

From the Schools of Public Health

COMMUNITY-BASED ENVIRONMENTAL RISK ASSESSMENT

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Risk assessment can be used to predict the likelihood of many unwanted occurrences, including industrial explosions, workplace injuries, failures of machine parts, natural catastrophes, and the presence of infectious or vectorborne agents, among others. The ultimate goal of environmental health risk assessment is to protect human health and the environment by providing decision makers with information that can be used to minimize risks posed by environmental agents. From its emergence in the late 1970s, modern health risk assessment has come of age, constituting a separate and distinct discipline with its own practitioners.¹

As currently performed, quantitative risk assessment can be an expensive, time-consuming, and complex endeavor from the administrative, technical, and scientific standpoints. Community organizations, particularly underfunded ones, generally do not possess the resources necessary to execute environmental risk assessments, and therefore lack information necessary to prioritize and minimize the effects of risk factors present in their neighborhoods. These factors may include lead-based paint and asbestos-containing building materials, inadequate sanitation, vectors such as rodents, uncontrolled dogs, substandard housing, clandestine drug laboratories, and proximity to agriculture, industry, and transportation routes.

This article describes an academic service learning activity that employs a streamlined approach to environmental health risk assessment. The methodology was adopted from techniques employed in developing countries where resources are limited, and community involvement and ownership of the process is critical to its success.² Students majoring in International Health at Loma Linda University School of Public Health conduct these assessments as part of an environmental health educational module. This activity serves to promote students' familiarity with the risk assessment process and public health structures and functions, and provides a basis for nurturing student understanding of underserved communities in proximity to the school. Community members benefit by receiving formal, independent, third-party reports of environmental risk factors in their neighborhoods.

Service Learning Assignment

The service learning project is executed in three distinct phases. Phase I consists of the pre-field activities. This phase is initiated by the teaching staff, which selects a suitable community, establishes contact with appropriate community representatives, and confirms arrangements for the future student site visit. Students receive an overview of the risk assessment process, covering both purpose and techniques. A briefing on the target community follows, focusing on point(s) of contact within the community and safety and health issues. Finally, each student is assigned into one of seven working groups:

- 1. Report writers (aggregate group reports and complete discussion section)
- 2. Residential lead paint, asbestos-containing building materials, and outdoor air pollution
- 3. Food vendors and water quality (drinking and wastewater)
- 4. Hazardous materials and motor vehicle issues
- 5. Community perception interviews
- 6. Solid waste disposal and proximity to industry
- 7. Public safety (foot traffic/footpaths/sidewalks).

To complete Phase I, students conduct a background investigation. This includes, but is not limited to, records reviews and literature searches and phone interviews with key informants within the community. Additional discussions are convened with local law enforcement and public health professionals, air quality and water management public agency personnel, and staff members of nongovernmental organizations active in the target neighborhood. The purpose of this data gathering is to familiarize students with the multiple agencies and issues confronting the community, while providing suitable time for them to become accustomed to the jargon and science associated with environmental health. Faculty is available to provide direction and clarification as needed.

Phase II consists of the on-site visit, which is scheduled for 4–5 hours during one business day at a time convenient for all interested parties. Each student group is required to select a "responsible party" within their group who will act as a point of contact for them and provide leadership and direction. Members of the report writing team attach themselves to the various technical groups for purposes of the field experience. Students conduct interviews, obtain photographic evi-

dence, and assess or confirm conditions noted during Phase I. Environmental sampling is not conducted.

Upon arrival at the site, each group works independently but shares critical information with classmates in real time through use of cellular telephones. This approach also allows the teaching team to remain in contact with each group and acts as a mode of communication in the event of a safety issue, such as a confrontation with gang members.

Phase III is the post-field activity, in which the students provide a formal report to the community. The report writing team integrates the working group reports and is responsible for compiling the final product. At minimum, the report contains:

- 1. Cover page
- 2. Table of contents
- 3. Executive summary
- 4. Methodologies
- 5. Findings (quantitative summary of environmental risk assessment by category and overall)
- 6. Perceptual map
- Discussion (including project strengths and weaknesses)
- 8. Recommendations

Probability

Most important, the report prioritizes the environmental risk factors found in the community into three categories: low, medium, and high risk. Figure 1, which takes into account indices of probability (x-axis) and severity (y-axis), is the matrix used by the students to develop their overall risk evaluation. (A complete discussion of the scoring and interpretation process is outside the scope of this article.) Scoring decisions

factor in both subjective and objective assessments, while considering concerns communicated by neighborhood residents. The intersection of the two factors suggests the relative importance of the issue, with low risk represented by a score of 9 or 10, medium risk by a score of 7 or 8, and high risk by a score of 1 to 6.

The example provided in Figure 1 demonstrates a condition of modestly high risk (score of 6).

A draft report is prepared and forwarded to the teaching team and community organization for review. Reviewers identify clerical or technical inaccuracies and subject the report to a gap analysis. After addressing the reviewers' comments, the class submits the final report to the community organization. Recently, presentation of findings has taken place in open public meetings where students entertain questions and criticisms regarding their efforts. Community organizations have used these findings as a vehicle to bring environmental conditions to the attention of elected officials and local media.

Student and Community Benefits

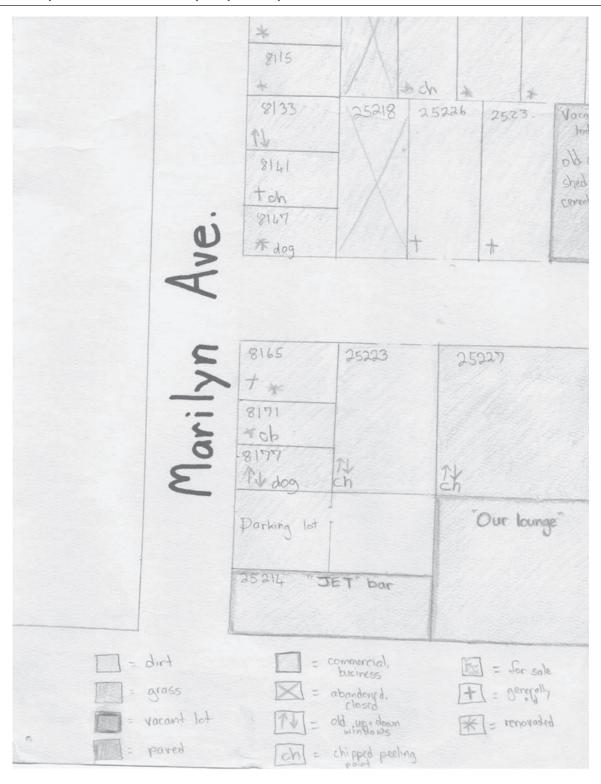
The service-learning opportunity described here provides multiple benefits for our students and local communities. The assignment occurs early in the students' academic program, thus exposing them to the mosaic of agencies, public and private, involved in the protection of human health and the environment. The learner is afforded an opportunity to understand environmental standards, environmental justice issues, and political access/influence through a real-world experience. Perhaps as important, students gain insight into the social-technical interface, where environmental risk factors are viewed from the public's perspective.

Figure 1. Comparative Risk Assessment Matrix adapted from Brantley et al.²

			Severity			
		1	2	3	4	5
	1	2	3	4	5	6
	2	3	4	5	6	7
	_3	4	5	6	7	8
	4	5	6	7	8	9

Severity

Figure 2. Representative section of a perceptual map



To further underscore the importance of public involvement and understanding, perceptual maps are produced as an integral part of the final report. These maps are useful for including details that may escape non-residents. For example, vacant buildings frequented after hours by gang members, suspected methamphetamine laboratories, and other factors that pose safety and health risks can be inserted into the map. Figure 2 shows a representative portion of a perceptual map produced during one of the assessments. Finally, the experience of presenting findings at a public meeting reinforces the importance of risk communication skills, both written and oral.

We hope our local community also receives tangible benefits from our service learning projects. The final written report is crafted in such a fashion that findings are prioritized and presented in high, medium, and low risk categories. This straightforward approach is amenable to easy digestion and encourages our partners to consider those factors that present the greatest risk to their communities. In school year 2000, the community partner invited a number of government agencies to attend our site visit. By virtue of our presence, attention was drawn to uncontrolled refuse disposal in an unincorporated portion of the county.

Conclusion

The service learning opportunity afforded by the module in environmental risk assessment provides students with experience in teamwork, interdisciplinary tasks, and exposure to the public health workforce. This knowledge, coupled with a degree of involvement with local citizens, plants the seeds of advocacy for underserved communities. To date, our service learning program has resulted in the abatement of lead-based paint in housing, creation of community refuse clean-ups, and improved law enforcement activities.

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REFERENCES

- 1. Paustenbach DJ. The practice of health risk assessment in the United States (1975–1995): how the U.S. and other countries can benefit from that experience. Hum Ecological Risk Assess 1995;1(1):29-79.
- Brantley E, Hetes R, Levy B, Powell C, Whiteford L. Environmental health assessment: an integrated methodology for rating environmental health problems. WASH Field Report # 436. PRITECH Report # HSS-133IR. Arlington (VA): WASH Project and Pritech Project; 1993.

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The Symposium will include invited talks and contributed papers on case studies depicting applications of study designs that improved public health decision-making: alternate study designs and implications for public health decision-making processes; decision-making algorithms and related software applications and development; statistics and policymaking in the face of uncertainty. A short course, "Modeling and Analysis Using Monte Carlo Methods," will be offered by George Casella, Ph.D., on January 27, 2003, in conjunction with the Symposium. To obtain further information, registration information and forms, please visit http://www.cdc.gov/od/ads/sag.



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