

Print Media Coverage of Risk-Risk Tradeoffs Associated with West Nile Encephalitis and Pesticide Spraying

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ABSTRACT When mosquito-borne West Nile virus emerged in the United States in 1999 and triggered pesticide spraying, society was faced with a controversy over an important risk-risk tradeoff—the risks of pesticide exposure versus those of West Nile encephalitis. Effective public communication about risk-risk tradeoffs is important because it can assist individuals and society in investing resources optimally. This study examined how effectively major North American print media in the year 2000 provided information on this risk-risk tradeoff. My colleagues and I found that the print media were generally ineffective in providing precise information about pesticide risks and in comparing risks of pesticide exposure with those of West Nile encephalitis. The media were also ineffective in mentioning the efficacy of pesticide spraying or comparing the economic costs of pesticide spraying with those of West Nile encephalitis. We suggest that greater effort in collecting and reporting precise risk information, fostering more active relationships between journalists and scientists/public health professionals, and recognizing biases resulting from preconceptions can help improve reporting by the print media and public health agencies on risk-risk tradeoffs associated with emerging insect-borne infectious diseases. These efforts could help improve public health by improving decision making related to the control of insect-borne diseases.

KEYWORDS Infectious diseases, Pesticide spraying, Risk-risk tradeoffs, West Nile virus.

INTRODUCTION

A mosquito-borne RNA flavivirus, West Nile virus, first appeared in the United States in 1999, causing acute illness in 62 individuals, 7 of whom died.¹ Numerous municipalities in the northeast, including New York City, sprayed organophosphate and/or pyrethroid pesticides from helicopters and trucks to reduce adult mosquito populations, with the goal of reducing the risks of the disease to citizens. West Nile virus poses health risks in the form of encephalitis, which can be debilitating or fatal.².³ However, organophosphate and pyrethroid pesticides also pose potential health risks.⁴-8 As a result, pesticide spraying to combat mosquitoes carrying West Nile virus became controversial, and society was placed in the position of needing to evaluate an important risk-risk tradeoff: the risk of West Nile encephalitis versus the risk of pesticide exposure.

Public communication about risk-risk tradeoffs is critical in relation to many public health issues. Such communication is essential because it provides information that can allow individuals and society to better reduce overall health risks, to focus resources on risks of higher magnitude, ^{9,10} and to employ disease control strategies only when their health benefits appear to outweigh their health costs. Such communication is of particular importance in the case of emerging insect-borne infectious diseases in the United States, including dengue fever, malaria, and West Nile encephalitis, because all of these diseases pose dangers, ¹¹⁻¹⁶ and all have mosquito vectors that can be controlled, in part, with pesticides. ¹⁷ The value of effective media communication of risk-risk tradeoffs has been further emphasized by recent incidents of bioterrorism in the United States. ¹⁸⁻²⁰ For example, citizens can benefit from being informed about how the risks of taking ciprofloxacin prophylactically²¹ compare with the risks of being infected with anthrax.

Information about risk can be viewed as lying along a scale of contextual precision ranging from qualitative statements (e.g., "somewhat risky"), to information about the number of individuals affected or potentially affected (i.e., numerator-level information), to information about the number of individuals affected/size of population potentially affected (i.e., numerator/denominator-level information). Information on number of individuals affected is more precise and more useful than qualitative statements because it provides concrete numerical data, whereas qualitative statements provide only vague categorizations. Information at the level of number of individuals affected/size of population potentially affected, however, is even more precise and more useful because it provides risk-magnitude information in the context of probability, information that can be meaningfully assessed and compared with information regarding other risks.^{22,23}

Risk perception research has shown that members of the public utilize a wide range of factors when estimating risk, such as degree of uncontrollability, dread, and fatality. However, this research has also shown that numerical estimates of risk probability are one of the factors that people do consider, and that people are capable of understanding such information. For example, members of the public routinely assess and compare numerical information while shopping in grocery stores and while comparing the risks and benefits of medical treatments and vaccines.

Contextually precise information offers the advantage of making it easy for readers to make comparisons—"1 in a million" is easy to sensibly compare to "1 in 100," whereas "risky" cannot sensibly be compared to "dangerous." Conversely, qualitative information poses disadvantages. Because people are influenced by impressions of factors such as level of dread and fatality, qualitative statements can engender inaccurate perceptions, such as the impression that fatality rates are high when in fact they are low. For example, many newspaper articles in 2000 referred to West Nile virus qualitatively as "the deadly" West Nile virus, which contributed to disproportionate fear and bias among citizens. In addition, media coverage that does not provide contextual comparisons of risk-risk tradeoffs can contribute to rapid shifts in public impressions of relative risks, out of proportion to actual relative risks.³¹

It is important that the news media effectively provide the public with precise, timely information about risk-risk tradeoffs because citizens use the news media as the primary basis for forming their impressions about risks, and because once formed, public impressions of risks are difficult to change. A central goal of media stories on health risks should be to supply citizens with information that they need to know to assess and make decisions based on the risks they face. In relation to pesticide exposure—West Nile encephalitis tradeoffs, it is critical for citizens to understand the approximate magnitude of the health risks of pesticide expo-

sure, the relative health risks of pesticide exposure and West Nile encephalitis, the efficacy of pesticide spraying, and the relative economic costs of pesticide exposure and West Nile encephalitis. Also, if components of such information are unavailable, it is vital that the media mention the lack of such information (a mention of lack of information provides some context for citizens). Information on the efficacies and costs of alternative, low-risk methods of mosquito control, such as applying biological or chemical agents to mosquito-breeding sites to target mosquito larvae (*larviciding*), would also be valuable. We have examined how effectively the print media provided information on the above categories by surveying articles about West Nile virus published in calendar year 2000 in major North American newspapers and magazines. Our study documents the degrees of effectiveness and levels of contextual precision with which the print media reported on this controversial risk-risk tradeoff and serves as a reference point for refinements in public communication about health risks related to pesticides and infectious diseases.

METHODS

We conducted Lexis-Nexis Academic Universe (http://web.lexis-nexis.com/universe) searches of the "General News" subheading of the "News" primary heading for articles in major North American newspapers and articles in major North American magazines using the key words "West Nile virus." The search yielded 359 unique newspaper articles and 6 magazine articles that met our search criteria of being about West Nile virus, of being published in North America, and of containing 250 or more words (if the same article was published twice, only one version was analyzed). West Nile virus was chosen as the search term because, of year 2000 newspaper articles with keywords "West Nile virus," "West Nile encephalitis," or "West Nile fever," 95% used the term "West Nile virus, but only 3% used West Nile encephalitis, and only 3% used West Nile fever.

Each of the surveys was conducted by two coders; each had extensive postgraduate and/or postdoctoral experience in data coding and analysis. A check sheet was designed prior to data collection, and a pilot study was conducted using sample newspaper articles to field test the check sheet and fine-tune categorization. The check sheet was then revised to fine-tune category comprehensiveness. The categories were straightforward and easy to code with consistency. During data collection, coders read articles, highlighted occurrences of target categories of information, and then checked these categories on a code sheet. Data from the code sheets were then transferred to an electronic spreadsheet. The percentage of intercoder agreement³⁹ on 25 cross-referenced articles was 100%, a result of the simplicity of the categories and the refinements in the pilot study. After the completion of data collection, coders checked the accuracy of all data in the data spreadsheet against the data on the code sheets.

We used a nominal quantification system in our study. 40,41 Our unit of analysis was any mention of information in selected information categories. We used the following content categories for data collection: (1) risks of suffering short-term health effects (e.g., allergic reactions, respiratory distress, or neurological symptoms); (2) risks of suffering long-term health effects (e.g., developmental toxicity, cancer, or long-term neurological effects); (3) risks of dying from pesticide exposure; (4) relative health risks of spraying pesticides compared to those risks associated with West Nile virus; (5) efficacy of pesticide spraying in reducing mosquito populations; (6) economic costs of pesticide spraying; (7) relative economic costs

of pesticide spraying and West Nile encephalitis; and (8) efficacy, economic cost, and comparative economic costs of larviciding as an alternative method of mosquito control with lower health risk.

When categorizing the degree of contextual precision of risk information, we used three categories along a continuum of inferred usefulness: (1) qualitative-level information (non-numerical phrases such as "very risky"); (2) numerator-level information (numerical information on the numbers of individuals affected [e.g., "10 people died"]); (3) number/population-level information (numerator/denominator information on numbers of individuals affected/size of population potentially affected [e.g., "5% of residents were seroinfected" or "a 1-in-20 chance of seroinfection"]). These categories were selected to provide a simple and basic categorization for general assessment of print media contextual precision; they were not meant to cover every step along the continuum. The level of complexity of these categories was sufficient, as shown by the results, to successfully illustrate a pattern in media contextual precision. Also, our study did not address the separate issue of the accuracy of the information about risk magnitude, only contextual precision and inclusiveness of categories of information. The numerical information presented in the vast majority of newspaper articles and magazine articles was accurate.

RESULTS

Contextual Precision of Information on Risks of Pesticide Exposure

Newspaper articles surveyed presented little information about the potential risks of pesticide spraying, and the information that was provided was generally presented with a low level of contextual precision (Table 1). Of the newspaper articles, 21%, 8%, and 5% gave qualitative statements about unspecific, short-term, and long-term risks of pesticides, respectively. However, less than 3% of articles gave information at the numerator level, and 0% gave information at the number/population level.

Of the 6 magazine articles surveyed, 33% made mention of unspecific risks of pesticide spraying at the qualitative level, but none mentioned any category of risks at the numerical or number/population levels. No newspaper or magazine articles provided any information about the risk of mortality from pesticide exposure.

TABLE 1. Percentages of newspaper articles (n=359) and magazine articles (n=6) reporting information on different health risks of pesticide exposure with different levels of contextual precision

	Newspapers			Magazines		
	Qualitative	Numerical	Num./Pop.	Qualitative	Numerical	Num./Pop.
Unspecific	21	0	0	33	0	0
Short term	8	2	0	0	0	0
Long term	5	0.006	0	0	0	0

Qualitative = qualitative, non-numerical assessment; number = number of individuals affected; Num./ Pop. = number of individuals affected/size of population potentially affected.

Frequency of Risk-Risk Comparisons

Key comparative information necessary for citizens to make informed decisions about the relative preferability of spraying or not spraying includes descriptions of how the risks of pesticide spraying compare with those of West Nile encephalitis. Only 15% of newspaper articles compared the risks of pesticide spraying with the risks of West Nile virus at the qualitative level, and none made such comparisons at the numerical or number/population levels. No magazine articles compared the risks of spraying with the risks of West Nile encephalitis at any level of contextual precision (Table 2).

Presentation of Information on Efficacy and Economic Costs of Mosquito Control

The newspaper articles and magazine articles surveyed provided little information that would assist citizens attempting to assess the efficacy of and economic rationale for pesticide spraying (Table 2). Less than 10% of newspaper and magazine articles mentioned the efficacy of spraying, and less than 3% mentioned the economic costs of pesticide spraying. No newspaper or magazine articles compared the economic costs of the virus with the economic costs of spraying.

In terms of coverage of larviciding as an alternative to adulticiding (aerial or ground spraying of insecticides to kill adult mosquitoes), 25% of newspaper articles and 17% of magazine articles mentioned larviciding. However, only 8% of newspaper articles mentioned the efficacy of larviciding, 2% mentioned the economic cost of larviciding, and 0% compared the cost of larviciding with the cost of adulticiding. No magazine articles gave any information on the efficacy, absolute cost, or relative cost of larviciding (Table 2).

DISCUSSION

Risk estimates, risk comparisons, efficacy estimates, and cost estimates are all critical categories of information for citizens trying to make informed decisions about whether to support or oppose the spraying of pesticides to combat mosquitoes that may carry West Nile virus. Contextual risk estimates and comparisons inform citizens of the degree of concern that is appropriate, and information on efficacy estimates is critical for decision making. If spraying is not effective in reducing illness, application of adulticides simply compounds hazards to the public. Cost estimates and comparisons are important in allowing citizens to assess the fiscal impact of mosquito control programs. Our findings demonstrate that information in all of

TABLE 2. Percentages of newspaper articles (n = 359) and magazine articles (n = 6) presenting topics regarding West Nile virus

	Newspapers	Magazines
Efficacy of pesticide spraying	8	0
Economic costs of pesticide spraying	2	0
Economic costs of pesticide spraying versus		
those of West Nile encephalitis	0	0
Efficacy of larviciding	0	0
Economic costs of larviciding	2	0
Economic costs of larviciding versus adulticiding	0	0

these important categories was generally not provided by the print media; therefore, individuals and society were operating "in the dark" in evaluating the question of whether pesticides should be deployed.

When reporting on risk issues, treatment of conceptual nuances such as confidence intervals, cumulative effects, exposure to multiple hazards, and degrees of uncertainty have been discussed in the primary literature as helpful to readers for clearly understanding risk magnitude and its relevance. 42-44 We found that no surveyed articles mentioned any of these advanced concepts about risk. Furthermore, very few articles presented the most basic information about risk, risk-risk tradeoffs, efficacy, or costs relating to pesticide usage. Given the evident public concern about the relative risks of pesticide spraying and West Nile encephalitis, 45 it would have been valuable for readers to have access to comparative risk figures in a majority of articles on West Nile virus, comparisons that have been demonstrated to help put relative risks in perspective for citizens. 28,34,46,47 Our analysis reveals that sophisticated findings on risk perception and risk communication 29,32,48-52 have not been applied to practical risk communication by the print media concerning vector control and insect-vectored disease (see also reference 53).

There are a number of ways in which journalists and public health experts could improve the efficacy with which they report on risk-risk tradeoffs. One would be for journalists to more actively collect and report precise information on relevant risk magnitudes and risk-risk tradeoffs. A second would be for journalists to design messages that focus on building understanding and correcting misconceptions. A third would be for experts to assist members of the media by providing information on risks and risk-risk tradeoffs to members of the media with as much contextual precision as possible so that such information would be available for reporting to the public. Journalists report that they find it difficult to collect the information they need to write stories about risk. Experts can help diminish this difficulty by actively providing necessary information.

It is of course important not only that journalists be precise when presenting information about risk magnitude, but also that they be accurate, accuracy that depends on the methodological quality of primary analyses of risk. If precise information is inaccurate, it can do more harm than good. With the West Nile virus outbreak in North America, this was not an issue because accurate data on the number of people affected were widely available in the primary literature and on Web sites (e.g., the Centers for Disease Control and Prevention, New York State Department of Health, and New York City Department of Health sites all provided excellent information), and the accuracy of the numbers presented in the media was high. There was a wide range of information on general pesticide exposure risks readily available in the primary literature and on Web sites (e.g., the Environmental Protection Agency site) in 2000, although there was more uncertainty in these figures than in the figures on the numbers of people affected by West Nile virus. Care needs to be taken by journalists to choose primary sources from among methodologically rigorous sources and to report on issues of uncertainty when such issues are relevant. Experts could assist in the delivery of scientifically appropriate, but publicly understandable, information to the press by helping provide key risk information to journalists and helping the journalists understand its relevance and context.

In a more general sense, frequent consideration of the steps needed to reduce overall public health risks could help journalists and experts focus their research and reporting. Pursuit of this strategic goal can be impeded by the polarization of

discussion that results from controversy (e.g., the viewpoint that pesticide spraying must be either always good or always bad) and by preconceptions (e.g., that mosquitoes, or pesticides, should be automatically considered more dangerous). Developing and reporting on a level of understanding that extends beyond polarization and preconception might lead to the exploration of sound integrative solutions, such as integrated vector control. Progress toward minimization of overall health risks will ultimately rely, in part, on the ability of public health professionals and the print media to provide refined and objective coverage of such issues.

Coverage from print media and public experts should communicate to the public "need-to-know" information about a topic, ^{23,36–38,56} information that in this specific case would enhance the ability of the public to assess the relative risks of disease incidence and disease control strategies. While most journalists are dedicated and highly successful in many of their activities, they often failed to achieve this basic communication goal in 2000. Nonetheless, determined efforts by journalists, in cooperation with public health experts, could help improve the efficacy with which the media provide members of the public with information needed to decide whether to accept, oppose, or modify pesticide spraying for the control of insect-vectored diseases.

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