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Public Health

journal homepage: www.elsevier.com/puhe

Original Research

Why participation matters for air quality studies: risk perceptions, understandings of air pollution and mobilization in a poor neighborhood in Nairobi, Kenya

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ARTICLE INFO

Article history:

Received 2 February 2015

Received in revised form

15 May 2015

Accepted 13 July 2015

Available online 19 August 2015

Keywords:

Air pollution

Participatory methodologies

Risk perceptions

Capacity building

Local knowledge

Sub-Saharan Africa

ABSTRACT

Objectives: With high urbanization rates, Sub-Saharan Africa is facing growing problems of poor air quality in its cities. We make a case for participatory approaches in air quality studies especially including those living in poor neighborhoods who may be particularly at risk from this trend.

Study design: We used collaboration with a community based organization, interviews, focus group discussions and a community forum.

Methods: We conducted a pilot study to assess health risk perceptions of air pollution for civic-minded residents in Mathare, an informal settlement in Nairobi, Kenya. Simultaneously, we involved Mathare residents in measuring levels of PM_{2.5} and later presented these data at a community forum with the participants of the monitoring study and the focus group discussions.

Results: We found that participation in conducting and interpreting air quality studies helped residents improve their understanding of air pollution and also helped them develop responses to it. Initially, participants associated air pollution with a bad odor or discomfort rather than their health, but once the connection to health was made through participation, they sought more information about air quality data and its hazards. Some residents also came up with strategies for coping with their environment and its risks.

Conclusions: These results point to the potential of including participation in air quality monitoring as a way to increase awareness and support local action to address it. Discussion and sharing of results at the local level as well as at a wider policy level will be critical for advocacy to improve air quality.

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<http://dx.doi.org/10.1016/j.puhe.2015.07.014>

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Introduction

In 2014, the World Health Organization estimated that air pollution contributed to seven million premature deaths a year globally, making poor air quality one of the most severe environmental risks to human well-being.¹ In response, the United Nations Environmental Program (UNEP) has made promoting improved air quality through capacity building for better regulation, monitoring and action a new priority. Clearly, a strong need exists for increasing support for local monitoring systems, science, regulation and action plans to address this growing public health concern. This is especially the case for many cities in Asia and Africa where rapid urbanization is increasing this public health risk but adequate scientific understanding, capacity to build and maintain monitoring systems as well as the public awareness needed to address the issue do not yet exist.

In this article, we argue that to do more effective air quality work, both the science and the advocacy must incorporate thoughtful participation of affected populations into its methodology. We illustrate this point through a reflection on air quality work (both risk perception and actual air quality sampling) in a poor community in Nairobi, Kenya. Such poor communities are at risk for a myriad of serious public health problems linked to poor services and location in the city, including respiratory infections from exposure to cook smoke or diarrhoea due to improper drinking water.^{2–8}

Overall, recent air quality studies in burgeoning urban areas in Sub-Saharan Africa (SSA) suggest in addition to indoor air pollution, outdoor air pollution is a serious, growing and understudied problem poised to grow worse.^{9–17} Vehicle emissions are one growing source contributing to as much as 90% of urban air pollution in developing countries.¹⁸ Further, this is an acute problem for the urban poor who comprise a large and growing portion of the urban population. The urban poor are already vulnerable as they also face indoor air pollution and live in close proximity to more pollution sources like highways, open burning of waste or industry.^{15,19,20} Inadequate planning and service provision in African cities also means that poor pedestrians who cannot afford motorized transport are often forced to walk near streets full of traffic and vehicle emissions.²¹

Long term air quality monitoring is rare in SSA. However, a growing number of urban air quality measurements are showing pollution levels often exceeding World Health Organization guidelines.^{11,14} The few studies within poor neighborhoods suggest a particularly severe problem.^{19,20,22} One air quality study showed that women living in Mathare slum in Nairobi experienced similar high levels of PM_{2.5} (particulate matter [PM] with an aerodynamic diameter <2.5 μm)³⁴ as roadside mechanics and street vendors, populations already considered at-risk since they spend their workday in close proximity to roadway emissions.²³ Dionisio et al.²⁰ in Accra, Ghana found PM emissions in low-income, densely populated neighborhoods were almost double that of high-income, less densely populated areas. Socio-economic differences in exposure to poor air quality require further study.

In this pilot study in Mathare, an informal settlement in Nairobi, we explored how to involve the urban poor in

learning about air pollution and its risks. We were interested in the possibility of incorporating participatory methodologies into research design even for something as technical as air quality monitoring. Participation can involve many levels including informing, consulting and collaborating with the highest level and ultimate goal being citizen control and empowerment. In this work we incorporate consulting and informing local activists on air quality and risk, collaboration with a local community based NGO on this study and incorporation of local citizens into measurement taking with the aim of ultimately supporting more informed citizen action and pressures on government to improve conditions.

Nairobi provides an interesting setting for this study because its population is growing at an annual rate of 4% and reflects the rapid urbanization facing many parts of SSA.²⁴ Approximately 3.1 million people live in Nairobi and sources estimate that as much as 30%–70% of Nairobi's residents reside in informal settlements, and that at least 70% of the adult population lives on less than \$42/month.^{25,26} Evidence of a serious air quality problem is growing.^{9–11,13,16,27} While few epidemiological studies on air pollution exist for Kenya, studies show that diseases strongly associated with exposure to air pollution, like respiratory tract infections, pneumonia, or asthma and some cardiovascular diseases are serious public health concerns in this region.^{22,26}

In this study we conducted a preliminary assessment of health risk perceptions of air pollution for a group of residents in Mathare. Risk perceptions are subjective judgments not based on scientific experiments, but influenced by a combination of individual factors, like sensory experiences (e.g. odor produced from pollution), and institutional, societal, and cultural factors, like social networks.^{28–31} Thus far, with a few notable exceptions,^{32,33} most of the literature on this subject has focused on Europe or the US; little, if any work, has addressed this question in SSA. Yet risk perception matters in terms of advocacy and mobilization for improving conditions and hence deserves more attention.²⁸

In this work, we sought to understand how residents defined air pollution and what they considered important pollution sources. We also examined the potential of using air quality data collected via participatory monitoring as a form of health risk communication and explored how risk perceptions might change through the participation of three residents in data collection and a follow-up discussion of this air quality data and monitoring with residents. We took preliminary measurements of personal exposure levels to PM_{2.5}, which is typically used as a measure of urban air pollution, for three women living in Mathare who carried pumps as they went about their daily activities (results are reported elsewhere²³). We focus on women in the air quality pilot study for a number of reasons. First, indoor air pollution from cook stoves is serious problem in low-income neighborhoods, particularly for women who do most of the cooking while watching the children, making them especially vulnerable. Second, women tend to be organized and more involved in community based organizations, and many are important activists and opinion leaders in their neighborhoods. We discussed these results in a community forum as a way to learn how the participants in the air quality and focus group discussions would react to a discussion of the data.

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