

# Right-to-Know: Implications of Risk Communication Research for Regulatory Policy

*Brenda J. Nordenstam\* and Joseph F. DiMento\*\**

Whenever a clear and reasonable warning is required under section 25249.6 of the Health and Safety Code, the method employed to transmit the warning must be reasonably calculated, considering the alternative methods available under the circumstances, to make the warning message available to the individual prior to exposure. The message must clearly communicate that the chemical in question is known to the state to cause cancer, or birth defects or other reproductive harm.<sup>1</sup>

## I. THE LEGAL AND POLITICAL CONTEXT

The rule cited above exemplifies an administrative agency effort to regulate the provision of information to the public concerning environmental hazards. Such regulatory action, popularly known as *right-to-know* law, is becoming increasingly common. Presently, right-to-know laws exist at the federal level and in a majority of the states.<sup>2</sup> Several

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\* B.S., University of California, Davis; B.A., University of California, Irvine; M.S., California State University, Long Beach; graduate student in Social Ecology at the University of California, Irvine.

\*\* B.A., Harvard College; J.D., Ph.D., University of Michigan; Professor of Social Ecology and Management, University of California, Irvine; member of the California Bar.

<sup>1</sup> Safe Drinking Water and Toxic Enforcement Act of 1986, CAL. CODE REGS. tit. 22, § 12601 (1989).

<sup>2</sup> At the federal level, see the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), Pub. L. No. 99-499, § 300-30, 100 Stat. 1728 (codified at 42 U.S.C. §§ 11001-11050 (Supp. V 1987)). For worker protection, see Hazard Communication Standard, 29 C.F.R. § 1910.1200 (1987). For a list of state right-to-know statutes, see O'Reilly, *Driving a Soft Bargain: Unions, Toxic Materials, and Right to Know Legislation*, 9 HARV. ENVTL. L. REV. 307, 309 n.13 (1985); Oleinick, Fodor & Susselman, *Risk Management for Hazardous Chemicals: Adverse Health Consequences of Their Use and the Limitations of Traditional Control Standards*, 9 J. LEGAL MED. 1, 5 n.8 (1988) [hereafter *Health Consequences*].

local right-to-know laws also have been passed.<sup>3</sup>

Much of the right-to-know regulation analysis has focused on scientific questions pertaining to accurate risk assessment<sup>4</sup> and to legal issues raised by the laws' implementation.<sup>5</sup> Little effort has been made to address the laws' impact and effectiveness on the knowledge, perception, and behavior of the individuals whom the information is intended to protect.<sup>6</sup> This is particularly significant because these laws — perhaps more so than many legal mandates — depend for their efficacy on accurate analysis of much studied psychological dynamics.

This Article discusses ways in which understanding and utilization of social science research may enhance the utility of right-to-know laws. Initially, the Article presents a brief background on right-to-know laws. Secondly, the Article explores the knowledge and use of risk communication research in presenting information to the public concerning environmental hazards. Finally, the Article considers policy reforms relevant to risk communication.

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<sup>3</sup> For a list of California municipal right-to-know regulations, see COMMUNITY TOXICOLOGY UNIT, CALIFORNIA DEPARTMENT OF HEALTH SERVICES, TOX-EPI REVIEW, HAZARDOUS MATERIALS DATA COLLECTION AND USE STRATEGIES: A FOCUS ON COMMUNITY RIGHT-TO-KNOW LAWS (June 1986) [hereafter TOX-EPI REVIEW].

<sup>4</sup> See *Proposition 65 Implementation: Interim Joint Hearing Before the California Senate Comm. on Toxics and Public Safety Management and Subcomm. 3 of the Comm. on Budget and Fiscal Review (Mar. 1987)* [hereafter *Interim Hearing*] (devoting less than one page out of ninety pages of text to a discussion of the information process). For a discussion of the legal and public health need for hazard communication standards at the occupational level, see *Health Consequences*, *supra* note 2, at 47-64.

<sup>5</sup> See Note, *California's Toxics Initiative: Making It Work*, 39 HASTINGS L.J. 1195 (1988) [hereafter *California's Toxics*] (proposing an amendment to exempt undetectable amounts of carcinogens from the warning requirement); Tyson, *The Preemptive Effect of the OSHA Hazard Communication Standard on State and Community Right-to-Know Laws*, 62 NOTRE DAME L. REV. 1010 (1987) (arguing OSHA's Hazard Communication Standard preempts state right-to-know laws); Note, *A Hazardous Mix: Discretion to Disclose and Incentives to Suppress Under OSHA's Hazard Communication Standard*, 97 YALE L.J. 581 (1988) [hereafter *A Hazardous Mix*] (arguing for an ingredient disclosure requirement as part of OSHA's Hazard Communication Standard). See generally ENVIRONMENTAL LAW INSTITUTE, COMMUNITY RIGHT-TO-KNOW DESKBOOK (1988) (providing text of EPCRA, implementing regulations, and expert analysis).

<sup>6</sup> Needleman, *Ritualism in Communicating Risk Information*, 12 SCI. TECH. & HUM. VALUES 20-25 (1987) (noting lack of effort to determine risk communication laws' effectiveness in enabling public to make informed choices and to decrease health risks by changing behavior).

### A. Background on Right-to-Know Laws

#### 1. Rationale for Right-to-Know Legislation

Presumably, right-to-know laws primarily seek to give the public accessible and understandable information on environmental hazards by requiring the provision of risk information to the public.<sup>7</sup> This information should increase the public's ability to make informed choices concerning the risk reduction measures they may wish to implement. Such laws, however, may produce an information warning system with little notable impact if these laws simply require that the public be informed of risks, without considering the variety of ways in which warnings can be presented to and interpreted by the public. Considerable literature exists which illustrates the difficulty in designing and implementing successful information campaigns.<sup>8</sup>

In addition to right-to-know laws, various approaches exist to protect the public from exposure to environmental hazards. More frequently, agencies assert direct control through the promulgation and enforcement of traditional command and control regulations. These direct approaches have proven effective in certain situations.<sup>9</sup> However, hazard information strategies have served as regulatory surrogates when sufficient technology and enforcement resources are unavailable. Additionally, information strategies are employed when economic considerations make the use of available technology for hazard reduction infeasible, or

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<sup>7</sup> See Oleinick, Fodor & Susselman, *Risk Management for Hazardous Chemicals: OSHA's Hazard Communication Standard and EPA's Emergency Planning and Community Right-to-Know Regulations*, 9 J. LEGAL MED. 179 (1988) [hereafter *OSHA*]; Hazard Communication, 48 Fed. Reg. 53,280, 53,282 (1983) (codified at 29 C.F.R. § 1910.1200 (1988)) (noting, in preamble to final rule, critical need to provide hazard information to all workers); *OSHA Oversight Hearings on Proposed Rules on Hazards Identification: Hearings Before the Subcomm. on Health and Safety of the House Comm. on Education and Labor*, 97th Cong., 1st Sess. (1981).

<sup>8</sup> See generally BANBURY REPORT 6: PRODUCT LABELING AND HEALTH RISKS (L. Morris, M. Mazis, & I. Barofsky eds. 1980) (describing many difficulties in communicating product and health risks); S. HADDEN, READ THE LABEL: REDUCING RISK BY PROVIDING INFORMATION (1986) (discussing lack of successful communication programs and proposing methods to improve risk communication); REGULATORY POLICY AND THE SOCIAL SCIENCES 258 (R. Noll ed. 1985) (discussing difficulty in developing effective risk communication regulations).

<sup>9</sup> See L. LAVE, THE STRATEGY OF SOCIAL REGULATION: DECISION FRAMEWORKS FOR POLICY (1981). Command and control regulations generally incorporate a technology-based decision framework for regulatory action. Various agencies use frameworks for regulatory decisionmaking for environmental, health, and safety actions including: market regulation, no-risk, technology-based standards, risk-risk, risk-benefit, cost-effectiveness, regulatory budget, and benefit-cost. *Id.* at 9.

when the level of risk is considered sufficiently low to make direct control via hazard reduction or prohibition unnecessary. Other alternatives to direct regulation include taxation or market incentives. The assumed advantages of information provision over direct regulation and, to some extent, tax and market strategies, include lower cost, greater flexibility and efficiency, and the absence of coercion.<sup>10</sup>

Generally, two basic assumptions underlie most information disclosure programs. First, given a hazard of uncertain and low risk probability, policymakers prefer to furnish information rather than to ban a product. The United States Food and Drug Administration employed this approach when it chose to require products containing saccharin to carry a warning label rather than to ban saccharin.<sup>11</sup> Thus, the agency preserved a choice for those who perceive the benefit of these products' use to outweigh the risk. Secondly, for products of medium or high risk, providing risk information places fewer restrictions on an individual's freedom to assume or to reject risks than a complete ban of the potentially hazardous product.<sup>12</sup> The use of warning labels on cigarette packages exemplifies a relatively high risk product that agencies allow to remain on the market when manufacturers provide sufficient warnings. A wide variety of agencies have incorporated and used the strategy of information disclosure.<sup>13</sup>

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<sup>10</sup> O'Hare, *Information Strategies as Regulatory Surrogates*, in SOCIAL REGULATION: STRATEGIES FOR REFORM 222 (E. Barach ed. 1982).

<sup>11</sup> For an excellent example, try reading the tiny printed warning on packages of sugar substitute containing saccharin.

<sup>12</sup> Bettman, Payne & Staelin, *Cognitive Considerations in Designing Effective Labels for Presenting Risk Information*, 5 J. PUB. POL'Y & MARKETING 1 (1986) [hereafter *Cognitive Considerations*] (discussing basic assumptions underlying information provision programs). For another viewpoint on reasons for informational provision programs, see Adler & Pittle, *Cajolery or Command: Are Education Campaigns an Adequate Substitute for Regulation?*, 1 YALE J. ON REG. 159 (1984). These authors summarize advantages as (1) a belief by many regulators that large numbers of injuries and illnesses cannot be prevented through direct regulation alone; (2) information programs serve to preserve individual choice while avoiding direct government involvement in industry's production and activities; (3) information programs are easier and faster to implement because they usually bypass the complex procedural requirements most agencies must follow to promulgate rules; and (4) information programs can be used to enhance the image of agencies and their staffs. *Id.* at 160.

<sup>13</sup> Hutt, *Public Policy Issues in Regulating Carcinogens in Food*, 33 FOOD DRUG COSM. L.J. 541, 554 (1978); Cooper, *Freedom of Choice in the Real World*, 34 FOOD DRUG COSM. L.J. 612, 613 (1979); Hutt, *Unresolved Issues in the Conflict Between Individual Freedom and Government Control of Food Safety*, 33 FOOD DRUG COSM. L.J. 558, 586 (1978).

## 2. Right-to-Know Laws

Within the last ten years, concern over community and occupational health risks involving environmental hazards has become an issue of major public importance. Community disasters, such as Love Canal and Times Beach,<sup>14</sup> and increasing evidence of occupational health risks due to highly toxic chemical exposure have heightened awareness of environmental hazards.<sup>15</sup> In response to these concerns, federal and state legislatures passed laws designed to inform citizens about environmental hazards in the workplace and the community.

Right-to-know laws emphasize an individual's right to information about potential health risks resulting from exposure to hazards and to make an informed decision as to whether the benefits of a hazard's continued use outweigh the potential risks. A majority of states have adopted legislation which focuses on the workplace or the community.<sup>16</sup> These laws vary in their degree of comprehensiveness. Some simply require that lists be made available, while others require strict training procedures or information provision. Additionally, the laws vary in scope and complexity within each state.<sup>17</sup> California has over fifty information disclosure laws.<sup>18</sup>

## 3. Workplace Right-to-Know Law

More than twenty states mandate that industry disclose information to employees. Some laws regulate a large number of materials and

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<sup>14</sup> See M. EDELSTEIN, *CONTAMINATED COMMUNITIES: THE SOCIAL AND PSYCHOLOGICAL IMPACTS OF RESIDENTIAL TOXIC EXPOSURE* 4-5 (1988). Love Canal was a residential community in Niagara Falls, New York. In 1978, the discovery of a major toxic waste dump located beneath the neighborhood eventually led to abandonment of the community. In Missouri, the use of dioxin-contaminated oil to treat roads during the 1970s created a health crisis that resulted in the federal buyout of the town of Times Beach. *Id.*

<sup>15</sup> For occupational safety, see F. GOLDSMITH & L. KERR, *OCCUPATIONAL SAFETY AND HEALTH* 103 (1982) (noting need to develop successful programs to inform workers of occupational health risks); N. ASHFORD, *CRISIS IN THE WORKPLACE: OCCUPATIONAL DISEASE AND INJURY* (1976) (discussing occupational health risks generally and noting need for preventative measures to protect workers).

<sup>16</sup> Note, *Toward a Meaningful "Right-to-Know": Model Legislation and Commentary*, 9 SETON HALL LEGIS. J. 621, 621 (1986). Over 29 states and 36 municipalities have enacted laws designed to provide workers and the public with information regarding the environment and the health effects of exposure to chemicals and other hazards. *Id.*

<sup>17</sup> See O'Reilly, *supra* note 2, at 311 & n.28.

<sup>18</sup> See TOX-EPI REVIEW, *supra* note 3, at 2.

types of businesses, while others apply only to specific materials and businesses.<sup>19</sup> The Occupational Safety and Health Agency (OSHA) established one federal standard in 1983 when it promulgated the Hazard Communication Standard. This standard governs assessment, communication, and training requirements associated with hazardous substances for employees in all states.<sup>20</sup> The standard requires employers in the manufacturing industry to label hazardous substances, to prepare and maintain material safety data sheets (MSDS) containing detailed information on each chemical present in the workplace, and to conduct education and training programs to increase employee awareness and knowledge of these hazards. The Hazard Communication Standard also requires employers to notify employees exposed to toxic substances on the job. Many observers consider this standard the most significant regulatory action ever taken by OSHA.<sup>21</sup>

#### 4. Community Right-to-Know Law

Congress adopted a community right-to-know law that the Environmental Protection Agency (EPA) administers. The Emergency Planning and Community Right-To-Know Act (EPCRA), Title III of the Superfund Amendments and Reauthorization Act (SARA), requires the establishment of state, regional, and local districts to develop procedures for processing public information requests.<sup>22</sup> The Act defines districts by geographical location, but does not limit the number of districts that each state may establish.<sup>23</sup> The Act also requires each state to create emergency planning and notification provisions.<sup>24</sup> It required that each state commission establish emergency planning districts by July 1987.<sup>25</sup>

As its name implies, EPCRA has two purposes: community right-to-know and emergency planning. The community right-to-know requirements create new rights for local government and the public to obtain information on potentially hazardous substances in their neighborhoods. Industry must divulge proprietary information concerning hazardous substances used or maintained on its property.<sup>26</sup> The Act's emergency planning requirements direct local communities to prepare

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<sup>19</sup> See Note, *supra* note 16, at 623; O'Reilly, *supra* note 2, at n.28.

<sup>20</sup> Hazard Communication Standard, 29 C.F.R. § 1910.1200 (1988).

<sup>21</sup> Tyson, *supra* note 5, at 1011.

<sup>22</sup> 42 U.S.C. § 11001(b) (Supp. V 1987).

<sup>23</sup> See *id.*

<sup>24</sup> See *id.* at § 11003.

<sup>25</sup> See *id.* at § 11001(b).

<sup>26</sup> See *id.* at § 11023.

plans to address hazardous substance emergencies.<sup>27</sup> EPCRA calls for active community involvement. Thus, the Act indicates that Congress recognizes the importance of citizen awareness and support in making hazardous substances laws work.<sup>28</sup>

#### 5. Proposition 65: California's Right-to-Know Law

California promulgated regulations implementing the Safe Drinking Water and Toxic Enforcement Act, referred to as Proposition 65. In 1986, an overwhelming sixty-three percent of the voters<sup>29</sup> approved Proposition 65.<sup>30</sup> Proposition 65 represents the most complex and innovative right-to-know law yet developed. Other states are monitoring its implementation and success.<sup>31</sup> Proposition 65 introduces a new "preventative strategy" approach into environmental hazard management that may eventually become the standard that other states follow. Proposition 65 shifts the burden of proving that a chemical does not present a health risk to the business using the chemical. It also places responsibility on the business using the chemical to inform the public, workforce, and consumers of possible exposure.<sup>32</sup>

##### a. Proposition 65 Objectives

Proposition 65 has two major objectives. The first is to prevent unsafe amounts of chemicals from entering the environment. Thus, Proposition 65 prohibits anyone from releasing detectable amounts of toxic chemicals into any source of drinking water.<sup>33</sup> The second objective is to warn the public about potential exposure. Proposition 65 requires toxic chemical manufacturers and sellers to give the public a "clear and reasonable warning" of possible chemical exposure when they release these chemicals into the environment or when consumer products contain these chemicals.<sup>34</sup> Regulations implementing Proposition 65 contain guidelines on how to provide risk information concerning cancer-

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<sup>27</sup> See *id.* at § 11003(a).

<sup>28</sup> ENVIRONMENTAL LAW INSTITUTE, *supra* note 5, at 5.

<sup>29</sup> *Prop. 65 Backers Oppose New Rules on Product Labeling*, Orange County Reg., Feb. 17, 1988, at A3, col. 5.

<sup>30</sup> CAL. HEALTH & SAFETY CODE §§ 25249.5-.13 (West Supp. 1989).

<sup>31</sup> Kizer, Warriner & Book, *Sound Science in the Implementation of Public Policy: A Case Report on California's Proposition 65*, 260 J. A.M.A. 951, 955 (1988) [hereafter *Sound Science*].

<sup>32</sup> *Id.*

<sup>33</sup> CAL. HEALTH & SAFETY CODE § 25249.5 (West Supp. 1989).

<sup>34</sup> *Id.* at § 25249.6.

causing chemicals and reproductive toxins<sup>35</sup> to the public and the workforce.<sup>36</sup>

Proposition 65 requires several time dependent steps to ensure the successful implementation of these two objectives. First, the Governor must publish a list of chemicals known to the state to cause cancer or reproductive toxic effects. The Governor must update this list at regular intervals.<sup>37</sup> Twelve months following the listing of a chemical, no entity may knowingly expose the public or workforce to a "significant amount"<sup>38</sup> of this chemical without first giving a "clear and reasonable warning."<sup>39</sup> Twenty months following the listing of a chemical, no entity may knowingly discharge the chemical at a significant level into any source of drinking water.<sup>40</sup> Proposition 65, however, exempts businesses from the warning requirement if a business can show that a listed carcinogen does not cause a significant risk or that a reproductive toxin has no observable effect at 1000 times the exposure level.<sup>41</sup>

Proposition 65 also provides measures which facilitate citizen involvement and enforcement. Proposition 65 imposes civil penalties of up to \$2,500 per day, per violation.<sup>42</sup> After notifying public authorities and allowing them sixty days to prosecute, citizens may sue a business that violates the discharge or warning requirements. If a citizen sues suc-

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<sup>35</sup> CALIFORNIA SENATE OFFICE OF RESEARCH, ANALYSIS OF PROPOSITION 65: SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT 5 (1986) [hereafter OFFICE OF RESEARCH ANALYSIS]. "Unlike cancer-causing agents, no professional consensus exists regarding the definition of reproductive toxics. The term may refer to general complications of birth which may include: low birth weight, developmental disabilities, sterility, neurotoxic effects, childhood diseases, birth defects and other physical disabilities and diseases." *Id.* (emphasis omitted).

<sup>36</sup> CAL. CODE REGS. tit. 22, §§ 12000-12901 (1989).

<sup>37</sup> CAL. HEALTH & SAFETY CODE § 25249.8 (West Supp. 1989). On February 27, 1987, the California governor appointed the Scientific Advisory Panel, a committee created to review and to recommend chemicals to be placed on the list of carcinogens and reproductive toxins. The Panel consists of scientists from the toxicology, epidemiology, pathology, oncology, teratology, and reproductive toxicology fields. Chemicals identified by the International Agency for Research on Cancer (IARC) of the World Health Organization and the National Toxicology Program of the Public Health Service serve as the primary source of review. *Sound Science*, *supra* note 31, at 952.

<sup>38</sup> CAL. HEALTH & SAFETY CODE § 25249.10 (West Supp. 1989). Proposition 65 considers only those chemicals which have been assessed to have a risk of less than one excess cancer in 100,000 to represent no significant risk to the exposed population. CAL. CODE REGS. tit. 22, § 12703(b) (1989).

<sup>39</sup> CAL. HEALTH & SAFETY CODE § 25249.6 (West Supp. 1989).

<sup>40</sup> *Id.* at § 25249.9.

<sup>41</sup> *Id.* at § 25249.10(c).

<sup>42</sup> *Id.* at § 25249.7(b).



cessfully, the citizen may collect twenty-five percent of the penalties.<sup>43</sup> This measure shifts the burden of proof from the potential exposure victims to the manufacturers and distributors of products containing hazardous substances. The defendant must prove compliance with Proposition 65.

*b. Citizen Motivation to Pass Proposition 65*

Prior to Proposition 65's passage, California had developed major programs in the areas of waste disposal, drinking water quality, pesticide exposure, and hazardous waste regulation and cleanup.<sup>44</sup> Despite the existence of these and federal laws designed to protect the public from environmental hazard exposure, the initiative's proponents identified a need for greater protection from, and more information about, the growing number of hazards present in their environment.<sup>45</sup>

Proposition 65 represents the citizenry's desire to override slow and cumbersome risk management processes of regulating chemicals. Risk management involves consideration of political, social, economic, and scientific information to select appropriate regulatory responses for environmental hazards.<sup>46</sup> Decisions on the control of potential risks may take years to accomplish through notice and comment rulemaking.<sup>47</sup> The actual risk assessment of a substance under consideration involves several years of study.<sup>48</sup> As one Proposition 65 proponent expressed the public's frustration over the slow-moving protection process: "The purpose of Proposition 65 is to go beyond the inept, bungling regulatory process that has failed to protect us from cancer-causing chemicals in our drinking water and at the workplace."<sup>49</sup> Proponents hope that Pro-

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<sup>43</sup> *Id.* at § 25249.7(d).

<sup>44</sup> OFFICE OF RESEARCH ANALYSIS, *supra* note 35, at 1-2. The Pesticide Contamination Prevention Act, CAL. FOOD & AGRIC. CODE §§ 13141-13152 (West 1986), and the Hazardous Waste Control Law, CAL. HEALTH & SAFETY CODE §§ 25100-25249 (West 1986 & Supp. 1989), both of which address the protection of groundwater sources, and the Birth Defects Prevention Act of 1984, CAL. FOOD & AGRIC. CODE §§ 13121-13130 (West 1986 & Supp. 1989), which limits the use of certain cancer causing agents, exemplify state laws that regulate the use of hazardous chemicals. OFFICE OF RESEARCH ANALYSIS, *supra*.

<sup>45</sup> *Sound Science*, *supra* note 31, at 951.

<sup>46</sup> NATIONAL RESEARCH COUNCIL, RISK ASSESSMENT IN THE FEDERAL GOVERNMENT: MANAGING THE PROCESS 18-19 (1983).

<sup>47</sup> *California's Toxics*, *supra* note 5, at 1199-1200.

<sup>48</sup> NATIONAL RESEARCH COUNCIL, *supra* note 46, at 73.

<sup>49</sup> *Voter Initiative Requires Toxic Warnings*, STATE LEGISLATURES, May-June 1988, at 8 (quoting California Assemblyman Tom Hayden).

position 65 will encourage businesses to stop using cancer-causing chemicals in their products. Presumably, warning labels would allow consumers to choose nontoxic products, and thus, induce businesses to reduce toxins in consumer products.

When passed, Proposition 65 did not contain a single guideline or definition for implementing any of its key provisions. Agencies subsequently developed regulations on the methods to determine if the Governor should list a chemical, the types of businesses exempted from the warning requirements, and the types of acceptable warnings. As a result of the initiative's failure to specify an approach to implementation, proponents and opponents attempted to influence the regulations implementing its key provisions. Powerful business lobbyists and the Governor's office sought to weaken the regulations implementing Proposition 65, while environmental groups fought to maintain the initiative's original intentions.<sup>50</sup> The initial list issued by the Governor's office sparked disagreement over the number of chemicals it included. The Department of Health Services recommended that the Governor's office consider 250 chemicals for placement on the initial list.<sup>51</sup> However, the list issued by the Governor's office on February 27, 1987, contained only twenty-nine chemicals.<sup>52</sup> Initiative proponents sued, challenging this short list of carcinogens and reproductive toxins.<sup>53</sup> In April 1987, a Sacramento superior court ordered the Governor's office to add more than 200 chemicals to the initial list.<sup>54</sup>

### *c. Proposition 65 Warning Requirements*

Proposition 65's warning requirements did not mandate any specific method or language. Proposition 65 defined warnings as general communications to the public, including labels on products, notices in mailings, posted notices, and notices in the news media.<sup>55</sup> Proposition 65 required businesses to provide clear and reasonable warnings. However, Proposition 65 did not require businesses to provide separate

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<sup>50</sup> *Prop. 65 Backers Oppose New Rules on Product Labeling*, *supra* note 29.

<sup>51</sup> *See Interim Hearing*, *supra* note 4, at 13-14. Initially, the Governor's office chose only those chemicals known to be human carcinogens and did not list chemicals determined to be a human risk on the basis of data derived from animal studies. *See Sound Science*, *supra* note 31, at 952. The use of this criteria excluded such commonly accepted human carcinogens as EDB (Ethylene Dibromide) from the list. *See Interim Hearing*, *supra* note 4, at 19, 64.

<sup>52</sup> *See Sound Science*, *supra* note 31, at 952.

<sup>53</sup> *Id.*

<sup>54</sup> *Id.*

<sup>55</sup> *See CAL. CODE REGS.* tit. 22, § 12601 (1989).

warnings to each exposed individual.<sup>56</sup>

Proposition 65's implementation regulations establish three general exposure categories: consumer product exposure,<sup>57</sup> occupational exposure,<sup>58</sup> and environmental exposure.<sup>59</sup> The regulations require that each business' chosen warning method contain specific language. Depending on the exposure type, a business may provide warnings by using one or more of the following methods: product labels, posted signs in affected areas, periodic mailings, public media announcements, or toll-free information services.<sup>60</sup>

To comply with the employee notification provision, regulations implementing Proposition 65 allow businesses using one of the identified chemicals to post warnings on their property. Many businesses have opted to print notices in newspapers to satisfy the community notification requirement. The regulations require the following warning for exposure to a chemical known to the state to cause cancer: "*WARNING: This area contains a chemical known to the State of California to cause cancer.*"<sup>61</sup> The regulations mandate the following warning for exposure to a chemical known to the state to cause reproductive toxicity: "*WARNING: This area contains a chemical known to the State of California to cause birth defects or other reproductive harm.*"<sup>62</sup>

The Governor's office adopted guidelines which did not require businesses selling consumer products to identify individually products containing toxic chemicals within the store.<sup>63</sup> Instead, the guidelines require these businesses to post a single notice stating that the store sells products which contain cancer-causing chemicals.<sup>64</sup> This notice often provides a toll-free number for consumers to call to obtain specific information on brand products. Use of the toll-free number has been problematic. For example, a consumer cannot discover whether the list includes a product unless the consumer can recall an exact brand name.<sup>65</sup>

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<sup>56</sup> OFFICE OF RESEARCH ANALYSIS, *supra* note 35, at 8.

<sup>57</sup> CAL. CODE REGS. tit. 22, § 12601(b) (1989).

<sup>58</sup> *Id.* at § 12601(c).

<sup>59</sup> *Id.* at § 12601(d).

<sup>60</sup> CAL. CODE REGS. tit. 22, § 12601 (1989).

<sup>61</sup> *Id.* at § 12601(b)(4)(A).

<sup>62</sup> *Id.* at § 12601(b)(4)(B).

<sup>63</sup> *See* CAL. CODE REGS. tit. 22, § 12601 (1989).

<sup>64</sup> *See id.*

<sup>65</sup> Letter from Environmental Defense Fund to the California State Attorney General (Aug. 2, 1988) (discussing Ingredient Communication Council, Inc.'s operation of 800-number system to warn consumers of health risks from tobacco products). "[T]he

These warnings may not satisfy the clear and reasonable standard and may not fulfill Proposition 65's aim to provide all individuals with information about toxic chemicals. California Attorney General John Van de Kamp, who often disagrees with Governor Deukmejian over Proposition 65's implementation,<sup>66</sup> stated that the regulations intended only to clarify that businesses could use a toll-free information number as part of *an overall warning system* and that the regulations never intended to allow businesses to use such a number alone.<sup>67</sup> The Attorney General further stated that an adequate warning system must provide the required information to all consumers, not just those who are willing to invest unusual amounts of time and effort to obtain the facts.<sup>68</sup> A Sacramento superior court recently held that mere use of the toll-free number, independent of an overall system, fails to comply with Proposition 65's warning requirements.<sup>69</sup>

## II. THE CONTRIBUTION OF RISK COMMUNICATION RESEARCH

In most cases, right-to-know laws adequately address the scientific, legal, and policy aspects of communicating risk to the community and workforce. However, too often these laws do not supply direction about one of the most important aspects of this process: how most effectively to communicate risk to individuals. Effective notification of individuals who are at an increased risk of cancer or other disease requires consideration and application of knowledge about complex psychological processes. Depending on the way in which the information is communicated, the communication can elicit psychological reactions such as fear,

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persistent and diligent caller may eventually receive a recorded warning message for each such product if he or she calls the 800 number and is sufficiently precise in requesting information. . . . [N]o caller who requests information on 'cigars,' 'pipe tobacco,' 'cigarette tobacco,' . . . or 'tobacco products' receives any such message." *Id.* at 4.

<sup>66</sup> *Chemicals Added to Prop. 65 List as Criticism of Governor Rises*, L.A. Times, July 2, 1988, § I, at 30, col. 1.

<sup>67</sup> Letter from California Attorney General John K. Van de Kamp and Chief Assistant Attorney General Andrea Sheridan Ordin to Assemblyman Lloyd G. Connelly (Mar. 3, 1988).

<sup>68</sup> *Id.*

<sup>69</sup> Vargas, *Judge Vetos Prop. 65 Call-in Plan*, Sacramento Bee, Aug. 23, 1989, at E-1, col. 2; *Ingredient Communication Council, Inc. v. Van de Kamp*, No. 504601 (Sacramento County Super. Ct., Aug. 22, 1989) (Tentative Decision). "Specifically, the [c]ourt finds that the warning method is not reasonably calculated, considering the alternative methods available under the circumstances, to make the warning available prior to exposure. The [c]ourt further finds that the system has not been effective in practice in providing warnings prior to exposure." *Id.* at 12.

denial, or cancerphobia, which will greatly affect individual response to the presented material. A communicator must consider the kind of information to provide, the means of providing it, the way the recipient will perceive the information, and strategies which can make the information more useful.

Legislatures have expanded right-to-know laws without adequately considering knowledge about risk communication. Ill-defined and poorly reasoned laws encourage businesses to develop legally sufficient but ineffective, and perhaps even counterproductive, warnings.<sup>70</sup> Understanding and incorporating risk communication principles into right-to-know programs should prove useful in developing a systematic disclosure method that will achieve the desired goal of providing risk information to the public and the workforce.

Although considerable social science research concerns the design of risk communication programs, government agencies rarely use social science data in developing regulations for information disclosure requirements.<sup>71</sup> Right-to-know communication guidelines have become ritualistic.<sup>72</sup> The formal act of conveying risk information has taken precedence over the information's actual impact in reducing health risks. Providing information is necessary, but not sufficient, to decrease health risks. Information must stimulate the individual to make changes that reduce health risks.<sup>73</sup> The following sections describe social science principles and dynamics from several fields. These sections indicate how social science principles can help to develop more meaningful rules. First, these sections address problems organized around a typology of the risk communication process. Next, these sections discuss general learning on human information processing. Finally, this Article presents several relevant concepts from the social psychological analysis of the response to risk.

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<sup>70</sup> Schwartz & Driver, *Warnings in the Workplace: The Need for a Synthesis of Law and Communication Theory*, 52 U. CIN. L. REV. 38, 43 (1983).

<sup>71</sup> Mazis & Staelin, *Using Information-Processing Principles in Public Policymaking*, 1 J. MARKETING & PUB. POL'Y, 3, 3 (1982) (reporting that government agencies rarely use information processing theory in public policy development for consumer information programs).

<sup>72</sup> Needleman, *supra* note 6, at 20.

<sup>73</sup> *Id.*; Schwartz & Driver, *supra* note 70, at 43.

### A. Overview of the Risk Communication Process

#### 1. Origin of Risk Communication Problems

Technological or environmental hazard communication problems arise in many forms.<sup>74</sup> Risk communication research provides a useful typology to describe problems in conveying information on environmental health issues.<sup>75</sup> This typology includes source problems (who says it), message problems (what is said), channel problems (how it is said), and receiver problems (to whom it is said). Various communication models adopt the approach of *who* says *what* to *whom* and with *what effect* as their basic structure.<sup>76</sup> Specifically, source refers to the message's generator: the communicator, author, speaker, or agency. Message refers to the content of any communication sent between persons (from source to receiver). Channel refers to the communication setting and the medium for conveying the message. Receiver refers to the person or group reading or hearing the message.<sup>77</sup>

#### 2. Source

Source problems generally refer to communication difficulties originating in the person, company, or agency delivering the information. Social psychologists have repeatedly demonstrated that the communication's source influences the information's effectiveness, including an acceptance of the message.<sup>78</sup> Salient characteristics include source credibility, expertness, competence, trustworthiness, objectivity, sociability, attractiveness, and similarity to the receiver. Credibility, expertness, and trustworthiness influence message effectiveness. Perceived ex-

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<sup>74</sup> Covello, von Winterfeldt & Slovic, *Communicating Scientific Information About Health & Environmental Risks: Problems and Opportunities from a Social and Behavioral Perspective*, in RISK COMMUNICATION 110 (J. Davies, V. Covello, & F. Allan eds. 1986) [hereafter *Communicating Scientific Information*].

<sup>75</sup> V. COVELLO, D. VON WINTERFELDT & P. SLOVIC, RISK COMMUNICATION: RESEARCH AND PRACTICE 1 (1988) [hereafter RISK COMMUNICATION: RESEARCH AND PRACTICE]; *Communicating Scientific Information*, *supra* note 74, at 4.

<sup>76</sup> Laswell first set forth this typology in 1948. See Laswell, *The Structure and Function of Communication in Society*, in THE COMMUNICATION OF IDEAS 37 (L. Bryson ed. 1948). Yale theorists extensively developed the typology in the 1950s. See C. HOVLAND, I. JANIS & H. KELLEY, COMMUNICATION AND PERSUASION (1953). As the first information-processing theory of persuasion, the Yale model is responsible for much of our empirical knowledge of communication and persuasion effects. For a comprehensive review and critique of social influence theories of communication, see generally M. SMITH, PERSUASION AND HUMAN ACTION (1982).

<sup>77</sup> M. SMITH, *supra* note 76, at 215.

<sup>78</sup> See *id.* at 219.

expertise on the issue and reputation for honesty influence credibility. Credibility, in general, refers to all characteristics that may affect the believability of a message's content.<sup>79</sup>

Source problems specifically associated with environmental health and policy issues arise from: lack of institutional trust and credibility; disagreements among scientific experts; failure to discuss limitations of risk assessments and resulting scientific uncertainties; limited understanding of individuals' and communities' fears, concerns, and values; and use of bureaucratic and highly technical language.<sup>80</sup> The Fernald, Ohio incident exemplifies a serious source related problem. Government officials failed to release all the information concerning a uranium processing plant's contamination of a neighboring community.<sup>81</sup> The plant had leaked radioactive material.<sup>82</sup> Although government and plant officials told residents that all health and environmental standards were met, in reality the officials knew that a persistent problem in the uranium dust collection system existed.<sup>83</sup> The system frequently released large amounts of uranium particles into the atmosphere.<sup>84</sup> Residents now speak of the plant as "some kind of enemy down there trying to do away with us."<sup>85</sup> For some local citizens, the government's credibility may have been irrevocably destroyed as a reliable source of information by the deliberate withholding of information. Any future governmental attempts to discuss the risk assessment, showing actual exposure-related health effects, could continue to be met with disbelief and distrust.

### 3. Message

Message problems generally refer to problems originating in the information that the risk communication provides. Many variables influence the message. These variables include: the frequency of exposure to the message; the level of fear-arousing information included in the message; the message's directness and understandability; and the articulation of specific steps for coping with the problem.<sup>86</sup> Providing specific

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<sup>79</sup> *Id.* at 219; Kelman, *Processes of Opinion Change*, 25 PUB. OPINION Q. 57, 78 (1961) (discussing various aspects of credibility that affect believability of message).

<sup>80</sup> RISK COMMUNICATION: RESEARCH AND PRACTICE, *supra* note 75, at 2.

<sup>81</sup> *Amalgam of Agony and Anger Downwind from Uranium Site*, N.Y. Times, Oct. 19, 1988, at A1, col. 4.

<sup>82</sup> *Id.*

<sup>83</sup> *Id.*

<sup>84</sup> *Id.*

<sup>85</sup> *Id.*

<sup>86</sup> M. SMITH, *supra* note 76, at 227, 230; C. BERNIER & A. YERKEY, COGENT COMMUNICATION: OVERCOMING READING OVERLOAD (1979) (discussing variables

actions to follow increases the extent to which an individual accepts a recommendation.<sup>87</sup> Studies indicate that repeated message exposure initially increases the message's effectiveness by giving people an opportunity to learn new information. With continued repetition, however, boredom and satiation begin to develop, decreasing the message's effectiveness.<sup>88</sup>

Message problems associated with health and environmental risk include: the use of highly technical analyses, often unintelligible to laypersons; the risk analysis' complexity; the use of aggregate levels of risk to address individual concerns about risk; and deficiencies in scientific understanding which result in large uncertainties in risk information.<sup>89</sup> The lack of public interest displayed toward warning signs placed in businesses, in compliance with Proposition 65 requirements,<sup>90</sup> exemplifies a message-oriented problem. For example, the single warning sign, "fetal alcohol syndrome may result from the use of alcoholic beverages during pregnancy," will have limited impact because it fails to indicate steps that an individual may follow to obtain further information.

#### 4. Channel

Channel problems generally refer to difficulties in communication resulting from the method in which the source transmits information. Channel variables that influence the message's effectiveness include: the medium used to convey the information, such as television, radio, print, or face-to-face; the timing of the information's release; and the presence of other stimuli competing for the receiver's attention.<sup>91</sup> Social science research concludes that a face-to-face channel most effectively delivers a

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that influence message problems).

<sup>87</sup> Leventhal, *Findings and Theory in the Study of Fear Communications*, 5 *ADVANCES IN EXPERIMENTAL SOC. PSYCHOLOGY* 151-56 (1970) (discussing specific actions to follow to increase message acceptability).

<sup>88</sup> M. SMITH, *supra* note 76, at 229. See generally Berlyne, *Novelty, Complexity, and Hedonic Value*, 8 *PERCEPTION & PSYCHOPHYSICS* 279, 279-86 (1970) (conducting experiment in which "interestingness" increased with novelty). The Berlyne study suggests that a curvilinear relationship exists between message exposure and attitude change.

<sup>89</sup> *RISK COMMUNICATION: RESEARCH AND PRACTICE*, *supra* note 75, at 2.

<sup>90</sup> See *Toxic Chemical Warnings Debut to Mixed Reviews*, L.A. Times, Feb. 28, 1988, § II, at 1, col. 5.

<sup>91</sup> M. SMITH, *supra* note 76, at 232; C. BERNIER & A. YERKEY, *supra* note 86, at 194.



message.<sup>92</sup> However, most risk communication, in part because of its nature, occurs via mass communication. Therefore, research in risk communication focuses on timing, bias, or inaccuracies resulting from the media's reporting of health and environmental issues.

Channel problems associated with risk communication include: selective and biased reporting that emphasizes an event's sensational or dramatic aspects; oversimplification and distortions in interpreting technical information; and premature disclosure of scientific information.<sup>93</sup> The EPA's ban of the pesticide ethylene dibromide (EDB) in the face of grain produce contamination exemplifies a channel problem in communicating risk. Following the February 1984 reported contamination of products on Florida's grocery shelves, the EPA banned the use of EDB on stored grain and machinery.<sup>94</sup> The media provided extensive commentary on EDB for several months before the EPA issued federal guidelines. Coverage peaked immediately after the ban.

The media focused on the EDB event's dramatic aspects, such as the health effects on chemical workers exposed to much greater EDB levels than that found in some products.<sup>95</sup> Reports focused on risk level controversies among different scientific experts and between state and federal agencies. In addition, the media often incorrectly reported the health risk's seriousness and the actual extent of contamination because the media attempted to translate technical information into forms that the reader could understand.<sup>96</sup> Consequently, public concern over possible EDB health risks increased rapidly, and consumer sales of both contaminated and related uncontaminated products fell markedly.<sup>97</sup>

## 5. Receiver

Receiver problems refer to the intended audience's perceived dysfunctional response to the risk message. Receiver variables that influence the message's effectiveness include: personality traits; the level of personal involvement with communication issues; and initial attitudes

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<sup>92</sup> Eldersveld & Dodge, *Personal Contact or Mail Propaganda? An Experiment in Voting Turnout and Attitude Change*, SOCIETY FOR THE PSYCHOLOGICAL STUDY OF SOCIAL ISSUES, PUBLIC OPINION AND PROPAGANDA 532 (1954) (presenting result of study to determine most effective channel for message delivery).

<sup>93</sup> RISK COMMUNICATION: RESEARCH AND PRACTICE, *supra* note 75, at 2.

<sup>94</sup> See Sharlin, *EDB: A Case Study in Communicating Risk*, 6 RISK ANALYSIS 61, 61-62 (1986).

<sup>95</sup> See *id.* (discussing impact of media in influencing public's perception of health risks from EDB).

<sup>96</sup> See *id.*

<sup>97</sup> See *id.*

toward the communication issue. For example, research in attitude change and persuasion indicates that individuals suffering from chronic anxiety exhibit a lowered ability to comprehend a message's content, but a greater tendency to believe the message.<sup>98</sup> In addition, research indicates that people personally involved with an issue will generate many more counterarguments than less involved individuals when exposed to a message contrary to their initial attitudes.<sup>99</sup>

In the health and environmental hazards area, the receiving audience may have inaccurate risk perceptions, a lack of interest in the problem, varying psychological perceptions resulting in denial of the problem, or overconfidence in individual ability to avoid harm. Previously developed opinions and beliefs that are resistant to change and unrealistic expectations about regulatory effectiveness contribute to communication problems with the intended audience.<sup>100</sup>

Receiver problems in communicating a risk resulting from groundwater contamination occurred in a community where the residents were already concerned about urban sprawl and perceived resulting detrimental effects. The residents concluded that another evil of urban sprawl affected them.<sup>101</sup> This caused a much higher anxiety level over the potential health risk than that warranted by the risk assessment results.<sup>102</sup> The residents' personal involvement in the groundwater contamination issue was part of an interrelated attitude structure associated with larger quality-of-life issues. When personal involvement issues become so linked, they produce an "anchoring" effect in which commitment to the entire interrelated belief structure (quality-of-life preservation) results in higher resistance to any information concerning a specific part of the issue (information about the level of health risk associated with groundwater contamination).<sup>103</sup>

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<sup>98</sup> See M. SMITH, *supra* note 76, at 235.

<sup>99</sup> *Id.*

<sup>100</sup> RISK COMMUNICATION: RESEARCH AND PRACTICE, *supra* note 75, at 2-3.

<sup>101</sup> Fessenden-Raden, Fitchen & Heath, *Providing Risk Information in Communities: Factors Influencing What Is Heard and Accepted*, SCI. TECH. & HUM. VALUES, Summer/Fall 1987, at 94, 95 (reporting results of study of risk perception in community suffering from groundwater contamination).

<sup>102</sup> *Id.*

<sup>103</sup> Holt, *Resistance to Persuasion on Explicit Beliefs as a Function of Commitment to and Desirability of Logically Related Beliefs*, 16 J. PERSONALITY SOC. PSYCHOLOGY 583, 583-91 (1970) (presenting results of psychological study on "anchoring" effect found in resistance to persuasion).

### B. *The Critical Function of Audience Characteristics*

Designing effective risk communication programs for the public, workplace, or consumers require an understanding of the entire communication process between source and receiver. The characteristics of the audience receiving the information is of primary importance.

Homeowners who receive notice from neighboring companies of the use of chemicals listed by the government as causing cancer or reproductive harm must decide whether to remain in their neighborhood. Individuals receiving workplace warnings must decide whether to remain at the worksite. The communication of potential risk in the use of consumer products requires the individual to process hazard information and to make a risk judgment for certain products. To effectively communicate risk, a program must provide very different individuals in very different settings with necessary hazard information. A program must present this information in a manner that allows these individuals to choose the risks to which they are exposed. Ideally, an individual will choose the option in her best interest by utilizing the available information.<sup>104</sup> As the following discussion illustrates, however, many social and psychological factors interfere with an individual's ability to utilize available information and to make a truly informed choice.

#### 1. Human Information Processing

Policymakers must consider the limitations and complexities of human judgment and decisionmaking when designing risk communication programs. The individual's ability to gather and to process information provided is critical in determining the risk communication program's effectiveness. Human information-processing research shows that people generally find it difficult to think clearly about uncertain outcomes and probabilistic data.<sup>105</sup>

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<sup>104</sup> Fischhoff, *Cognitive and Institutional Barriers to "Informed Consent,"* in *TO BREATHE FREELY: RISK, CONSENT, AND AIR* 169, 170-71 (M. Gibson ed. 1985) (discussing need to provide risk information in manner that allows consumer to make optimal choice).

<sup>105</sup> See Tversky & Kahneman, *Judgment Under Uncertainty: Heuristics and Biases,* in *JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES* 3, 3-20 (D. Kahneman, P. Slovic & A. Tversky eds. 1982) (presenting research findings on human information-processing abilities).

a. *Judgment Heuristics*

People use judgmental heuristics (mental strategies) to reduce complex judgments to simpler and more manageable forms.<sup>106</sup> Behavioral decisionmaking research indicates that this use of heuristics often leads to serious judgment errors.<sup>107</sup> The availability heuristic, a strategy people use to judge an event's frequency or likelihood, becomes especially important in considering how to inform people about risk.<sup>108</sup> People often judge risk according to the ease of imagining relevant examples.<sup>109</sup> People overestimate dramatic and sensational events such as cancer, fire, and plane crashes.<sup>110</sup> People underestimate nonsensational events such as asthma, diabetes, and automobile accidents.<sup>111</sup> The availability heuristic implies that a health hazard's perceived risk and benefits can be manipulated by varying the method of describing the hazard.<sup>112</sup> For example, researchers altered the perception of the likelihood of contracting a disease by describing the disease with either easy-to-imagine or difficult-to-imagine symptoms. Subjects more readily believed that they would contract the disease when researchers presented the disease in a way that the subject could easily imagine.<sup>113</sup>

The presence or lack of sensory cues also influences availability. New Jersey's Department of Health initially feared that a panic reaction would occur when it disseminated information on the risk of radon in homes.<sup>114</sup> It adopted an information program designed to diffuse the

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<sup>106</sup> See Slovic, Fischhoff & Lichtenstein, *Regulation of Risk: A Psychological Perspective*, in REGULATORY POLICY AND THE SOCIAL SCIENCES 241, 244 (R. Noll ed. 1985); Tversky & Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCIENCE 1124, 1124-31 (1974) (discussing use of judgment heuristics).

<sup>107</sup> See Tversky & Kahneman, *supra* note 106, at 1124.

<sup>108</sup> See *id.* at 1127-28.

<sup>109</sup> *Id.* at 1124.

<sup>110</sup> *Id.* at 1127.

<sup>111</sup> See *generally id.* (discussing impact of salience on retrievability of instances).

<sup>112</sup> Thompson, Research on Human Judgment and Decision Making: Implications for Informed Consent and Institutional Review 13-14 (Aug. 1986) *to be published in* EMPIRICAL STUDIES OF ETHICAL ISSUES IN RESEARCH (J. Seiber & B. Stanley eds. forthcoming 1990) (draft on file at U.C. Davis Law Review).

<sup>113</sup> See Sherman, Cialdini, Schwartzman & Reynolds, *Imagining Can Heighten or Lower the Perceived Likelihood of Contracting a Disease: The Mediating Effect of Ease of Imagery*, 11 PERSONALITY & SOC. PSYCHOLOGY BULL. 118, 118-27 (1985) [hereafter *Imagining*] (reporting results of study illustrating effect of description's vividness on perception of health risk).

<sup>114</sup> See Sandman, Weinstein & Klotz, *Public Response to the Risk from Geological Radon*, J. COMM., Summer 1987, at 93, 96 [hereafter *Public Response*]. Contrary to predictions by Proposition 65 opponents, see *California's Toxics*, *supra* note 5, at 1217

information to the public slowly and thereby decrease a panic response possibility.<sup>115</sup> The Department primarily used an information hotline to provide information on request.<sup>116</sup> Instead of panic, the public responded apathetically, reducing the needed testing of radon levels in homes.<sup>117</sup> Researchers suggest that radon's lack of visual or sensory cues to indicate a threat contributed to the public's apathy.<sup>118</sup> A second example of sensory cues' importance in risk communication occurred in California when the public strongly opposed the spraying of pesticides over communities to control the spread of a crop pest. One commentator suggests that the helicopters' visual presence in spraying the pesticide caused strong public reaction by dramatically increasing the hazard's vividness.<sup>119</sup>

*b. Individual Differences in Information Seeking*

Designers of risk communication programs often overlook the fact that American consumers are not, in general, information seekers. Only ten to twenty percent of Americans seek information.<sup>120</sup> Information seekers generally have high incomes, high media use, and high confidence in scientific test data.<sup>121</sup> Many information programs are used almost exclusively by these information seekers and not by the vast majority of consumers. This may be because information program designers are themselves information seekers. Thus, they fail to consider that their target audience's information needs may differ from their own.<sup>122</sup> A risk communication program which requires active information seeking by the consumer will reach only a small minority of the intended

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(arguing that labeling requirement could increase fear of risk in using products), panic is actually a rare response to hazards, requiring a strong sense of urgency. *See* T. DRABEK, HUMAN SYSTEM RESPONSES TO DISASTER: AN INVENTORY OF SOCIOLOGICAL FINDINGS 357 (1986); S. BREZNITZ, CRY WOLF: THE PSYCHOLOGY OF FALSE ALARMS 6 (1984).

<sup>115</sup> *Public Response*, *supra* note 114, at 96.

<sup>116</sup> *See id.*

<sup>117</sup> *See id.* at 98-100 (evaluating public reaction to radon threat).

<sup>118</sup> *See id.* at 96.

<sup>119</sup> E. Vaughan, Some Factors Influencing the Nonexpert's Perception and Evaluation of Environmental Risks (1986) (unpublished doctoral dissertation, Department of Psychology, Stanford University).

<sup>120</sup> *See* Thorelli & Engledow, *Information Seekers and Information Systems: A Policy Perspective*, J. MARKETING, Spring 1980, at 9, 13.

<sup>121</sup> *Id.* at 12.

<sup>122</sup> Earle & Cvetkovich, *Risk Communication: A Marketing Approach*, NSF/EPA WORKSHOP ON RISK PERCEPTION AND RISK COMMUNICATION, Long Beach, California (Dec. 1984).

audience. In the case of Proposition 65, requiring use of an 800 number as the primary risk communication method effectively prevents a majority of the public from receiving information needed to make an informed decision. A recent study to measure the impact of OSHA's Hazard Communication Standard<sup>123</sup> on workplace conditions and employee behavior indicates that employees' level of information seeking is very low.<sup>124</sup> When applicable to their job, sixty-eight percent of the employees "often" or "always" read the chemical warning labels placed on containers.<sup>125</sup> However, only ten percent of the employees "often" or "always" obtained the Material Safety Data Sheet which describes the chemical health hazard in detail.<sup>126</sup>

### C. *Social-Psychological Response to Risk*

Policymakers also need to recognize the influence of social-psychological processes on a risk communication program's success when providing hazard information. Researchers have studied extensively the psychological responses to a hazard's qualitative dimensions. For example, the negative public reaction to nuclear power plants derives from factors which include: the catastrophic potential should an accident occur; feelings of dread associated with radioactive material; and the threat to future generations.<sup>127</sup> In addition, subtle psychological dynamics in response to risk may vary extensively across different targeted groups. These dynamics play a major role in determining the receiving audience's response to the risk communication.

#### 1. Exposure Characteristics: Voluntary Versus Involuntary

Policymakers considering the response to risk information often ignore the perceived voluntary versus involuntary nature of the risk.<sup>128</sup>

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<sup>123</sup> Hazard Communication Standard, 29 C.F.R. § 1910.1200 (1988).

<sup>124</sup> See *OSHA*, *supra* note 7, at 227 (reporting employees' use of hazard information).

<sup>125</sup> *Id.*

<sup>126</sup> *Id.*

<sup>127</sup> See Slovic, Fischhoff & Lichtenstein, *Characterizing Perceived Risk*, in *PERILOUS PROGRESS: MANAGING THE HAZARDS OF TECHNOLOGY* 91, 108 (R. Kates ed. 1985) [hereafter *Perceived Risk*].

<sup>128</sup> See D. NELKIN & M. BROWN, *WORKERS AT RISK* 83 (1984); Deer, Goble, Kasperon & Kates, *Protecting Workers, Protecting Publics: The Ethics of Differential Protection*, in *RISK ANALYSIS IN THE PRIVATE SECTOR* 257, 266 (C. Wipple & V. Covello eds. 1983); Vaughan & Nordenstam, *Farmworkers and Pesticide Exposure: Perceived Risk, Psychological Distress, and Health*, abstract for American Psychological Association Symposium (Aug. 1989).

Generally, people oppose risks from involuntary hazards and accept voluntary risks. Cigarette smoking exemplifies a voluntary risk. The nonsmoker's exposure to the cigarette's secondary smoke exemplifies an involuntary risk.

Literature focusing on the public's reaction to involuntary risk reveals a public tendency to view involuntary hazards as more risky than hazards of equal risk under voluntary control. The social scientific work primarily focuses on technological and environmental hazards in the community.<sup>129</sup> Little work focuses on the employee's risk perception. Some research on a subpopulation of employees indicates that employees perceive risk differently than the public.<sup>130</sup> Some employees deny the level of risk to which they may be exposed.<sup>131</sup> Researchers link this difference in risk perception to the involuntary nature of employee exposure. In particular, blue collar employees feel that they do not have the option of leaving their jobs to avoid hazard exposure. Economic necessity requires many to remain at their current occupation.

A study examining factors affecting health risk perception related to air pollution from an arsenic emitting copper smelter illustrates this principle. The study found that the smelter employees, although facing greater arsenic exposure than nearby residents, were less likely to view the smelter as a personal health hazard.<sup>132</sup> Instead, employees were more likely to indicate that they would not get cancer from the smelter's arsenic emissions.<sup>133</sup> The study's author believes that this risk denial process occurs because denial makes it psychologically easier for the smelter employee to go to work each day and to continue the health hazard exposure.<sup>134</sup> Another study measured perceived risk, psychological distress, and pesticide health effects on southern California migrant farm workers. The study revealed that many of the farm workers could

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<sup>129</sup> See, e.g., Covello, *The Perception of Technological Risks: A Literature Review*, 23 *TECHNOLOGICAL FORECASTING & SOC. CHANGE* 285, 285-97 (1983) (providing extensive literature review of research in field of risk perception); Starr, *Social Benefits Versus Technological Risk: What is Our Society Willing to Pay for Safety?*, 165 *SCIENCE* 1232 (1969). Despite some criticism of the methodology used, Starr's classic article on the acceptability of risk served as the catalyst for much of the current research on risk perception.

<sup>130</sup> Baird, *Tolerance for Environmental Health Risks: The Influence of Knowledge, Benefits, Voluntariness, and Environmental Attitudes*, 6 *RISK ANALYSIS* 425, 434 (1986).

<sup>131</sup> *Id.*; Vaughan & Nordenstam, *supra* note 128, at 3.

<sup>132</sup> Baird, *supra* note 130, at 433.

<sup>133</sup> *Id.*

<sup>134</sup> *Id.* at 434.

not view workplace exposure to pesticides as voluntary.<sup>135</sup> Over forty percent knew of no other job possibilities, and fifty-four percent believed that it would be extremely difficult to find another source of income if forced to leave field work for health reasons.<sup>136</sup>

## 2. Control Over Exposure

Policymakers must also consider a second social psychological consideration closely related to voluntariness of exposure. They must consider the amount of control that the intended audience feels it has over the hazard or possible exposure-related health outcomes. Control refers to the real or perceived ability to determine an event's outcome.

Research in human stress clearly shows that the ability to control an undesirable situation, believing that one can control the situation, or perceiving that one can control other aspects of the environment can reduce the stressful impact of the undesirable situation or event.<sup>137</sup> In one laboratory experiment, subjects required to take one of three supposedly different noxious pills reported a significantly higher number of stomach aches than when allowed to choose which pill to take.<sup>138</sup> The three pills were actually the same placebo.

A perceived lack of control generally increases the public's risk perception of the hazard.<sup>139</sup> Limited studies performed in the workplace demonstrate that a perceived lack of control increases denial that a health hazard exists.<sup>140</sup> For example, in the migrant farm worker study, workers who felt they had less control over the harmful effects of pesticide exposure also had fewer fears about pesticide exposure than workers with a greater sense of control.<sup>141</sup> This research illustrates that even though workers may know of potential risks, routine exposure to common hazards may not always increase fear or distress if employees perceive the harmful effects of pesticide exposure as uncontrollable.<sup>142</sup>

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<sup>135</sup> Vaughan & Nordenstam, *supra* note 128, at 7.

<sup>136</sup> *Id.*

<sup>137</sup> R. GATCHEL & A. BAUM, AN INTRODUCTION TO HEALTH PSYCHOLOGY 77-100 (1983) (providing a general overview of research in health psychology focusing on human stress).

<sup>138</sup> Renn & Swaton, *Psychological and Sociological Approaches to Study Risk Perception*, 10 ENV'T INT'L 557, 566 (1984).

<sup>139</sup> *See Perceived Risk*, *supra* note 127, at 100.

<sup>140</sup> *See D. NELKIN & M. BROWN*, *supra* note 128, at 94; *see also* Vaughan & Nordenstam, *supra* note 128, at 16.

<sup>141</sup> *See* Vaughan & Nordenstam, *supra* note 128, at 16.

<sup>142</sup> *See id.*



### 3. Learned Helplessness

The psychological dynamic of learned helplessness may contribute to an individual's response to an uncontrollable hazard. Animal learning and motivation research shows that animals continually exposed to an unavoidable negative event eventually make little effort to avoid it.<sup>143</sup> Human stress researchers have been aware that individuals who repeatedly fail to exert control effectively over something may stop trying in that setting and in other situations where the individual may achieve success more readily. Passive behavior, negative expectations ("I won't be able to do this"), and hopelessness ("It won't make a difference") characterize learned helplessness.<sup>144</sup> Environmental risk response parallels learned helplessness when people feel that they have little control over avoiding the increasing number of environmental hazards.<sup>145</sup>

### 4. Psychological Responses to Public Information Programs

Research developed for natural disaster, chronic illness, and other public health information programs has implications for developing risk communication programs. This literature demonstrates that making an individual aware of a risk, and the potential damage from the risk, does not guarantee that the individual will act on this information.<sup>146</sup> Some people unrealistically hold optimistic views about their chances of experiencing a negative event in comparison to their estimations of risk for others.<sup>147</sup> People tend to think that they have less chance of experiencing health and safety problems than their peers. In general, people are consistently biased about risk factors perceived to be under their personal control, such as personal actions, lifestyle, and personality.<sup>148</sup> They view these factors as capable of decreasing, but not increasing,

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<sup>143</sup> See R. TARPY, PRINCIPLES OF ANIMAL LEARNING AND MOTIVATION 338-39 (1982) (presenting research on learned response of animals unable to control conditions).

<sup>144</sup> R. GATCHEL & A. BAUM, *supra* note 137, at 90-91.

<sup>145</sup> See D. NELKIN & M. BROWN, *supra* note 128, at 87.

<sup>146</sup> See generally PUBLIC COMMUNICATION CAMPAIGNS 92-94 (R. Rice & L. Bourne eds. 1981) (reporting results of antismoking campaign); Sims & Baumann, *Educational Programs and Human Response to Natural Hazards*, 15 ENV'T & BEHAV. 165, 165-89 (1983) (providing examples from public information programs on risks from natural hazards).

<sup>147</sup> Weinstein, *Unrealistic Optimism About Future Life Events*, 39 J. PERSONALITY & SOC. PSYCHOLOGY 165, 165 (1983); Weinstein, *Why It Won't Happen to Me: Perceptions of Risk Factors and Susceptibility*, 3 HEALTH PSYCHOLOGY 431, 431-32, 452 (1984) [hereafter *Why It Won't Happen*].

<sup>148</sup> See sources cited *supra* note 147.

their personal risk.<sup>149</sup>

Public health campaigns strongly emphasizing the link between behavior and susceptibility have had greater success than campaigns failing to stress that people who engage in high risk behavior are most susceptible to harm. For example, the "buckle-up-for-safety" seat belt campaign unsuccessfully encouraged seat belt use, even though surveys showed increased public awareness of driving risks and the benefits of wearing seat belts.<sup>150</sup> This type of study illustrates the difficulty in designing risk communication programs that move the public from hazard awareness to self-protective behavior. Recent health campaigns emphasizing the need for active learning, as opposed to simple information provision, have successfully achieved behavioral change.<sup>151</sup>

## 5. Personality Research

Studies on factors contributing to individual personality differences show a relationship between specific personality traits and one's likelihood to take preventive action to mitigate risk. Research on the relationship between perceived vulnerability and self-esteem indicates that those who rate high in self-esteem are less likely to admit vulnerability to a health hazard.<sup>152</sup> Egocentrism (failure to consider others' circumstances in relationship to one's own) contributes to unrealistic optimism about one's vulnerability.<sup>153</sup> Therefore, risk communication programs likely will have variable success with different target audiences.

## 6. Individual Risk Factors

Studies identifying key factors affecting one's perception and reaction to risk also relate to risk communication programs. Environmental-hazard and reactive-behavior research indicate that one's past experience with the hazard, the value placed on other positive attributes associated with the hazard, and prior beliefs about the hazard influence perception and reaction to the risk information. Environmental-hazard re-

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<sup>149</sup> See sources cited *supra* note 147.

<sup>150</sup> See generally Robertson, Kelley, O'Neill, Wixom, Eiswirth & Haddon, *A Controlled Study of the Effect of Television Messages on Safety Belt Use*, 64 AM. J. PUB. HEALTH 1071, 1076-80 (1974) (describing effect of television campaign to increase seatbelt use); Robertson, *The Great Seat Belt Campaign Flop*, J. COMM., Autumn 1976, at 41, 41-45 (discussing lack of success in encouraging public to wear seatbelts).

<sup>151</sup> See Earle & Cvetkovich, *supra* note 122, at 22.

<sup>152</sup> See *Why It Won't Happen*, *supra* note 147, at 453.

<sup>153</sup> Weinstein & Lachendro, *Egocentrism as a Source of Unrealistic Optimism*, 8 PERSONALITY & SOC. PSYCHOLOGY BULL. 195, 195 (1982).

search indicates that the link between experience and behavior varies depending on the hazard's occurrence and severity.<sup>154</sup> Prior hazard experience increases one's "threshold" response to a hazard, thus delaying responsive action.<sup>155</sup> The hazard's frequent occurrence, however, eventually may convince one to take protective measures.<sup>156</sup> This research also indicates that other considerations often obscure information presented about the potential hazard. Potential homebuyers place more importance on location, size, and style than on information about earthquake risks when deciding whether to purchase. In addition, consumers may weigh a product's other features more heavily than the potential long-term health effects implied by a warning label.

### III. POLICY IMPLICATIONS OF RISK COMMUNICATION REGULATIONS

Risk communication policymakers must consider several elements from the above inventory to implement effective risk communication programs. Development of the best health hazard warning requires addressing the target group's characteristics, the circumstances in which the audience will encounter the message, and the desired impact.

Social science may provide imprecise contributions and may not suggest a single, best communication strategy. Policymakers may need to weigh one desired goal against another. For example, emphasizing the source's credibility may reduce the receiver's attention to supporting arguments.<sup>157</sup> Similarly, features that help ensure that an audience will read risk information will not necessarily enhance behavioral change.<sup>158</sup> This section applies risk communication research to the development of effective health hazard warnings.

#### A. *Application of Risk Communication Research*

Research on individual differences in information seeking indicates that policymakers should not design warning programs that depend extensively on the public's ability to seek out risk information if the program designers wish to reach a majority of the population. Consumer-psychology research refers to the ability to make information available

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<sup>154</sup> Sims & Baumann, *supra* note 146, at 173.

<sup>155</sup> *Id.*

<sup>156</sup> *Id.*

<sup>157</sup> See Kanouse & Hayes-Roth, *Cognitive Considerations in the Design of Product Warnings*, in BANBURY REPORT 6: PRODUCT LABELING AND HEALTH RISKS 147, 148 (L. Morris, M. Mazis & I. Barofsky eds. 1980).

<sup>158</sup> *Id.*

to the public as "exposure."<sup>159</sup> The public must have some contact with the message's content before the message can affect knowledge, decisionmaking, or behavior. Since decisionmaking and behavioral change require initial exposure to risk information, any breakdown in this phase will affect the information flow in the remainder of an individual's information processing system.<sup>160</sup> Right-to-know laws, such as Proposition 65, would be more effective by providing the warning message directly on the product rather than exposing the hazard only through the use of an 800 number. As discussed, only a small percentage of people actively seeks out new information.

Other factors also affect message exposure. Policymakers must target the warning message to intended receivers. Television or radio messages may need to adapt the warning's content to the likely audience at a certain time (elderly during the day and youths after school). Print media may need to match the message's content with the audience reading a certain magazine (youth oriented magazine and black or hispanic oriented magazines).

Appropriate timing of the message in another sense also becomes important. Research indicates that once a consumer purchases a product, the consumer psychologically becomes committed to the purchase, and risk information may not change a decision on a product's use.<sup>161</sup> This finding provides additional support for the need to provide adequate risk information at the point of purchase. Thus, policymakers must ensure full public exposure to the hazard warning because the public will have varying opportunities for information exposure and differing propensities toward information seeking.

However, mere exposure to risk information is not sufficient. The message's processability is also important. Processability refers to the ease with which an audience can comprehend and use information.<sup>162</sup> Policymakers must recognize the public's need to use simplifying heuristics, such as the availability heuristic. Policymakers then must incorporate this need into risk communication programs to aid in processability. In communicating risk, inconsequential factors, such as the risk information's vividness of certain outcomes, may influence peo-

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<sup>159</sup> See Mazis & Staelin, *supra* note 71, at 3.

<sup>160</sup> See *Cognitive Considerations*, *supra* note 12, at 14.

<sup>161</sup> See Mazis & Staelin, *supra* note 71, at 4.

<sup>162</sup> See generally Russo, Krieser & Miyashita, *An Effective Display of Unit Price Information*, J. MARKETING, Apr. 1975, at 11, 11-12 (discussing processability of consumer price information).

ple's perception of a given outcome's probability.<sup>163</sup> The more concrete the risk communication to the intended audience, the more relevant the information. Successful examples exist. A public health campaign for seat belt use described the increased risk from failure to use seat belts in terms of overall risk over a lifetime of use.<sup>164</sup> The campaign rejected the abstract "percentage of risk per car trip" description, which previous safety campaigns had used.<sup>165</sup> Television and radio messages based on this lifetime-cumulative-risk approach appear to have increased actual seat belt use.<sup>166</sup>

A risk communication program should also incorporate a set of guidelines which focus on the individual's perceived control over hazardous exposure. These considerations are especially relevant to workplace situations where the economic necessity to work results in risk denial. Risk denial may lead to other dysfunctional coping mechanisms. The large number of workplace chemical and physical agents and the delayed, insidious disorders they may portend pose uncertain health threats.<sup>167</sup> This uncertainty makes it difficult to shape messages that provide information on long-term health risks and that seek to ensure worker understanding and responsiveness.<sup>168</sup>

Risk communication program designers should take several steps in formulating health risk messages which address the social-psychological factors of involuntary exposure, perceived control, and learned helplessness. First, to ensure adequate background preparation, designers must determine the target group's level of knowledge about the hazard and that group's understanding of protective measures to reduce risks.<sup>169</sup> Secondly, designers should designate credible information sources for the receiving audience. This perception requires expertise and trustworthiness. Credible sources can include governmental agencies, recognized national and international bodies of health researchers, and in

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<sup>163</sup> See *Imagining*, *supra* note 113, at 118-19; Thompson, *supra* note 112, at 14.

<sup>164</sup> See Slovic, Fischhoff & Lichtenstein, *Behavioral Decision Theory Perspectives on Protective Behavior*, in *TAKING CARE: UNDERSTANDING AND ENCOURAGING SELF-PROTECTIVE BEHAVIOR* 14, 28 (N. Weinstein ed. 1987) [hereafter *Behavioral Decision*].

<sup>165</sup> See *id.*

<sup>166</sup> *Id.*

<sup>167</sup> Cohen, Colligan & Berger, *Psychology in Health Risk Messages for Workers*, 27 *J. OCCUPATIONAL MED.* 543, 543 (1985) [hereafter *Health Risk Messages*].

<sup>168</sup> *Id.*

<sup>169</sup> Cohen, *Perspectives on Self-Protective Behaviors and Work Place Hazards*, in *TAKING CARE: UNDERSTANDING AND ENCOURAGING SELF-PROTECTIVE BEHAVIOR*, *supra* note 164, at 298, 313.

certain circumstances, the hazard manufacturer.<sup>170</sup> The warning message will have higher credibility when the potential user perceives it as contrary to the manufacturer's best interest.<sup>171</sup>

Message content and structure is another critical factor. The way the source frames or presents the message may determine perception and response.<sup>172</sup> Framing the risk in vivid, easily imaginable terms enhances the threat's saliency.<sup>173</sup> However, messages presented in this manner always should provide positive coping actions to control the risk.<sup>174</sup> These may include: discussing protective measures available to the employee to avoid undue risks, such as reducing exposure by leaving work clothing at work or wearing respirators; providing early screening programs to detect adverse health effects; and using additional training programs to increase safety.<sup>175</sup>

The work of the National Institute of Occupational Safety and Health (NIOSH) in developing occupational warnings for employees provides an excellent example.<sup>176</sup> Guidelines to foster protective behavior in the workplace reflect much of the current thinking in the communication field regarding health beliefs.<sup>177</sup> Messages emphasizing potential workplace dangers also emphasize actions available to control or otherwise minimize health threats.<sup>178</sup>

Any risk communication program should include a means for evaluating the message's success in meeting its intended goals.<sup>179</sup> Before and after surveys are one strategy.<sup>180</sup> The surveys compare the target audience reaction to the risk information, knowledge of the hazards, and use of self-protective behavior.<sup>181</sup> Results may dictate the need for changes in risk messages or other strategies to increase the health hazard warnings' effectiveness.<sup>182</sup>

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<sup>170</sup> See Lirtzman & Shuv-Ami, *Credibility of Sources of Communication on Products' Safety Hazards*, 58 PSYCHOLOGICAL REP. 707, 708 (1986).

<sup>171</sup> See *id.*

<sup>172</sup> *Behavioral Decision*, *supra* note 164, at 23-25; Thompson, *supra* note 112, at 14.

<sup>173</sup> OSHA, *supra* note 6, at 212; see also *Health Risk Messages*, *supra* note 167, at 545.

<sup>174</sup> See sources cited *supra* note 147.

<sup>175</sup> See *Health Risk Messages*, *supra* note 167, at 545-46.

<sup>176</sup> See Cohen, *supra* note 169, at 312.

<sup>177</sup> *Id.* at 313.

<sup>178</sup> *Id.*

<sup>179</sup> *Health Risk Messages*, *supra* note 167, at 545.

<sup>180</sup> *Id.*

<sup>181</sup> *Id.*

<sup>182</sup> *Id.*

Research on psychological responses to public information programs indicates that the perception of personal vulnerability ("others may suffer, but I do not") greatly impedes the adoption of preventative measures.<sup>183</sup> Risk warnings designed to elicit a moderate increase in fear toward the health hazard can eliminate this optimistic bias and can compensate for personality factors such as high self-esteem.<sup>184</sup> Fostering identification with health hazard victims ("individuals just like you") and using vivid and concrete imagery that the public cannot ignore are promising strategies.

Designers must use care, however, when incorporating fear appeals into a risk communication program. Health promotion campaigns designed to elicit fear have often failed to achieve the desired behavioral change.<sup>185</sup> Fear appeals operate most effectively under the following conditions: (1) the message also offers clear and reasonable self-protective behavior; (2) the suggested behavioral changes substantially reduce the fear elicited by the message; and (3) the suggested self-protective behavior produces fear offset, thus confirming its effectiveness.<sup>186</sup>

The proclivity of people to use a "representativeness" heuristic when determining the risk of falling victim to a particular health hazard also contributes to optimistic bias and egocentrism. Representativeness refers to focusing on victim stereotypes, while ignoring the actual base rates for occurrence.<sup>187</sup> The phenomenon exists for many events, including contracting lung cancer. Individuals who do not see themselves as possessing stereotypical features will conclude that they are not at risk. These individuals overlook the possibility that few people who contract lung cancer fit the stereotype. Policymakers developing health hazard warnings should provide detailed information about the risk to similar peer groups to increase the target audience's motivation to take precautions. Without such benchmarks, people cannot interpret individual standing on different risk factors and often assume that they are better off than most others.<sup>188</sup>

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<sup>183</sup> See Averill, *The Role of Emotion and Psychological Defense in Self-Protective Behavior*, in *TAKING CARE: UNDERSTANDING AND ENCOURAGING SELF-PROTECTIVE BEHAVIOR*, *supra* note 164, at 54, 70; *see also* *Why It Won't Happen*, *supra* note 147, at 453-54 (discussing role of self-esteem in risk perception).

<sup>184</sup> *See* sources cited *supra* note 183.

<sup>185</sup> *See* Soames Job, *Effective and Ineffective Use of Fear in Health Promotion Campaigns*, 78 AM. J. PUB. HEALTH 163, 165 (1988).

<sup>186</sup> *Id.*

<sup>187</sup> *See* Kahneman & Tversky, *Subjective Probability: A Judgment of Representativeness*, 3 COGNITIVE PSYCHOLOGY 430, 451 (1972).

<sup>188</sup> Weinstein, *Reducing Unrealistic Optimism About Illness Susceptibility*, 2

Policymakers also should address the influence that individual risk factors have on the health hazard message's effectiveness. Prior beliefs, attitudes, values, experience, and social relationships will influence awareness and behavioral change. For example, when a hazard rarely causes damage, little behavioral change will occur. When a hazard often causes damage, however, many behavioral changes will occur.<sup>189</sup> Many previously discussed strategies for facilitating awareness and behavioral change also apply here. In particular, communication program designers should survey the sociocultural situation. This can involve the use of open-ended interviews, structured questionnaires, and public opinion surveys to determine the situational variables that affect the public's prior beliefs and behavior associated with the hazard. Designers should then use the survey to develop clear warning messages targeted to the audience's needs and to provide appropriate coping responses. When resources do not allow for such investigations, analyses based on secondary information about the target group's culture may help.

If the probability of a hazard's occurrence is low, the public may dismiss fear appeals as scare tactics, rather than changing their behavior, thereby reducing the message's credibility.<sup>190</sup> The warning signals used in emergency evacuation procedures parallel the use of fear appeals. If the predicted hazard fails to occur, the warning signal eventually loses its credibility.<sup>191</sup> The degree of credibility lost depends on the level of fear that the warning signal created.<sup>192</sup>

This relates to a risk information program which provides warning messages on the possible long-term health effects of chemical exposure. When health effects do not appear obvious and the probability of occurrence is low, the possibility of effecting behavioral change decreases. Concurrently, the chance of adversely affecting the credibility of future health hazard messages increases. Program designers must use care to avoid all purpose "generic" warnings that lump several hazards, regardless of probability or type of risk, into one unidentifiable threat.

Policymakers need to develop a systematic dissemination method that allows the public to determine the relative risk levels of different health hazards. Consumer marketing research on the use of labels designed to

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HEALTH PSYCHOLOGY 11, 18-19 (1983).

<sup>189</sup> Sims & Baumann, *supra* note 146, at 173.

<sup>190</sup> Averill, *supra* note 183, at 70-71.

<sup>191</sup> *Id.* at 71.

<sup>192</sup> *Id.* See generally S. BREZNITZ, *supra* note 114, at 206-14 (discussing loss of credibility when predicted warning fails to appear).



facilitate product comparisons<sup>193</sup> can direct the development of warning messages that provide information on health risk levels. For example, the United Kingdom presents cigarette warnings on tar and nicotine content in terms of high, medium, or low level.<sup>194</sup> The United States' labels provide information on the absolute tar and nicotine levels. The American warning may prove less effective because most consumers have no baseline for deciding the meaning of an absolute nicotine level.<sup>195</sup>

This discussion on the application of risk communication research to policymaking has focused on methods to increase attention and response to the health hazard warning. The type of risks which most right-to-know laws address, and the information dissemination method which most require, lead to under-reaction to risk, rather than over-reaction that occurs in other risk communication situations.

### *B. General Implications of Research*

In addition to these lessons for improving risk warnings based on knowledge of individual characteristics, three general implications derive from the research on risk communication.

#### 1. Public Involvement in Program Development

Public involvement in all stages of program development can enhance the success of a risk communication policy. Further, the policy should represent the needs, abilities, and values of relevant target groups. Public behavioral changes strongly relate to congruence between the communicated message and the target audience's characteristics.<sup>196</sup> The use of small focus groups to pretest risk communication materials and to select appropriate risk communication channels will increase the message's effectiveness.<sup>197</sup>

Although public participation may seem obvious, many unsuccessful risk communication campaigns have underutilized knowledge of target groups in developing risk communication programs. The attempts to increase seat belt use exemplify this failure. Risk communication

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<sup>193</sup> See *Cognitive Considerations*, *supra* note 12, at 16.

<sup>194</sup> McGuire, *The Communication-Persuasion Model and Health-Risk Labeling*, in BANBURY REPORT 6: PRODUCT LABELING AND HEALTH RISKS, *supra* note 8, at 99, 105.

<sup>195</sup> See *id.*

<sup>196</sup> Earle & Cvetkovich, *supra* note 122, at 38.

<sup>197</sup> Desvousges & Smith, *Focus Groups and Risk Communication: The "Science" of Listening to Data*, 8 RISK ANALYSIS 479, 481 (1988).

panels, functionally similar to consumer panels, could provide periodically gathered information to assess which hazards concern groups and why. Panels also provide information on how people acquire and use hazard information and how they make risk decisions.<sup>198</sup>

Public participation also can assist in avoiding policy made with incomplete assessments of decisionmaking on risks. For example, public involvement would help negate the assumption that an employee has the option to decide whether to continue exposure to hazardous work after receiving potential risk information. Economic factors, such as providing for the family, or social factors, such as psychological links to a community, may become paramount.<sup>199</sup> Generally, public participation can customize risk information to make the information more personally relevant to any identifiable target group. Facially, EPCRA's express goal of increasing community involvement in local emergency planning and right-to-know guidelines serve as an excellent example of incorporating public participation. In reality, however, the implementation of this process does not always occur as planned. For example, policymakers divided California into six large emergency planning districts, thus limiting the opportunity to obtain meaningful public participation at the local level.<sup>200</sup>

Surveys on the impact of public notices, such as those required by Proposition 65, can determine the risk communication regulations' effectiveness. A telephone survey of residents in neighborhoods surrounding companies that printed notices in local newspapers should indicate the percentage of residents who knew that the newspapers published the notices. Next, the survey should determine how awareness of the cancer-causing chemicals' proximity has affected risk perception.<sup>201</sup> The

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<sup>198</sup> Robin, *The Need for a New Class of Information to Aid Public Policy Decision-Makers*, 5 J. PUB. POL'Y & MARKETING 58, 70 (1986); Earle & Cvetkovich, *supra* note 122, at 39.

<sup>199</sup> See D. NELKIN & M. BROWN, *supra* note 128, at 90-94.

<sup>200</sup> In California, six multicounty districts (mutual aid regions) exist within the organizational structure of the Office of Emergency Services. The Office of Emergency Services is designated as the lead agency for California's hazardous material management program and EPCRA. See CAL. HEALTH & SAFETY CODE § 25503 (West Supp. 1989). To facilitate implementation of EPCRA, six local emergency planning committees were selected to correspond to the existing mutual aid regions. A. GANULIN, SARA TITLE III: EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986: IMPLEMENTATION IN CALIFORNIA 32 (1989) (unpublished master thesis, Graduate School of Public Policy, University of California at Berkeley).

<sup>201</sup> A survey of risk perception would tap psychological processes such as denial and optimistic bias. For example, residents would be asked if they felt the air emissions from a company in their neighborhood presented a health hazard to them. A later series

survey should also investigate whether the provided information elicited any behavioral change from an awareness of the chemicals. A follow-up study should determine the effectiveness of different types of notices published by various companies. Even slight format manipulation may markedly affect an individual's perception of the information presented.<sup>202</sup>

## 2. Regulation and Standardization of Risk Information

Format manipulation suggests a second general lesson for successful implementation of risk information: regulation and standardization of warning labels based on an information processing approach. Arranging information provided on warning labels in a hierarchical manner, with follow-up levels of information repeated in more detail, effectively increases a person's ability to process information.<sup>203</sup> For example, businesses should provide Proposition 65's required warning labels at multiple levels: on the product itself; within the store; and finally, through telephone sources or libraries.

Symbols should serve as the first level of information in any information warning program.<sup>204</sup> The use of symbols most effectively creates attention. Symbols warn users that the product poses a hazard. Symbols allow users quickly to determine whether to read the more detailed risk information provided on the label. The system reduces information overload.<sup>205</sup>

The next level of warning messages should be information available within the store itself. For instance, stores should contain booklets with more detailed information on the chemicals' health risks. Additionally, comparisons of different products allow consumers to feel that they

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of questions would determine if residents felt that the company's air emissions presented a health hazard to other residents in the neighborhood. Residents would also rate their risk of cancer in general compared to those of their neighbors. Further, demographic information would be obtained to measure the influence of age, race, sex, education, and occupation on residents' responses to perceived risk.

<sup>202</sup> Magat, Payne & Brucato, *How Important Is Information Format? An Experimental Study of Home Energy Audit Programs*, 6 J. POL'Y ANALYSIS & MGMT. 20, 20 (1986).

<sup>203</sup> Nordenstam, *Proposition 65: Risk Communication and Regulatory Policy*, PROCEEDINGS OF THE SOCIETY FOR RISK ANALYSIS ANNUAL CONFERENCE, Washington, D.C. (1988).

<sup>204</sup> See Wogalter, Godfrey, Fontenelle, Desaulniers, Rothstein & Laughery, *Effectiveness of Warnings*, 29 HUM. FACTORS 599, 599 (1987).

<sup>205</sup> See *Cognitive Considerations*, *supra* note 12, at 15; S. HADDEN, *supra* note 8, at 220; Mazis & Staelin, *supra* note 71, at 11.

have some choice and control over possible exposure.<sup>206</sup>

Designers should provide a final level of information to those who wish to go beyond the detail provided by the warning itself. This group of interested people might include hypersusceptible individuals or those who make frequent use of a certain product. Proposition 65 regulations only require that businesses post signs in stores informing consumers of an available toll-free telephone number<sup>207</sup> to obtain specific product information.<sup>208</sup> If regulations required businesses to post warning labels on products, the toll-free telephone number could provide more information than a short label can capture. A computerized data base accessible to the public,<sup>209</sup> perhaps in public libraries, also would provide more information.<sup>210</sup>

### 3. Unification of Risk Communication Programs

Agencies involved in regulating risk communication should develop a unified and consistent method of providing risk information. The use of computerized data bases requires the standardization of risk information. The large and inconsistent amount of information available confuses and overwhelms the public. In some jurisdictions, a business must provide as many as six different sets of information disclosure.<sup>211</sup> In addition to differing agencies' overlapping requirements,<sup>212</sup> federal,

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<sup>206</sup> Nordenstam, *supra* note 203.

<sup>207</sup> In a recent small pilot study (n=20), conducted to measure the degree of satisfaction and perceived effectiveness of the 800 number, over 75% indicated that they did not feel this method of information distribution was effective and that they would use product health risk information if available at the place of purchase. B. Nordenstam, unpublished research, University of California, Irvine, 1989 (results on file in office of Brenda Nordenstam, UCI).

<sup>208</sup> CAL. CODE REGS. tit. 22, § 12601 (1989).

<sup>209</sup> See S. HADDEN, *supra* note 8, at 239-42; Thorelli & Engledow, *supra* note 120, at 20.

<sup>210</sup> See G. LOWRY & R. LOWRY, *LOWRY'S HANDBOOK OF RIGHT-TO-KNOW AND EMERGENCY PLANNING* 161 (1988). The Environmental Protection Agency is considering several options for making available to the public data required by the Emergency Planning and Community Right-to-Know Act. These include creating an EPA-funded clearinghouse; making the information available through the National Library of Medicine's TOXNET database; and entering into an agreement with Purdue University, which maintains the National Pesticides Information Retrieval System. *Id.*

<sup>211</sup> Interview with Dr. R. N. Hazelwood, International Technology Corporation, Irvine, California (1988).

<sup>212</sup> See generally O'Reilly, *supra* note 2, at 308-312 (describing right-to-know legislation); OSHA, *supra* note 7, at 180-81 (noting complexity of risk management scheme); TOX-EPI REVIEW, *supra* note 3, at 2-3 (describing community right-to-know laws).

state, and local requirements exist. This duplication evidences the need for a centralized information system.

Congress might create a risk communication coordinating council to work across agencies regulating or providing information about a given substance. This council could develop a uniform risk communication system. Less ambitiously, a study group, such as the National Academy of Science, might design the appropriate features of a standard risk communication program. All agencies could then adopt the program. A current NIOSH project to furnish uniform guidelines for health risk communications on industrial chemicals (as required by the Hazard Communication Standard) has made a significant contribution to developing health hazard warnings that utilize psychological research in risk communication.<sup>213</sup> The NIOSH project and the Interagency Regulatory Liaison Group's (IRLG) success in devising generic carcinogen standards suggest that agencies can reach compromises and can adopt a consistent system.<sup>214</sup>

### C. *The Product Liability Perspective: A Useful "Worst Case" Analysis?*

In 1964, the Johns-Manville Corporation placed warning labels on its products which contained asbestos fiber. In a 1973 product liability suit, the Fifth Circuit Court of Appeals held that the cautions provided on the label were inadequate warnings.<sup>215</sup> The label did not adequately communicate knowledge of the dangers so as to give a consumer a choice of whether to work with a dangerous product.<sup>216</sup> The court noted that the label did not indicate the risk's severity.<sup>217</sup> Further, the court found it absurd to caution an employee to avoid breathing the dust.<sup>218</sup> Twenty-five years later, right-to-know regulations provide consumers with labels on gasoline pumps that warn the user to avoid inhaling the fumes and with warning signs posted in restaurants which inform the consumer that the secondary cigarette smoke that they breathe may

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<sup>213</sup> See Cohen, *supra* note 169, at 312-17.

<sup>214</sup> See S. HADDEN, *supra* note 8, at 204-05 (describing IRLG's position document); Stenzel, *The Need for a National Risk Assessment Communication Policy*, 11 HARV. ENVTL. L. REV. 381, 395-98 (1987) (proposing creation of interagency advisory board).

<sup>215</sup> *Borel v. Fibreboard Paper Prods. Corp.*, 493 F.2d 1076 (5th Cir. 1973).

<sup>216</sup> *Id.* at 1104.

<sup>217</sup> *Id.*

<sup>218</sup> *Id.*; see also G. PETERS & B. PETERS, SOURCEBOOK ON ASBESTOS DISEASES: MEDICAL, LEGAL, AND ENGINEERING ASPECTS E15-16 (1980) (discussing *Borel*, 493 F.2d 1076).

cause cancer. Product liability theories may provide some guideposts of where to begin in the potentially limitless area of risk communication.

Courts have recognized several factors in assessing the adequacy of manufacturers' warnings in product liability cases.<sup>219</sup> Indeed, product liability cases often focus on the adequacy of a product warning's content. Failure to adequately warn or instruct the consumer renders the product defective.<sup>220</sup> An ideal product warning identifies the seriousness of the danger, describes the nature of the risk in an understandable manner, and provides the product's user with information that allows the user to avoid the hazard.<sup>221</sup> The warning's content should be direct and clear.<sup>222</sup> It should be intense enough to cause the expected user to heed its message.<sup>223</sup> The warning should fully and completely describe the risk to enable the product user to make an informed choice.<sup>224</sup>

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<sup>219</sup> All courts recognize a manufacturer's duty to warn of a product's dangerous conditions. Courts have gone beyond the negligence standard of foreseeability and have applied strict liability in some duty to warn situations. See MEDICAL PRODUCT LIABILITY 2-8 (D. Gingerich ed. 1981). For a comparison of product liability and right-to-know laws, see Ashford & Caldart, *Framework Provides Path Through Right-to-Know Law*, OCCUPATIONAL HEALTH & SAFETY, Oct. 1983, at 11. Ashford provides a framework that lists laws and regulations covering the duty to inform, *id.* at 12-13, the duty to generate, *id.* at 17, and the requirement to provide access to toxic hazard information. *Id.* at 18-19. Hazardous waste cases have developed a similar analogy between strict product liability and hazardous waste situations. See F. ANDERSON, D. MANDELKER & A. TARLOCK, ENVIRONMENTAL PROTECTION: LAW AND POLICY 54-55 (1984). The authors note that, "The analogy to strict product liability can be most easily drawn in the 'toxic tort' cases, where questions of scientific proof, long latency periods of disease, and high risk recur, whether the injury was caused by exposure to a chemical product or to toxic waste." *Id.* at 55; see also Huber, *Environmental Hazards and Liability Law*, in LIABILITY: PERSPECTIVES AND POLICY 128, 144 (R. Litan & C. Winston eds. 1988). Huber states that warnings can become the crux of the debate in cases in which hazards of a toxic pollutant are uncertain. *Id.* In such cases, "A diffuse environmental problem is thus converted into a concrete claim against a 'defective' product, building, or piece of land. The defect in turn is identified not with the good itself but with its packaging — the absence of a warning about possible, though highly speculative, risk." *Id.*

<sup>220</sup> See M. BARAM, CORPORATE RISK MANAGEMENT: INDUSTRIAL RESPONSIBILITY FOR RISK COMMUNICATION IN THE EUROPEAN COMMUNITY AND IN THE UNITED STATES 113 (1988).

<sup>221</sup> J. O'REILLY, PRODUCT DEFECTS AND HAZARDS: LITIGATION AND REGULATORY STRATEGIES 163 (1987).

<sup>222</sup> *Id.* at 164.

<sup>223</sup> *Id.*

<sup>224</sup> For an examination of concepts underlying the right to informed decisionmaking, see G. PETERS & B. PETERS, *supra* note 218, at E23-26.

The origins of informed consent seem to have developed from concepts of individual freedom, personal responsibility, and self-determination. The

Thus, product liability law creates a consumer and user right to safe products, including the right to know about product hazards and safe use methods.<sup>225</sup>

Determining the adequacy of product warnings and instructions for safe use requires consideration of the seriousness of the harm which may result from product exposure.<sup>226</sup> Even with a remote probability of harm, a product usually requires a precise warning if a great degree of harm could result from its use.<sup>227</sup> A warning's content should be specific enough to motivate the user to act reasonably and responsibly.<sup>228</sup> The warning's intensity, the inclusion of a specific risk description, problems associated with too many warnings for too many risks, and the inclusion of adequate instructions exemplify issues of major concern.<sup>229</sup> The message's intensity is a function of its signal value, wording, appearance, and prominence.<sup>230</sup> Courts look for "a degree of intensity that would cause a reasonable person to exercise caution commensurate with the risk."<sup>231</sup> Other issues of concern include the use of warnings which increase the level of fear beyond the actual risk involved, overwarning so as to dilute the warning's effectiveness, and product overpromotion that decreases an otherwise adequate warning's effectiveness.<sup>232</sup>

The warning's format, style, and placement play an important part in the communication process.<sup>233</sup> Courts consider the probability that the warning's format will catch the user's attention.<sup>234</sup> Courts likely will impose a duty to use a warning styled in a certain manner if a

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moral choice of an individual, to decide for himself whether to agree to undertake a known risk, apparently sprang from political, social, and humanistic reactions against feudal, dogmatic, and dictatorial excesses wherein people were told what to do by some authority and had to blindly obey without question or reasoning.

*Id.* at E23.

<sup>225</sup> See M. BARAM, *supra* note 220, at 113 (describing product liability lawsuits).

<sup>226</sup> *Id.* at 114.

<sup>227</sup> *Id.*

<sup>228</sup> J. O'REILLY, *supra* note 221, at 164.

<sup>229</sup> *Id.*

<sup>230</sup> *Id.*

<sup>231</sup> Bituminous Casualty Corp. v. Black & Decker Mfg., 518 S.W.2d 868, 873 (Tex. Ct. App. 1974).

<sup>232</sup> See generally Schwartz & Driver, *supra* note 70, at 51-62 (considering objective and content of effective product warning design).

<sup>233</sup> J. O'REILLY, *supra* note 221, at 166.

<sup>234</sup> *Id.*

large number of users will benefit from such a warning.<sup>235</sup> Courts also may consider warnings inadequate when placed not on the product, but placed elsewhere.<sup>236</sup> Warning adequacy depends on complexity of the risks involved, available space on the actual product, and utility of the location in which the manufacturer places the warning.<sup>237</sup> Positioning the warning so that it will attract the user's attention becomes crucial.<sup>238</sup> Manufacturers should give warnings in a way reasonably expected to reach and to inform the user.<sup>239</sup> Courts have judged the adequacy of warnings or instructions from the point of view of the inexperienced employee or user, unaware of the hazard's specific characteristics.<sup>240</sup> Courts also have held that the manufacturer must exercise the knowledge and skill of an expert in the field.<sup>241</sup>

Thus, policymakers might use the extensive product liability case law to examine the efficacy of right-to-know warning messages. Based on common law standards, certain responses to right-to-know requirements might be vulnerable to criticism. For example, under this adequate warning rubric, consider the 800 number which stores currently use to warn consumers of products containing chemicals known to cause cancer. This warning message probably would not satisfy product liability standards. First, the store does not post the sign in a manner

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<sup>235</sup> M. BARAM, *supra* note 220, at 114.

<sup>236</sup> J. O'REILLY, *supra* note 221, at 166.

<sup>237</sup> *Id.*

<sup>238</sup> Schwartz & Driver, *supra* note 70, at 58 n.96; *see also* Williams v. Caterpillar Tractor Co., 149 So. 2d 898, 903 (Fla. Dist. Ct. App. 1963) (holding summary judgment inappropriate when issue of warning sign's placement not resolved).

<sup>239</sup> *See* Schwartz & Driver, *supra* note 70, at 40 n.11 (quoting Kammer v. Lamb-Grays Harbor Co., [1981-1982 Transfer Binder] PROD. LIAB. REP. (CCH) ¶ 9240 (Jan. 25, 1982)); M. BARAM, *supra* note 220, at 114. Baram summarizes general rules for persons charged with formulating warnings to avoid products liability challenges. These include assuring that:

The warning or instruction is printed in such a manner as to assure that a user's attention will be attracted; symbols, such as skull and crossbones, are used in circumstances where the written word alone would be incomprehensible to foreseeable users; the warning or instruction adequately conveys the nature and magnitude of the risks associated with the product; the warning or instruction is placed in a location calculated to catch the attention of the user; . . . the warning or instruction is sufficiently specific and complete to convey the risk of harm, the method of proper and safe use and appropriate means of disposal.

*Id.* These rules seem much like the lessons derived from social sciences for efficacy of right-to-know warnings.

<sup>240</sup> M. BARAM, *supra* note 220, at 115.

<sup>241</sup> *Id.*



that will catch the user's attention. The store normally posts a small notice near the store entrance. Second, the message is not clear and direct. It fails to state which products contain cancer causing chemicals. Third, the message content is not stated in a way that would motivate the user to act reasonably. The consumer must seek additional information to discover which products contain the risk.<sup>242</sup>

Product liability doctrine, however, may provide the argument that given the small probability of risk associated with development of cancer from the product's use, this warning method may be adequate.<sup>243</sup> After all, even the most liberal informed consent test requires only that manufacturers give the plaintiff information that a reasonable person in the same position would desire before making a decision.<sup>244</sup> While the probability of developing cancer arguably is quite low, courts have held manufacturers liable for failure to warn of remote, though serious, risks. Courts have held that the societal benefit of warning outweighed the warning's cost.<sup>245</sup> This brief discussion suggests that right-to-know warning messages need to be improved to enhance efficacy of an important public policy and to protect the public from a products liability perspective.

#### IV. CONCLUSION

Policymakers should seriously consider the implications of risk communication research to create effective information disclosure requirements in right-to-know programs. Proposition 65's regulations focus on the broad and general content of businesses' warnings, while ignoring format and presentation of risk information, information processing, and other human characteristics. Other right-to-know information policies reflect this weakness. Regulators try to require available and accu-

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<sup>242</sup> See *Ingredient Communication Council, Inc. v. Van de Kamp*, No. 504601 (Sacramento County Super. Ct., Aug. 22, 1989) (tentative decision) (holding 800 number warning ineffective and violative of Proposition 65 requirement); Vargas, *supra* note 69 (noting that in 14 months only 28,000 of California's 28 million residents called Ingredient Communication Council's 800 number, producing merely 488 warnings).

<sup>243</sup> J. O'REILLY, *supra* note 221, at 164-65 (noting that intensity of warning needed varies with severity of likely risk).

<sup>244</sup> A. WEINSTEIN, A. TWERSKI, H. PIEHLER, & W. DONAHER, *PRODUCTS LIABILITY AND THE REASONABLY SAFE PRODUCT* 67 (1978).

<sup>245</sup> See, e.g., *Davis v. Wyeth Laboratories*, 399 F.2d 121, 128-29 (9th Cir. 1968) (determining reasonableness of drug's risk by balancing public interest in drug's availability against drug's known danger); *Moran v. Faberge, Inc.*, 273 Md. 538, 543-44, 332 A.2d 11, 15 (1975) (determining reasonableness of risk by balancing probability and seriousness of harm against cost of precautions).

rate information. However, they often ignore whether individuals can understand and act on provided information.

This Article has presented several suggestions to improve risk communication policy implementation. These suggestions should better enable citizens to make informed decisions concerning risks to their health and safety and to act accordingly. These recommendations, and others which risk communication knowledge will suggest on a case-by-case basis, will form an ambitious public and private sector effort. Such a program can require significant financing and time commitments. However, without greater attempts to reflect social scientific knowledge of risk communication, right-to-know laws will become further routinized and will fail to realize their aims.