately and consistently. Intercoder agreement was assessed on every data point from twenty-five articles coded by both coders; the percentage of agreement (Holsti 1969) was 100 percent (a product of the simplicity of the categories). After the completion of data collection, quality control analysis was performed by checking every data point in the data summary spreadsheet against the data from the code sheets.

## **Results**

Articles in major newspapers, on average, presented information about the risks associated with West Nile virus with a low degree of precision (see Figure 1). Qualitative-level information on the effects of West Nile virus was found for seroinfection in fewer than 1 percent of articles, for acute illness in an intermediate percentage of articles, and for mortality in an intermediate percentage of articles. Numerator-level information was provided for seroinfection in a small percentage of articles, for acute illness in an intermediate percentage of articles, and for mortality in the majority of articles. However, number/population–level information was provided in only 2 percent of articles for seroinfection, 7 percent of articles for acute illness, and 4 percent of articles for mortality. Eighty-nine percent of articles had no information whatsoever at the number/population level.

Newspaper articles were ineffective in providing comparisons with other health risks, and the comparisons that were provided were generally not precise (see Figure 2). Mention of any comparisons of the risks of West Nile



**Figure 1: Percentage of Articles from Major Newspapers in 2000 ( $N = 359$ ) Reporting Information on West Nile Virus Risk for Different Detrimental Effects with Different Levels of Precision**

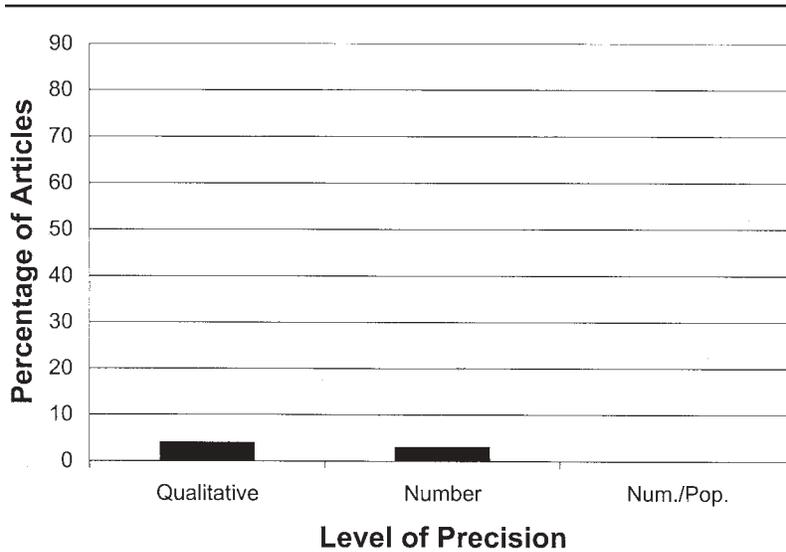
NOTE: Qualitative = qualitative, nonnumerical assessment; numerator = numerator-level information; Num./Pop. = number/population-level information (i.e., numbers of individuals affected/size of population potentially affected).

virus with other health risks was provided at the qualitative level in 4 percent of articles, at the numerator level in 3 percent of articles, and at the number/population level in less than 1 percent of articles.

Newspaper articles achieved intermediate success in presenting information on symptoms and low success in presenting information on risk-reduction measures (see Figure 3). Forty percent of newspaper articles reported information on symptoms of illness caused by West Nile virus. Ninety-eight percent of newspaper articles mentioned mosquitoes, but only 26 percent of newspaper articles reported information about source reduction, and only 27 percent reported information on personal protection. In addition, only 13 percent of newspaper articles gave information on both source reduction and personal protection.

### *Discussion*

Our results demonstrate that during 2000, major newspapers were generally ineffective in reporting with a useful level of contextual precision on the

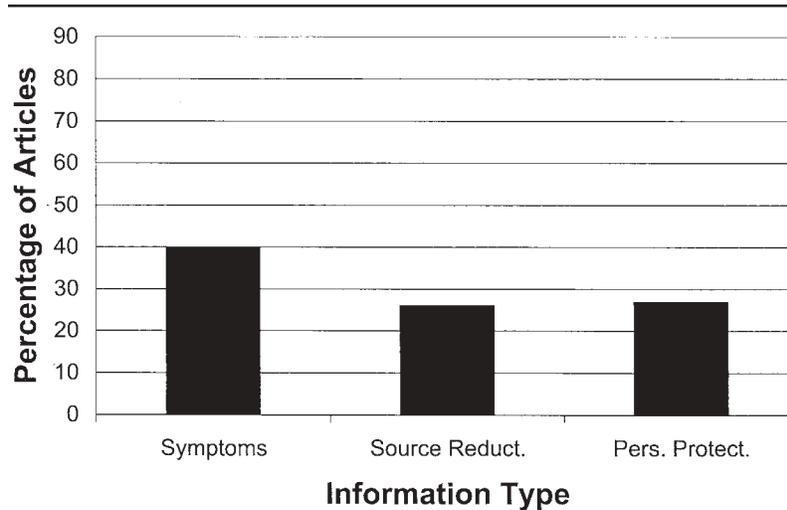


**Figure 2: Percentage of Articles from Major Newspapers in 2000 (N = 359) Providing Comparisons of West Nile Virus–Associated Risks with Other Risks at Different Levels of Precision**

NOTE: Qualitative = qualitative, nonnumerical assessment; numerator = numerator-level information; Num./Pop. = number/population-level information (i.e., numbers of individuals affected/size of population potentially affected).

risks associated with West Nile virus. Only 2 percent, 7 percent, and 4 percent of articles gave number/population-level information about the risks of seroinfection, illness, and mortality, respectively (see Figure 1). Eighty-nine percent of articles gave no number/population-level information at all, and only 8 percent of articles gave comparisons between West Nile virus risks and other risks. These results hold great significance because (1) they establish, in an exhaustive, quantitative manner, that the print media fail to do an adequate job of informing the public about relative risks associated with this emerging infectious disease, and (2) they point to the need for improvements in the ways in which the media report on the relative risks of health threats, so as to be more precise and more comprehensive in their coverage.

Qualitative statements regarding infectious diseases or other risks are essentially without value because they are so imprecise, and yet many articles surveyed provided qualitative statements about the risks of illness and mortality associated with West Nile virus. Numerator-level (numerator only) information is of little use if it is not given relative to the size of the population potentially affected (the denominator) (Griffin 1999). Yet many of the



**Figure 3: Percentage of Articles from Major Newspapers in 2000 ( $N = 359$ ) Reporting Information on Symptoms of West Nile Virus Encephalitis, on Mosquito Source Reduction, and on Personal Protection from Mosquito Bites**

articles surveyed gave numerator-level information without a context within which to assess its relevance. Number/population-level information (providing information on both the numerator and the denominator) is the most useful because it gives a context within which to assess relative risk magnitude. Yet only a small percentage of newspaper articles provided risk information at the number/population level. There was readily available information on denominator values (e.g., from the Centers for Disease Control and Prevention, the New York State Department of Health, and the New York City Department of Health) that journalists could have used in 2000. Such information included total numbers of people sampled in seroinfection surveys (which could provide denominator context for figures on number of people seroinfected and number of people with acute illness) and the size of the population in regions affected, such as the size of the population of the New York metropolitan area (which could provide denominator context for mortality figures). However, such denominator information was rarely included, meaning readers generally were given no context within which to assess numerator or qualitative statements about risk. (Number/population information is most useful if a time interval is given during which effects were observed or are expected; the time interval in the articles and press releases surveyed was generally at the level of “in the year 1999.”)

Articles exhibited mixed success in providing information on symptoms and risk-reduction measures. Newspaper articles were somewhat more successful in providing information on symptoms than information on risks (see Figure 2). Newspaper articles were very successful at mentioning mosquitoes (nearly all did so). However, these articles only provided information on source reduction approximately one-third of the time and mentioned personal protection approximately one-third of the time. It is puzzling why these two risk-reduction topics were not mentioned in more print media articles because both were clearly of importance to readers and information on both topics was readily available (e.g., from the Centers for Disease Control and Prevention and New York City Department of Health Web sites).

It is important to note that our study looked at only one variable associated with effective reporting about a health risk—that of contextual precision of the risks of those health threats. There are many other variables that are important, such as the diversity of sources used by the journalists, the level of authority of those sources, the level of reporting of nonrisk statistical information, the degree of background information provided, the use of explanatory graphics, the accuracy of headlines, and the provision of additional sources of information for readers. These variables are all important aspects of the efficacy of public communication associated with an article but were not the subject of the current study. These variables, perhaps most important the diversity and authority of sources used, and the degree of background information provided would make excellent subjects for future research in relation to print media public communication about infectious diseases and their risks.

Fischhoff (1985b) discussed several advanced considerations—such as assumptions, confidence intervals, individual sensitivities, exposure to multiple hazards, and cumulative effects—that he suggested journalists should cover in stories about risks. It would be ideal if journalists covered, and readers understood, these important considerations. Our study demonstrates, however, that far from reporting on such advanced concepts about risk (no articles in our survey did so), the popular print media generally fail to present even basic risk-assessment information regarding this emerging threat to public health. The central implication of our study is that although there has been a wealth of sophisticated research on risk perception and risk communication, not enough key information about infectious disease risks is being presented to the public in the print media. Thus, the science of risk perception and communication is far ahead of its practical application in the news media. More attention could be given to applying more of the important findings in risk communication research to practical situations, such as convincing experts to provide useful information about risks to journalists and

persuading journalists to more effectively communicate that information to the public.

The quality and efficacy of risk communication by the news media could improve if scientists, public health professionals, and journalists were to follow message-design recommendations outlined in the risk communication literature. For example, they could present information that the public needs to know in clear, unambiguous language that reinforces accurate impressions and avoids misconceptions (Arkin 1989; Fischhoff 1995; Lesley 1982; Slovic 1986) and that presents risk magnitudes with a useful degree of precision (Slovic 1991, 2000). They could also employ heuristic comparisons among similar types of risks (such as the risk of dying of West Nile encephalitis and the risk of dying of the flu), a technique found to be effective in helping people place risks in perspective (Covello, Sandman, and Slovic 1988; Fischhoff 1995; Wilson and Crouch 1987). Furthermore, they could provide assessment information on relevant risk-risk trade-offs, such as the risks associated with West Nile virus compared with pesticide risks (Thier 2001). Heuristic graphics can be particularly useful for simplifying these types of risk comparisons (Griffin 1999; Resnik 2001).

Scientists and public health professionals could also facilitate risk communication by providing members of the media access to accurate, useful information on public health topics in message delivery channels that are up to date and readily accessible. Members of the media express confidence that they can effectively report on risk issues but also believe they encounter difficulties in collecting the information they need to write accurate stories about risks (Baruch 1989). Access to information could be facilitated by traditional means, such as press releases, but also by maintaining and promoting Web sites and Internet listservs. Web sites and listservs that clearly, accurately, and precisely present information are particularly valuable because of their wide accessibility, high speed of dissemination, and low cost. Communication channels enabling more prolonged and interactive information exchanges, such as workshops, press advisory meetings, and media days, can also be valuable. Reporting on risk issues often requires attention to nuances outside of the traditional "who, what, when" framework, such as treatment of the issue of uncertainty (Friedman 1983; Hattis 1989; Stocking 1999). These nuances might be better communicated by journalists if they could engage in prolonged information exchanges with experts before crafting articles dealing with health risks.

Scientists, public health professionals, and journalists could further facilitate improvement in risk communication by fostering open, mutually respectful, and mutually productive relationships. The necessity for scientists and public health professionals to respect the fact that journalists need to

meet deadlines and tell stories that will have public appeal is particularly important (Lundgren and McMakin 1998). Forming connections among experts and journalists in advance of breaking news stories is valuable because it provides journalists with expert contact persons whom they can call quickly when necessary. Getting accurate information into the media rapidly is essential because beliefs on risk topics are formed quickly and are difficult to change once formed (Fischhoff 1985a).

The professional scientific community holds great untapped resources in terms of communicating science to the public. If more scientists became "civic scientists" (Greenwood and Riordan 2001), actively involved in communicating with the public and with journalists and editors, information about infectious diseases could be more effectively disseminated to citizens.

In summary, the results of this study are noteworthy because we have conducted an exhaustive quantitative analysis of the efficacy of risk communication by the popular print media concerning a specific threat, and we establish objectively the veracity of the commonly held subjective assumption that the print media are ineffective in communicating risk associated with infectious disease. Furthermore, we show not only that the percentage of articles providing precise risk information was close to zero but also that a majority of articles failed to mention risk-reduction tactics such as source reduction and personal protection. The lack of both types of information could have significant impacts on public understanding and public health.

The results of this study are sobering, but they need not be discouraging. Conscientious interactive efforts involving journalists, health scientists, and public health professionals hold promise for improving popular coverage of health risks associated with infectious diseases. The dedicated involvement of public health professionals is particularly vital to this effort because public health agencies are often the frontline source from which journalists gather much of their information about health issues. Such improvements in public health communication will generate substantial benefits for members of the public, the public health community, and governmental agencies through more precise communication about relative risks, communication that will promote optimal decision making and resource allocation in the expanding battle against infectious disease.

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