

Proposal title: Visual Communication and Public Consciousness of 'Invisible' Environmental Health Risks

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Russell Ackoff Doctoral Student Fellowships

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**Specific Aims:** Implement a population-based survey experiment to test the persuasive effects of visual media messages on public consciousness of ‘invisible’ environmental health risks (e.g., pesticides; formaldehyde) and corresponding protective behaviors.

**Background and Significance:** Historically, humans have been able to detect and avoid a majority of environmental hazards using the traditional five senses. The smell and appearance of rotting fruit, for instance, naturally precludes consumption. But as modern industrial society advances, it continues to introduce environmental risks to health that are not so readily perceptible (Beck, 1992). Pesticide residue on fresh produce and the flu virus can only be seen under a microscope while toxic amounts of hexavalent chromium in drinking water can neither be seen nor tasted. The proliferation of modern ‘invisible’ risks to human health thus demands alternative methods for individual detection and control that supplement the traditional senses. Here, visual communication may prove to be a useful and powerful tool.

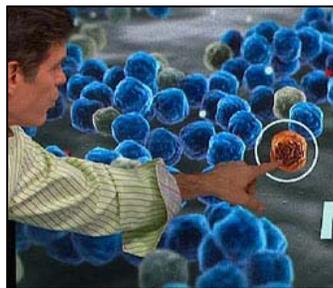
Past research on the visual communication of risk has tended to focus on enhancing quantitative reasoning and decision-making by manipulating graphical displays of risk information (e.g., risk ladders, histograms; Ancker, Senathirajah, Kukafka, & Starren, 2006; Lipkus & Hollands, 1999). While improving numeracy through the use of visuals has been an important part of decision-making research, there are many new and promising avenues of research in visual risk communication (Zinn, 2009). In particular, invisible health risks pose unique challenges to health communicators that have yet to be systematically addressed (Tomes, 1999). If humans fail to recognize the *very existence* of a proximal threat, the perceived likelihood and severity of the associated health risk are of little consequence to decision-making processes.

A preliminary examination of mass media messages has revealed that at least six different types of visual formats are commonly used to raise awareness of invisible health threats: text, photographic proof, detection, analogy, contrast, and causal connection. Text-based messages prompt audiences to imagine the presence and characteristics of risks *without visual reference* to the threat (for example, see Figure 1 below). While text may stand alone, it is often combined with the remaining five formats. Photographic proof offers evidence of the threat’s existence through microscopic technology by *zooming in on the actual threat* (Fig. 2). Detection relies on either technology (e.g., carbon monoxide detector) or artistic manipulation *to visually signal the presence of the threat* rather than showing its actual structure (Fig. 3). Analogy, or the *metaphorical visual representation of the threat*, serves to imbue what is invisible with the characteristics of a tangible, comparison object (Fig. 4). Analogies can also be made with depictions of real-life risks (e.g., cigarettes), a technique often applied to risk ladders. Contrast *juxtaposes the notion of contamination with a visual of the ideal* – a pristine, contaminant-free environment – which is particularly common in environmental communication. Finally, causal connection links the existence of the threat to a particular negative *consequence of exposure*, like radon and lung cancer (Fig. 5).

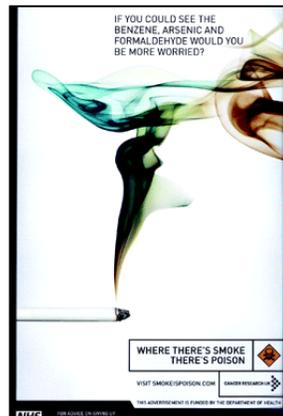
[1]



[2]



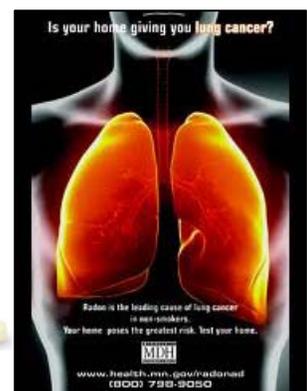
[3]



[4]



[5]



While these formats appear across many forms of visual media – magazine articles, websites, television news, billboards – we have yet to fully understand their effects on decision-making under risk. Does photographic proof serve as a heuristic to increase the perceived credibility and persuasiveness of a message? Are analogies easier to process and thus more memorable? Will a detection format that adds pigment to a colorless air pollutant increase vividness and incite fear, prompting homeowners to buy test kits; or will it undermine the message by offering an inherently false rendering of how the threat is actually detected? In order to develop effective environmental health risk communications in both commercial and public health sectors, it is critical to further

explore and understand how different visual formats impact public consciousness of and reactions to invisible risks.

### Research Design and Methods:

*Design and procedures.* The study will use an experiment embedded within a national online survey hosted by Survey Sampling International (SSI), which maintains an online panel of more than one million individuals who have opted-in to participate in surveys and also uses partner organizations to recruit additional study participants. This approach has several key advantages. First, the ability to draw a large sample increases statistical power to detect even subtle differences between experimental conditions. Second, a population-based experiment allows for a more diverse and relevant sample than a traditional laboratory experiment. Finally, this particular iteration of a population-based experiment – with one post-test and between-subjects factors – strengthens the study's internal validity and ability to establish causal inferences (Mutz, 2010).

Participants (N=1,000) will be randomly assigned to one of five experimental conditions with a multiple-message design in which visual format is the primary between-subjects factor. Each participant will view five different print advertisements, presented in random order, that address invisible environmental health threats using the same visual format – photographic proof, detection, analogy, contrast, or causal connection. Advertisements will be randomly selected for each participant from five pools of existing ads in each format category collected from media sources prior to the study (more below). Immediately following exposure to the ads, participants will complete a survey questionnaire.

*Stimuli.* In order to increase ecological validity and reduce the threat of case-category confounding (Jackson, 1992), the stimuli for this study will consist of existing ads collected from various print media sources. Collected ads will undergo two rounds of content analysis. First, eligibility for inclusion in the study will be based on whether each ad fits into one and only one visual format *and* whether they are otherwise equally persuasive as judged by two independent coders. Then, the content of eligible ads will be extensively coded to identify the type of health consequence addressed (e.g., acute vs. chronic), the source of the message, and other important message features that may impact message processing and acceptance. Depending on the diversity of ads in circulation, there may also be potential to explore whether the effects of visual type are moderated by these additional factors.

*Measures.* The effectiveness of the visual formats will be assessed in a post-test using Weinstein and Sandman's (1993) seven criteria for evaluating the effectiveness of visual displays for communicating risk: (1) *comprehension* (do recipients understand the content of the messages?); (2) *acceptance* (do recipients agree with the messages?); (3) *dose-response consistency* (do people facing a higher dose of a hazard perceive the risk as greater and/or show a greater readiness to take action than people exposed to a lower dose of this hazard?); (4) *hazard-response consistency* (do people facing a hazard that is higher in risk perceive the risk as greater and/or show a greater readiness to take action than people exposed to a hazard that is lower in risk?); (5) *uniformity* (Do audience members exposed to the same level of risk tend to have the same responses to this risk?); (6) *audience evaluation* (were the messages useful?); and (7) *direction of communication errors* (do message recipients tend to over- or underreact?). Measures of willingness to pay for safer products, emotional response (i.e., worry, fear), individual difference characteristics (i.e., regulatory focus) and relevant behavioral intentions will also be included in the questionnaire.

### References

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**I. Detailed budget of anticipated expenses**1. *Content analysis of experimental stimuli*

Training Annenberg undergraduate coders and execution of content analysis of advertisements over two-week period

|                        |                   |
|------------------------|-------------------|
| Cost per hour          | \$ 10.00          |
| Hours                  | 80                |
| Number of coders       | 2                 |
| <b>Estimated total</b> | <b>\$1,600.00</b> |

2. *Experimental post-test*

Management of sample, hosting 17-minute online survey (roughly 3 questions per minute), and monitoring completed interviews – all provided by Survey Sampling International (SSI)

|                        |                   |
|------------------------|-------------------|
| Cost per interview     | \$ 3.59           |
| Sample size            | 1,000             |
| <b>Estimated total</b> | <b>\$3,590.00</b> |

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|-------------------------------------|-------------------|
| <b>Estimated Total Project Cost</b> | <b>\$5,190.00</b> |
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**II. Description of other current sources of research funding**

## 1. Annenberg School for Communication (ASC)

ASC graduate students may apply for a dissertation budget of up to \$1,200 to be used for payment of incentives to study participants or coding expenses.

## 2. Center for Excellence in Cancer Communication Research (CECCR)

Funded by the National Cancer Institute, graduate students affiliated with the Penn CECCR may apply for up to \$5,000 to fund pilot projects related to the study of the public information environment surrounding cancer.