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Authors

Cohen, Alison
Lopez, Andrea
Malloy, Nile
et al.

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Our Environment, Our Health: A Community-Based Participatory Environmental Health Survey in Richmond, California

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**Alison Cohen, BA¹, Andrea Lopez, BA², Nile Malloy, BA²,
and Rachel Morello-Frosch, PhD, MPH³**

Abstract

This study presents a health survey conducted by a community-based participatory research partnership between academic researchers and community organizers to consider environmental health and environmental justice issues in four neighborhoods of Richmond, California, a low-income community of color living along the fence line of a major oil refinery and near other industrial and mobile sources of pollution. The Richmond health survey aimed to assess local concerns and perceptions of neighborhood conditions, health problems, mobile and stationary hazards, access to health care, and other issues affecting residents of Richmond. Although respondents thought their neighborhoods were good places to live, they expressed concerns about neighborhood stressors and particular sources of pollution, and identified elevated asthma rates for children and long-time Richmond residents. The Richmond health survey offers a holistic, community-centered perspective to understanding local environmental health issues, and can inform future environmental health research and organizing efforts for community–university collaboratives.

Keywords

community-based participatory research, empowerment, environmental health, health disparities, social determinants

Community-Based Participatory Research for Environmental Justice

The environmental justice movement seeks to address the fundamental causes of disparities in environmental health and exposure to hazards while working to democratize the research process to better integrate expert and community knowledge in ways that advance policy and improve regulation (e.g., Loh & Sugerman-Brozan, 2002). Mounting evidence indicates that environmental hazards and pollution are concentrated in low-income communities of color, and that these communities face higher health risks as a result (Bullard, Mohai, Saha, & Wright, 2007; Matsuoka, 2003; Morello-Frosch, 2002). Although many environmental justice advocates rely on scientific research to inform their work, they tend to reject “expert-driven” public health research because this approach often ignores the role of lay knowledge in research, overlooks the applicability of research findings to improve policy and regulation, and does not prioritize the need to transparently disseminate research results to study participants and the larger community in ways that can be used for organizing and advocacy. Community-engaged research methods seek to transform the scientific enterprise by integrating community members

throughout the research process—in the doing, interpreting, and acting on science. One approach is known as community-based participatory research (CBPR; Israel, Schulz, Parker, & Becker, 1998; Minkler & Wallerstein, 2003).

CBPR is a framework for conducting research in which the community being studied partners with academics to co-design the research question, protocols, and data dissemination work, with an eye toward applying the research to improve community life and public health policy (Minkler & Wallerstein, 2003). CBPR methods can include a coproduction model of scientific and political knowledge, which infuses local, community-based knowledge with tools and techniques from disciplinary science, often constructively improvising and shifting the research process using skills learned along the way to better address community-identified

¹Brown University, Providence, RI, USA

²Communities for a Better Environment, Oakland, CA, USA

³University of California, Berkeley, Berkeley, CA, USA

Corresponding Author:

Rachel Morello-Frosch, School of Public Health and Department of Environmental Science, Policy, and Management, University of California, Berkeley, Berkeley, CA 94720, USA
Email: rmf@berkeley.edu

concerns (Corburn, 2005). CBPR recognizes that outside researchers fail to understand all the factors that affect health in communities (Seifer & Sisco, 2006). Recognizing that different members involved in the research initiative—local groups and academic scholars—have varying levels of credibility among diverse audiences that will be useful in separate parts of the process is critical for effective CBPR.

Moreover, this process of community engagement in research has the potential to improve the rigor, relevance, and reach of scientific research on environmental health. CBPR is more *rigorous* because community engagement leads to better recruitment and retention of participants (Morello-Frosch et al., 2006), and because community members' local knowledge can inform data analysis strategies. It is more *relevant* because local knowledge is used to shape questions and link study results to policy and regulatory action. It also has greater *reach* because community involvement in the research process leads to more effective dissemination of research results to broader audiences (Israel et al., 1998) and ensures that the information presented is transparent to diverse stakeholders. Moreover, community involvement in results dissemination helps to put a human face on statistical results so that they are compelling and harder to ignore by policy makers and the regulatory community (Corburn, 2005).

CBPR enables scientists to consider institutional and structural forces that may contribute to biological and community-level exposures and susceptibility to toxics, including how legacies of discrimination in zoning shape current spatial distributions of pollution sources (Morello-Frosch, 2002), which can in turn affect environmental health policies. Community-based research can be used to inform the policy development and policy implementation process, thereby improving the quality of the policies produced (Corburn, 2005). By researching environmental causations of disease, researchers can address regulatory ignorance about fundamental causes of health and disease and highlight opportunities to reduce exposures to social and environmental stressors that may interact to affect community health and well-being (Leung, Yen, & Minkler, 2004). CBPR encourages environmental health scientists and epidemiologists to improve their research methods in order to better understand the cumulative impacts of multiple hazard exposures in both the social and environmental realms in ways that improve regulation and policy (Payne-Sturges et al., 2006).

We present our own CBPR for environmental justice, a community-academic partnership surveying residents from Richmond, California, about their health, environment, and neighborhood. We first describe our community research partners, followed by our CBPR approach and research goals. The survey examined topics selected by community members, organizers, and academic researchers for their community, policy, and research significance, including certain health problems, cumulative stressors, health insurance coverage, and perceptions of the neighborhood environment (Figure 1). Our findings include elevated rates of health

problems (including asthma and quality-of-life symptoms), a link between cumulative stressors from the built environment and overall health, and high uninsurance rates. Finally, we discuss the implications of our results for the Richmond community and the environmental justice movement, and make the case for integrating CBPR descriptive studies into community organizing work and exposure assessment science.

The Richmond Health Survey

Our health survey had two important and inextricably linked goals: generating descriptive health data at the community level (a) in the pursuit of scientific understanding and (b) as an outreach and organizing tool. By constantly engaging with community members, this research approach allows community-based organizations to identify persistent problems and priorities for action.

The impetus for the survey. Communities for a Better Environment (CBE), a California-wide environmental health and justice organization, decided to conduct this health survey to identify major neighborhood quality and health issues in Richmond as a complement to their scientific collaboration with Silent Spring Institute, Brown University, and University of California, Berkeley on the Household Exposure Study (HES). Briefly, the HES was a CBPR-based exposure assessment study conducted in 2004-2009 that entailed measuring endocrine disrupting chemicals and other pollutants from consumer products as well as industrial and mobile source emissions in indoor and outdoor air and dust in the homes of 40 Richmond residents and 10 residents of Bolinas, a rural community in the Bay Area with a history of environmental activism (Brody et al., 2009). The HES studied exposures rather than health outcomes because this was deemed to be more advantageous for research and policy purposes in terms of highlighting chemicals of concern and potential opportunities for exposure reduction: the HES assessed exposures to chemicals that had not been previously measured in indoor and outdoor air and dust (Brody et al., 2009). To supplement HES findings, CBE and community members wanted to do a survey documenting the environmental health challenges of four racially and socioeconomically diverse neighborhoods in Richmond that were likely to be impacted by mobile and stationary sources of pollution. The goal of the health survey was not to correlate health outcomes with exposures documented in the HES but rather to provide a community health profile of the Richmond neighborhoods located near some of the mobile and stationary emission sources of concern.

In response to this interest, the Richmond health survey was developed to (a) document the health experiences of Richmond residents, (b) assess residents' perceptions of environmental and nonenvironmental stressors to complement information from the HES, (c) assess CBE's effectiveness in serving its constituents and raising awareness, and (d) inform ongoing policy engagement efforts in Richmond. The four

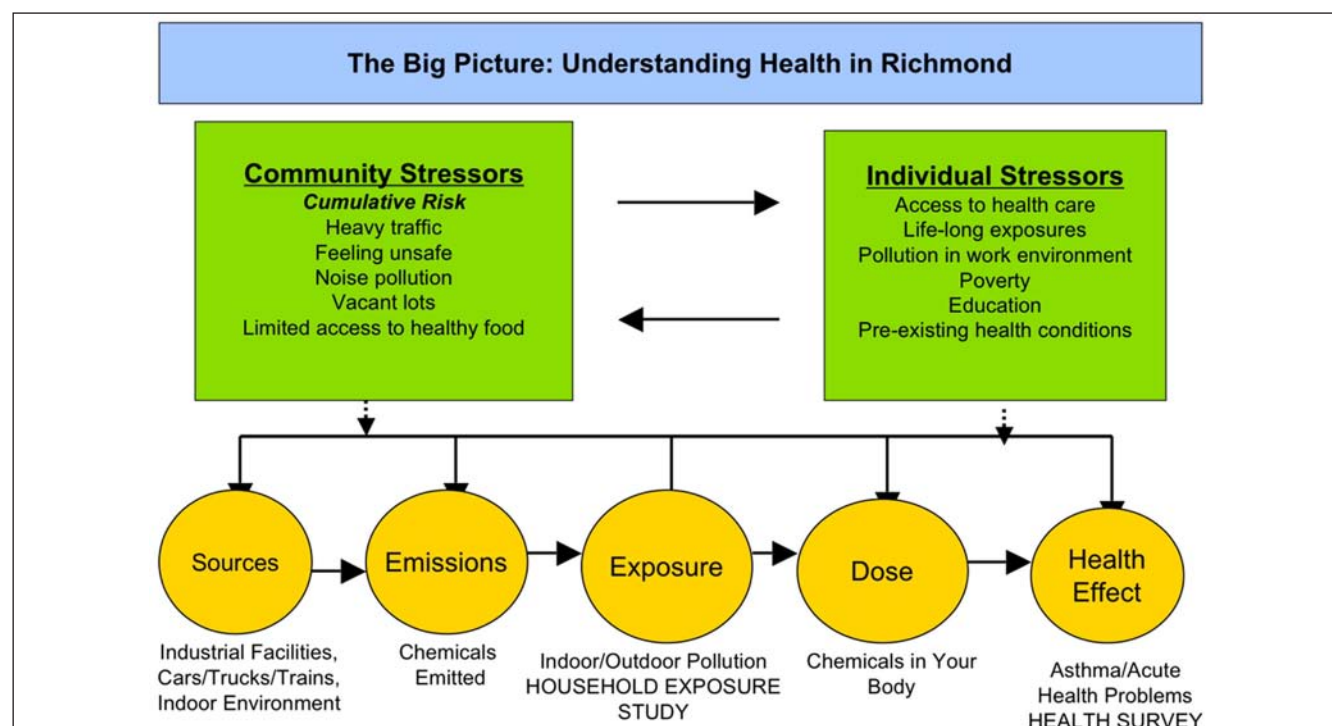


Figure 1. Communities for a Better Environment (CBE) research questions for health survey

Note. Respondents were asked questions about sources, community stressors, individual stressors, and health effects.

neighborhoods were selected because of their close proximity to each other and to major sources of air pollution; however, these communities conceived of themselves as distinct from each other because of differences in race/ethnicity, immigration status, and home ownership, and they were served by different community-based organizations. Given the HES's effort to link breast cancer advocacy with environmental justice activism through studying environmental health, the Avon Foundation, which typically funds traditional breast cancer research and activity, saw that funding the health survey could contribute to our understanding of environmental determinants of health outcomes such as breast cancer.

The research partners. The development of the survey stemmed from a division of labor between community and academic partners: the community partners (organizers at CBE) determined the research questions based on known community perceptions of local environmental health risks, and the academic partners developed a survey that could address those research questions effectively. The academic partners and CBE staff coordinated the field work to recruit study participants.

CBE is a California-wide environmental justice organization with offices in the San Francisco Bay Area, and served as the principal investigator on this project. The organization's work combines grassroots organizing, science, and litigation strategies for what the organization terms a *1-2-3 punch for*

social justice to address local environmental health justice problems, including working to change policies and practices of more than 200 industrial facilities in its thirty years of existence (May, 2004). CBE has a history of collaboration with academics to generate scientific information that can inform their organizing and advocacy efforts and build the evidence base for their legal cases. The organization also leverages scientific results to enhance their credibility with regulatory agencies and policy-makers, and works with scientific collaborators to develop appropriate research methodologies, making the community work more scientifically rigorous and the academic work more responsive to local needs (Brody et al., 2007; Morello-Frosch, Pastor, Porras, & Sadd, 2002; Pastor, Sadd, & Morello-Frosch 2007; Perez, Zota, & Altman, 2007).

CBE works in Richmond, California, which has a long history of industrial activity—including the petrochemical industry—and consequent pollution. The Richmond Chevron refinery is one of the nation's largest, covering 2,900 acres, employing 1,000 workers, and processing more than 240,000 barrels of crude oil into gasoline, jet fuel, diesel, and lubricants daily (Chevron, 2009a, 2009b). Richmond is located in Contra Costa County, which is one of the most industrialized counties in the western United States (Contra Costa County, 2010). Richmond's population is 79% people of color (City of Richmond, 2006), so the disproportionate burden of major industrial facilities, small area emitters and transportation

emission sources has been an ongoing environmental justice concern.

CBE worked with academic partners at University of California, Berkeley and Brown University from public health, environmental science, and sociology, who offered expertise in public health research methods and data analysis. The health survey also drew on an existing partnership with the Silent Spring Institute, a nonprofit research institute dedicated to studying links between the environment and women's health. Additionally, during development of the survey, another environmental justice community-based organization operating and organizing in Richmond, the West County Toxics Coalition (WCTC), became engaged in the research initiative by helping recruit participants, providing feedback on data analysis, and facilitating dissemination of findings.

Method

In developing the survey, university researchers and CBE staff met to lay out the main issues that were to be covered. Survey topics included area-level factors such as neighborhood access to stores selling fresh food, and individual-level factors such as a participant's health insurance coverage. Researchers then developed a draft questionnaire, which used several questions that had been validated in previous CBPR studies on community environmental health (including Parker et al., 2001, and Schulz et al., 2005). It was reviewed by all partners for feedback and subsequently revised. The questionnaire was then pilot tested with community members affiliated with CBE and revised again. Over the course of the research project, monthly team meetings and frequent communication between the two lead field researchers (AC and AL) allowed for constant university-community collaboration.

The Richmond health survey was conducted in four Richmond neighborhoods: Atchison Village, Liberty Village, North Richmond, and St. Mark's/Nevin Center. These neighborhoods border each other and are the neighborhoods closest to the area's major stationary polluting sources (Figure 2). CBE works primarily in Atchison Village and Liberty Village, which are home to Latino, African American, and White working-class residents. CBE was interested in expanding its reach to the St. Mark's/Nevin Center area, and so the health survey was viewed as a way to assess the needs and concerns of residents in this neighborhood. North Richmond, a historically African American neighborhood, is an organizing and advocacy base for WCTC, an organization dedicated to working with West Contra Costa residents to address local environmental issues. Activists there viewed the health survey as a way to identify commonalities and encourage collaboration across neighborhoods that bear similar pollution burdens but see themselves as distinct communities.

The research team was committed to employing surveyors from the community, which would increase buy-in for the research process and facilitate subsequent dissemination of survey results. Five community surveyors, all but one of whom spoke Spanish, were employed by CBE to build community leadership and capacity for research. Community surveyors were identified by CBE and WCTC as people who were leaders in their neighborhood and who might be interested in participating; each neighborhood had an affiliated community surveyor. To comply with Brown University's Institutional Review Board requirements, all community surveyors completed an online research ethics training course and were further trained by the CBE survey coordinator (AL) on the protection of human subjects and basic concepts in environmental justice, cumulative impact, and environmental health science. This additional training was intended to build community capacity and scientific literacy. Surveyors recruited participants and collected survey data in teams of two.

Study participants were recruited through a multipronged approach that included letters mailed to home addresses, door knocking, announcements at community events, and word of mouth. Our survey recruitment strategies demonstrated both the project's strengths and its limitations. Random selection by door knocking is ideal because it means that everyone in the same geographic area has the same chance of being selected for a study. We were only able to randomly sample (or knock on all doors, at multiple times of day) in two of the four neighborhoods we covered; because of neighborhood safety concerns, most residents in the other two neighborhoods did not have publicly accessible doors and/or would not open their doors to strangers. In these neighborhoods, we relied on snowball sampling, which recruits participants through social networks. Although we were able to harness local social networks through our community connections, social networks can be self-selective. For example, in one neighborhood most of the respondents were affiliated with the neighborhood church, because that was the primary social network of our community surveyors.

We provided a \$15 grocery store gift certificate to all survey participants to compensate people for their time. To be eligible to participate, respondents needed to live within the four neighborhood area, speak either English or Spanish, be older than 18 years, and not smoke. Smokers were excluded because smoking is associated with many of the health outcomes that are also associated with ambient air pollution, including respiratory outcomes such as asthma. Additionally, only one person from any given household was eligible to participate. No one was turned away because of language barriers, but smoking precluded many residents from participating.

Data were entered in MS Excel and analyzed in MS Excel, SPSS (Statistical Package for the Social Sciences version 14.0), and Stata (version 11); frequencies, cross-tabulations, analyses of variance, and multiple linear regressions were

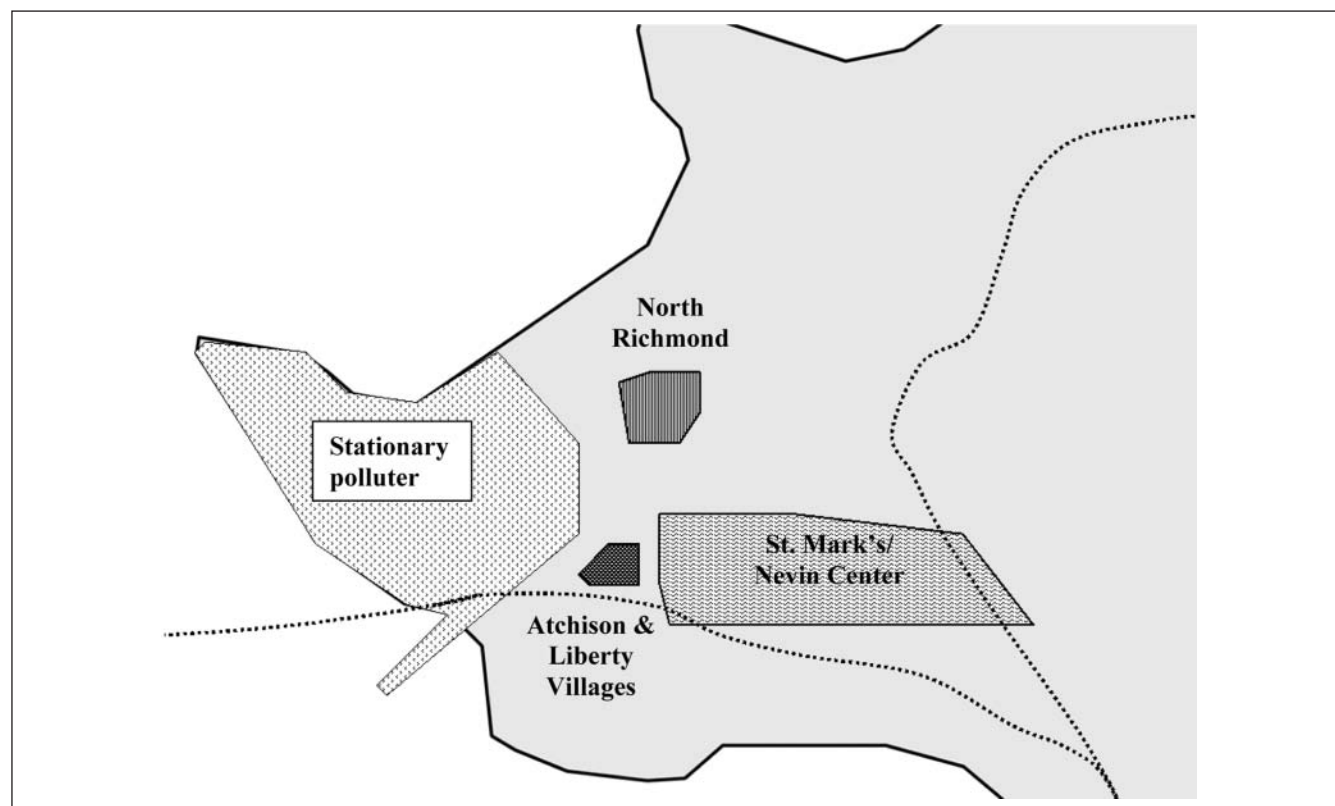


Figure 2. Map of the Richmond, California, survey area

Note. The three shaded polygons contain the four neighborhoods surveyed; the dotted lines indicate the position of major highways.

conducted. Missing responses were rare, but individuals were excluded only from analyses for which a specific variable was missing. Therefore, sample size for analyses of different variables may vary slightly. Our survey defined asthma as ever being told by a doctor or other health professional that they had asthma, a commonly-used definition, and one applied by the California Health Interview Survey to which we compare our results below. We developed a cumulative neighborhood stressor score that combines five factors known to be health stressors selected based on their diversity in describing built environment quality: feeling unsafe (Boynton-Jarrett, Ryan, Berkman, & Wright, 2008; Clark et al., 2008; Sampson, Raudenbush, & Earls, 2009), heavy car or truck traffic (Fan et al., 2009; Morrison, Thomson, & Petticrew, 2004; Thomson, Jepson, Hurley, & Douglas, 2008), loud noise from cars/motorcycles/trains/airplanes (Allen et al., 2009; Stansfeld & Matheson, 2003), presence of vacant lots/houses (Greenberg & Schneider, 1996; Oakes, 2004), and inability to find affordable and nutritious food (Franco, Diez Roux, Glass, Caballero, & Brancati, 2008; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). Each of these factors was presented as a statement, and respondents were asked to what extent they agreed or disagreed with each of the statements using a

Likert-type scale. As necessary, statements were recoded so that all statements were in the same direction, and then responses for each of the five statements were then summed. Although each of these stressors has been considered individually and much more complex indices have been created, combining these five individual dimensions of neighborhood stress into one simple cumulative score is new and, although limited in scope, operationalizes the concept of cumulative impact tackled by community organizers.

Data analysis was done in consultation with community surveyors and survey respondents: Two small community meetings were held in January 2009 (one in Spanish and one in English, located strategically to be accessible to residents from all four neighborhoods) to discuss plans for data analysis, community ideas for analytic work to be done, and feedback regarding data dissemination. This process influenced what hypotheses we chose to test and how to present our data; for example, the asthma results described in this article, which stratify adult asthma prevalence by length of residence in Richmond and compare child asthma prevalence with other communities, were inspired by these community discussions. This type of community engagement in the data analysis process is relatively unusual, even among CBPR projects (Cashman et al., 2008).

Table 1. Respondent and City of Richmond Demographic Information

	Health Survey Respondents (<i>n</i> = 198)	City of Richmond Demographics (U.S. 2000 Census)
Gender: % female	82.3	51.4
Race/ethnicity (%)		
Non-Hispanic White	11.2	21.0
Black/African American	23.0	36.0
Hispanic/Latino	64.7	27.0
Other	1.1	16.0
Aged ≥65 years (%)	14.9	13.7 ^a
High school graduates, aged 25+ years (%)	75.1 ^b	75.4
Bachelor's degree or higher, aged 25+ years (%)	16.4 ^b	22.4
Median household income (\$)	20,000-24,999	44,210
Homeownership rate (%)	46.0	53.3

a. The figure 13.7% represents the proportion of Richmond's 18 years and older population who is 65 years or older to allow for comparability to our respondent population, which was restricted by age and could not have surveyed anyone in the 27.7% of Richmond's population who is younger than 18 years.
b. These percentages were calculated excluding all respondents who were younger than 25 years, so we used an *n* of 189.

Results

A total of 198 Richmond residents were surveyed in English or Spanish (59% of respondents preferred to take the survey in Spanish). In addition to answering questions about themselves, all respondents also provided information about the health of the other members of their household, allowing us to collect data about the health of 722 Richmond residents. Our survey population was not representative of the City of Richmond (as described by the U.S. 2000 Census) in terms of gender, race, or income (Table 1). Whereas 51.4% of Richmond residents are women, 82.3% of the survey respondents were women. This gender imbalance was acceptable because our survey was not particularly concerned with issues of gender of respondents and because mothers and fathers are equally likely to accurately describe their children's health, with mothers' descriptions often more sensitive (Waters et al., 2000). In terms of race, our survey population had a much higher proportion of Latinos than the City of Richmond as a whole (65% vs. 27%) and a lower percentage of Whites, Blacks, and others. There are several possible reasons for having a higher proportion of Latinos than the City of Richmond, including Latinos being more likely to live in the four neighborhoods we targeted than elsewhere in the city, our community surveyors' social networks potentially including higher proportions of Latinos, and that we may have surveyed undocumented residents who may have gone uncounted in the U.S. Census.

Asthma: An Environmental Justice Concern

Survey participants provided health information about all members of their household (adults and children), allowing us to collect health information for 282 children in addition

to our 198 adult respondents. Among our adult respondents (*n* = 198), the prevalence of chronic asthma (17.7%) was higher than the most recent national average (8.7%) and California state average (7.5%; National Center for Environmental Health, 2009). Additionally, adult asthma was associated with being a long-time (15 years or more) Richmond resident (unadjusted prevalence ratio: 2.14, $p < .001$). (The decision to analyze the data based on this particular length of residence in Richmond was made by survey participants at one of our community data analysis meetings.) The prevalence of asthma for who had lived in Richmond for less than 15 years (9.2%; 95% confidence interval [CI] = 4.3% to 14.2%) and those who had lived in Richmond for 15 years or more (34.9%; 95% CI = 23.4% to 46.3%) were statistically significantly different. It is also worth noting that a subset (*n* = 20) of the adults who had lived in Richmond for 15 years or more are lifelong residents; the prevalence of asthma among these residents was 45.0%, as compared with the 15% lifetime asthma prevalence rate in Contra Costa County as a whole (Lund, 2005a). In multivariate analyses, a statistically significant relationship ($p < .005$) between asthma and length of residence in Richmond persisted even after controlling for potential confounders, including age, reported mildew or odor in the home, and presence of smokers in the home (since all respondents were nonsmokers).

Participants provided health information for the child members of their households (*n* = 282); this is a tested and validated method of collecting data about children's health, including for asthma, although underreporting can occur (Joesch, Kim, Kieckhefer, Greek, & Baydar, 2006) and household members are not independent from each other. The Richmond prevalence of childhood asthma (17%) reported by survey participants was more than double the

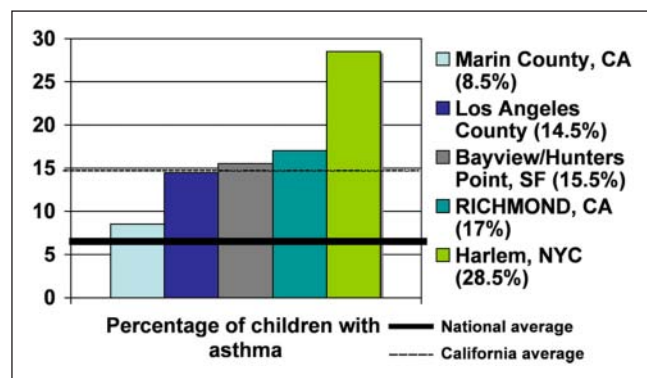


Figure 3. Prevalence of asthma among Richmond children reported by study participants, compared with prevalence rates in other areas. Sources: Lund (2005b), Mann (2000), and Nicholas et al. (2005).

national average (7%), but only 2 percentage points higher than the California state average (14.8%; Lund, 2005a, 2005b). The rate in our survey was roughly equivalent to the Contra Costa County asthma rate (Lund, 2005b). Community residents asked CBE to compare this result to what has been found in communities they considered to be similar to Richmond, as well as other communities nearby.

Marin County, which is directly across the San Francisco Bay from Richmond and is a wealthier, suburban community, has the lowest prevalence of childhood asthma in the state, whereas Los Angeles County and the Bayview/Hunters Point neighborhood of San Francisco—two areas known for air pollution—have prevalence rates much closer to what we found in Richmond (Figure 3). It is possible that Richmond's prevalence is even higher: In the New York City's Harlem neighborhood study—which was the only study we found that actively tested all participating children for asthma rather than rely on both parental reporting and access to a medical diagnosis—which also bears a heavy pollution burden, Nicholas et al. (2005) tested all participating children for asthma, rather than rely on parental survey, and found a 28.5% prevalence rate, which we consider to be a more probable upper bound for asthma prevalence for environmentally burdened communities such as Harlem or Richmond.

Quality-of-Life Health Problems: Prevalent, but Infrequently Discussed

We asked about a variety of acute health problems, including eye irritation, headaches, nosebleeds, respiratory allergies other than hay fever, and skin irritation within the last year. These health problems have been associated with acute pollution events in other communities (Elliott, Cole, Krueger, Voorberg, & Wakefield, 1999; Lerner, 2005; Subra, personal communication, April 30, 2008). Acute health problems are common: The majority (63%) of respondents ($n = 198$) reported that they suffered one to two acute health problems, with 13% reporting three or more acute health problems

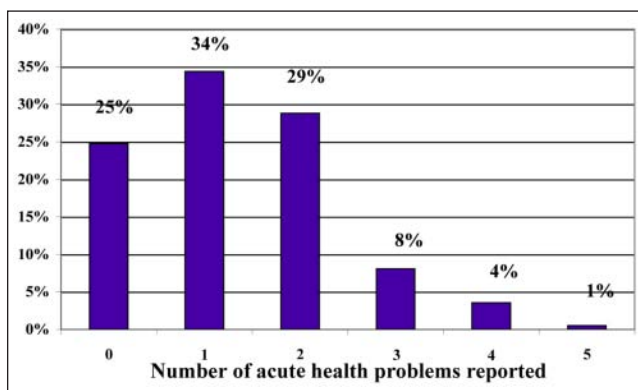


Figure 4. Percentage of respondents ($n = 198$) reporting acute health problems within the past year. Note. Percentages do not add up to 100% because of rounding.

(Figure 4). This suggests that the prevalence of acute health problems is not because of a small group of residents with multiple health problems, but rather that three quarters of all respondents are affected by at least one acute health problem. Furthermore, these acute health problems are a constant presence: The median frequency of headaches among household respondents was approximately twice per week, and the median frequency of eye irritation was just over once per month.

Sources of Pollution: What Causes Concern Is in the Eye of the Beholder

Almost all (93.4%) of respondents ($n = 198$) were concerned about the links between pollution and health, and in response to a separate question, 85% of respondents were concerned about industrial pollution. Respondents were asked to identify specific sources of pollution concern. Despite initial expectations that having heard of or being involved with CBE might bias responses about pollution and sources of concern, having heard of CBE was not associated with respondents having specific sources of pollution concern. This indicates that environmental pollution is a community-identified problem rather than an issue imposed by CBE. The Chevron refinery was the most commonly listed source of pollution, followed by cars, other industrial facilities, trucks, and trains (Figure 5). These are all highly visible sources of pollution and their presence is well known by residents. Less immediately visible or tangible pollution sources that CBE has identified in these neighborhoods, including pesticide drift from a nearby nursery, leaking underground storage tanks, and indoor air pollution from household chemicals, were not listed as concerns by survey participants.

General and specific concern about pollution was widespread. Although the majority (69%) of respondents ($n = 198$) reported that their neighborhood was a good place to live, they were concerned about environmental stressors:

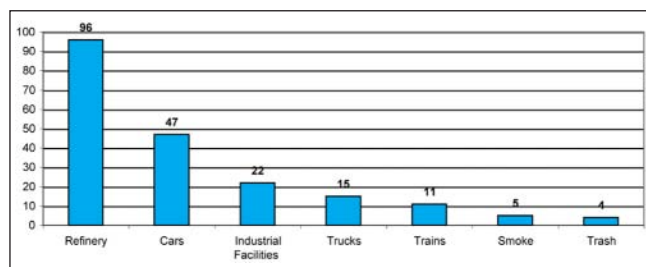


Figure 5. Percentage of respondents reporting specific pollutant sources of concern ($n = 198$)

81% of respondents ($n = 198$) were worried about at least one specific source of pollution in their community. However, of those worried about specific sources, only 41% of respondents reported communicating their concerns to government officials, industry officials/company representatives, or community-based organization representatives. The rest of the respondents reported not communicating their concerns for a variety of reasons, including language barriers, feeling that no one would respond to their concerns, and poor attendance by those institutions at meetings. Industry facilities, politicians, and community-based organizations view themselves as quite different from each other, but respondents described each of these sectors as being relatively unresponsive to community concerns regarding pollution sources, with none of the three sectors garnering satisfaction from more than 30% of respondents. In addition, when these sectors did respond to community concerns, it was in the same way: flyers, neighborhood meetings, and presentations or other participation at city meetings—event-related activities, rather than capacity building or long-term community investments aimed at reducing pollutant emissions and community exposures.

Multiple Stressors and Environmental Justice

Respondents' cumulative neighborhood stressor scores ranged from 5 to 25. Respondents were categorized into a high stressor category (scores ranging from 5 to 11, $n = 55$), medium category (scores of 12 to 18, $n = 95$), and low category (scores of 19 to 25, $n = 47$).

Bivariate analysis indicates that the cumulative stress score was associated with self-rated health (participants reporting fair or poor health status; $p = .011$), with people who reported higher perceived cumulative neighborhood stress being more likely to report fair or poor overall health (data not shown). As shown in Figure 6, 63% of those reporting high cumulative stress ($n = 55$) reported having fair or poor health as compared with 45% of those reporting medium or low cumulative stress ($n = 142$). Multivariate analyses found that the relationship between cumulative stress score and self-rated health persisted ($p < .05$) even after controlling for age and neighborhood of residence.

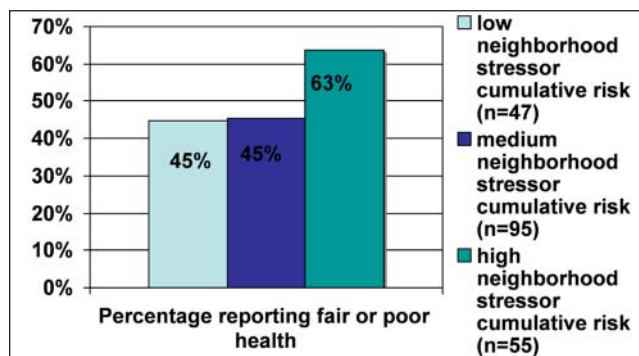


Figure 6. Association between cumulative stress score and self-reported health

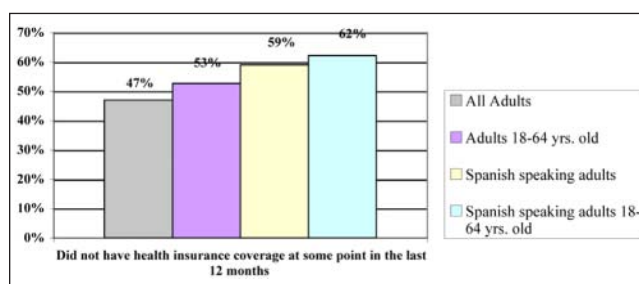


Figure 7. A majority of adults younger than 65 years, and an even higher proportion of Spanish-speaking adults, reported not having continuous health insurance coverage within the past 12 months

Health Insurance: Noncoverage Widespread, Especially Among Spanish Speakers

Access to health care was a common issue for survey respondents. Whereas 19.5% of Californians younger than 65 years currently lack health insurance (Brown, Lavarreda, Peckham, & Chia, 2008), 37% of all survey respondents ($n = 198$) lacked health insurance. We stratified respondents based on age, to address the fact that those older than 65 years are more likely to be insured through Medicare. Of respondents ages 65 years or older ($n = 29$), 13.8% did not have health insurance coverage continuously over the past year, and all these respondents were English speakers, making lack of citizenship an unlikely explanation. This suggests that there may be a serious gap in service provision and sign-up.

We also asked respondents if they had health insurance coverage continuously over the past 12 months, and a majority (52.7%) of respondents younger than 65 years ($n = 169$) did not, with Spanish-speaking respondents being even more likely to be uninsured (Figure 7). Among Spanish speakers younger than 65 years, 62.2% did not have health insurance at some point in the past 12 months. This is lower than average insurance coverage rates for Mexican immigrants in California (Wallace & Castañeda, 2008).

Discussion

Summary of Findings

Respondents described their neighborhoods as good places to live, but they also expressed concerns about neighborhood sources of pollution and stress; we sought to highlight the combination of environmental factors that affect reported neighborhood quality of life and contributed to cumulative stress across all neighborhoods. Additionally, the high asthma burden (both the elevated prevalence of childhood asthma and asthma disproportionately affecting long-time Richmond residents) highlight the health concerns of residents living in polluted areas. For adult asthma, CBE's hypothesis that length of residence in Richmond was associated with asthma prevalence was supported by our data. For childhood asthma, community partners requested comparisons to other regions to provide context. Compared with Richmond, asthma prevalence rates were lower in Marin County and similar in Bayview/Hunters Point and Los Angeles County.

Our results identified future research and advocacy opportunities for CBE and also point to areas for enhanced regulatory attention. For example, given concern about both asthma and local sources of air pollution, our survey results could be used to advocate for more air quality monitoring near emissions sources of concern. Typically, air monitoring networks are not located close to emission sources so as to provide an overall regional air quality assessment, but residents' concerns suggest a need for more targeted monitoring in those neighborhoods hosting major emission sources to examine localized air quality impacts. Furthermore, our results support the need for targeted asthma surveillance in these Richmond communities to verify our findings in terms of prevalence of disease reported by residents, including differential rates among children and people who have lived in Richmond for several years. In addition, CBE could work with health advocates and officials to increase health insurance coverage, given that they focus primarily on environmental stressors and health issues in primarily Latino communities, a group that is particularly lacking in access to health care.

This survey was conducted by CBE to guide its organizing and advocacy efforts and to supplement a larger household exposure study being conducted in two of the neighborhoods (Atchison and Liberty Villages). The generalizability of our survey, including how our measures of frequency and association are interpreted, is limited because of logistical constraints that limited our ability to collect a purely random sample of survey respondents. We were initially concerned about our sample being biased toward being concerned about environmental health issues because of participants' prior affiliation with CBE or WCTC, but as only a small proportion (less than one third) of respondents had heard of CBE and the vast majority (>90%) were concerned about links between environment and health, this potential bias was not realized. Additionally, the high prevalence of smoking in one neighborhood precluded many potential respondents from participating, which may have affected our results.

All surveys are imperfect instruments in that they rely on information that is self-reported. Given the number of respondents who did not have health insurance in the past year, it is possible that the actual frequencies of health problems are higher but have gone undiagnosed. For example, the 10-percentage-point difference between our measurement of childhood asthma rates in Richmond and Nicholas et al's (2005) Harlem study, which conducted diagnostic tests rather than rely on self-reports, suggests that additional and targeted asthma surveillance in these neighborhoods may be warranted to verify our findings that relied on self-reporting.

The greatest limitation of our analysis was the diversity and small size of our study sample. Although quite large for a community-based participatory research initiative, our sample size precluded systemic multivariate modeling to examine all potential interaction and confounding effects.

Dissemination of Health Survey Findings

In community-based participatory research partnerships, the work has only just begun when the data analysis ends. As discussed in the introduction, the community-based participatory research framework is iterative and values a wide array of different forms of research dissemination and engagement with research findings. Keeping these findings and commitment to community in mind, researchers presented results from the Richmond health survey to both academic and community audiences. We presented our findings at multiple meetings for community residents, including a meeting for HES participants, and for interested local public health and environmental agencies, including the county's Hazardous Materials Commission and the North Richmond Municipal Advisory Committee. In addition to those presentations and this article, a lay report available from CBE's website was released in July 2009. Since then, community-based organizations and residents have used the results of this survey to inform public and written testimonies regarding City of Richmond land use planning policy and other regional organizing work for environmental health (e.g., Choy & Orozco, 2009). By engaging with community members at each step of the research process and triangulating our research findings with local knowledge, we were able to overcome many limitations related to dissemination and applicability often present in public health research.

Conclusion

Achieving Community Building, Community Organizing, and Policy Goals

Descriptive studies such as our Richmond health survey can inform community organizing and help groups assess whether and how their priorities match with the concerns that are identified by residents in multiple ways. By surveying residents in four different neighborhoods and encouraging them to attend community meetings together, we were

able to facilitate community unity across racially and economically distinct neighborhoods through presenting our data and facilitating dialogue and strategizing about how to address community health concerns. These meetings revealed that neighborhoods that conceived of themselves very differently (i.e., immigrant renters vs. U.S.-citizen homeowners) share similar health problems and at similar rates. Here, the data emphasized that geographic proximity can bind neighborhoods and established a foundation for forging multiracial coalitions for promoting community environmental health.

The participatory nature of the health survey also served to increase community health literacy. By teaching community surveyors basic environmental health and epidemiology concepts and by engaging survey participants in data analysis and dissemination discussions, we were able to increase the capacity of those involved to contextualize, synthesize, and analyze public health research results. A key component of the health survey was to build the capacity of community partner organizations, CBE and WCTC. Historically, these two organizations have operated within mutually agreed-on and mutually exclusive geographic zones: CBE identified its base to be among the predominantly White and Latino residents of Atchison Village and Liberty Village, and WCTC was rooted in the African American community of North Richmond. By engaging these three communities in addition to the St. Mark's/Neve Center neighborhood, the health survey process helped the organizations build unity around a common goal—a healthier Richmond environment—and advance future Richmond-wide cross-collaboration for environmental health and justice.

In addition to facilitating collaboration between CBE and WCTC, we were able to increase community awareness of CBE and WCTC simply by virtue of recruiting people to participate in the survey, many of whom had previously never heard of either organization. This also has the potential to generate new members, because many of the respondents who had not previously heard of the organizations expressed interest in getting involved. The health survey also assessed community perceptions of what each organization does and their effectiveness, which is useful as these community-based organizations seek to respond to community interests and needs. Topics that community members identified as issues of concern, including noise pollution from trains, can also inform future organizing and advocacy projects undertaken by these organizations.

Implications for Advancing Community-Based Research Models and Understanding Local Health Issues

Our results support further regulatory scrutiny and research to determine the magnitude of health problems and potential environmental determinants of health in Richmond. To our

knowledge, this is the first Richmond health survey that examined community perceptions of environmental health concerns in conjunction with assessments of neighborhood quality and area-level stressors. The health survey also affirms local concerns about disproportionate respiratory health problems, bolsters the evidence of environmental injustice in Richmond, and raises ideas for future community organizing initiatives related to health and quality of life in these neighborhoods. Methodologically, we advance models for community-based participatory research by showing how perception surveys regarding environmental and nonenvironmental stressors and self-rated health can serve as a vehicle to achieve several aims. First, surveys like ours provide a foundation of knowledge regarding community environmental health concerns, which can be used to contextualize more traditional scientific studies (i.e., the HES) and inform future CBPR projects in these communities and direct local regulatory attention to specific concerns that have gone unnoticed or unaddressed. Second, such community-based surveys can build organizational and community capacity by shaping organizing and advocacy efforts of community collaborators and training residents on basic concepts of environmental health science in ways that enable them to interpret and disseminate study results to broader community constituencies.

Finally, adding to evidence of environmental injustice, the content of the Richmond health survey supports a cumulative impact model for environmental health—namely, that people are exposed to multiple sources of pollution and stressors that may cause and intensify multiple diseases. Since each of the factors included in our cumulative stress score has been individually found to be associated with self-rated health in other studies (e.g., Agyemang et al., 2007), our study supports that literature and adds to the base of research calling for considerations of the built environment and place-based stressors in public health policy. Environmental health scientists and environmental justice activists have begun to move away from the single polluter/single disease framework and toward a model of understanding the cumulative impacts of exposures to multiple environmental and social stressors; the Richmond health survey findings add to the research body encouraging this paradigm shift in regulatory decision making and public health prevention.

Human Participant Protection

The research protocol was reviewed by Brown University's Institutional Review Board and deemed to be exempt. Participants provided informed consent prior to initiating participation in the survey.

Authors' Note

At the time of research and writing, Alison Cohen was affiliated with Brown University, and she is now affiliated with the School of

Public Health University of California, Berkeley; Andrea Lopez was affiliated with Communities for a Better Environment, and she is now affiliated with University of California, San Francisco.

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