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Explaining Our Air

Towards inclusive air pollution monitoring and communication

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EXECUTIVE SUMMARY

Air pollution kills 4.2 million people per year, yet, most people are under-informed about its risks and impacts. At the same time, disparities exist in air pollution exposure, monitoring, and communication. Primary research – interviews with sixteen air quality experts and a survey conducted in the United Arab Emirates (UAE) – explores these challenges. Clear gaps exist in communicating air quality public health information to those who are most exposed. The language of communication must be more accessible and highlight practical ways to avoid exposure to air pollution. Meanwhile, governments should invest more into tailored information campaigns for populations most vulnerable to air pollution and proactively pursue pollution mitigation efforts.

INTRODUCTION

Air pollution is the leading environmental risk factor worldwide, killing around 4.2 million people per year.¹ However, these 4.2 million people are far from randomly distributed. Those most vulnerable to air pollution are clustered by age, health, income levels, race, and geographies. For instance, in the United States, low-income and non-white (especially Black) people have higher exposure to particulate matter.² Similarly, in Côte d'Ivoire, occupational status plays a role in reducing exposure to air pollution, with those most vulnerable socio-economically remaining the most exposed.³ These are just a few examples of how environmental and socio-economic challenges intersect. Yet, it demonstrates why air pollution is more than an environmental challenge – it is also equally a social issue.

Environmental safety is fundamental to fostering belonging in communities. This paper examines the inequitable impacts of air pollution and proposes recommendations to make air quality communication and public health information more accessible and inclusive. Original insights from air quality experts and UAE residents are summarized to shed light onto the gaps and opportunities for improving public health information. The UAE is a context in which air quality monitoring is relatively nascent but growing, is

¹ Richard Burnett et al, "Global Estimates of Mortality Associated with Long-Term Exposure to Outdoor Fine Particulate Matter," *Proceedings of the National Academy of Sciences* 115, no. 38 (2018): 9592-9597.

² Ihab Mikati, Adam F. Benson, Thomas J. Luben, Jason D. Sacks, Jennifer Richmond-Bryant, "Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status," *American Journal of Public Health* 108, no. 4 (2018): 480-485.

³ Sylvia Becerra, Marie Belland, Alain Bonnassieux and Catherine Liousse "Living with' air pollution in Abidjan (Cote d'Ivoire): a study of risk culture and silent suffering in three occupational areas," *Health, Risk & Society* 22, no. 1 (2020): 86-106.

made up of 87.9% migrants and is one of the most diverse populations in the world.⁴ Therefore, effectively communicating new found air quality data to UAE residents is a formidable challenge. By considering communication strategies that can better reach vulnerable populations in the UAE, the methodology and findings of this research serve to inform inclusive strategies in other contexts.

AIR QUALITY EQUITY CHALLENGES

Interviews with air quality experts, researchers, government officials and health care workers create a starting point to understand various air quality challenges. The following discussion is informed from video-call interviews with sixteen individuals, representing Asia, the Middle East, Europe and North America. If participants consented, interviews were recorded and transcribed, and in some cases quotes have been included in this paper.

Unequal exposure to air pollution

Eben Cross is the founder of QuantAQ⁵, a start-up that creates and deploys low-cost air quality sensors. He describes the health effects of air pollution as essentially “environmental health disparities.”⁶ He notes that, while natural drivers of air pollution exist, it is the use of fossil fuels, most prominently by developed nations and high-income households, that creates pollution externalities for vulnerable populations. Funda Gacal, Senior Consultant of the Health and Environment Alliance, echoed these

⁴ "International Migration Stock 2019." United Nations Department of Social and Economics Affairs - Population Division. (2019). Accessed September 15, 2020.

<https://www.un.org/en/development/desa/population/migration/data/estimates2/countryprofiles.asp>.

⁵ Learn more: <https://www.quant-aq.com/>.

⁶ Cross, Eben. Air quality monitoring challenges. Interview by author. June 26, 2020.

sentiments, highlighting the catch-22 situation that exists where individual actions to limit exposure to air pollution can exacerbate the harm to more vulnerable groups. She said:

If you're living in a big city [...] you already know that you're exposed to air pollution. So there is no way to escape from it. You can only buy some air purifier [...] but at that time you have to forget that this electricity also came from somewhere [...] so it means that you're polluting someone else and you're risking someone else's life. You're just exporting the position. That is all.⁷

Essentially, both experts highlight the disproportional exposure of vulnerable populations to air pollution. These equity challenges require governments to intervene and concentrate efforts on protecting at-risk populations to pollution. In order to meet this challenge, governments and city officials must first measure the problem to understand the problem. Yet, air quality monitoring comes with its own inequities.

Monitoring air pollution

Access to air quality data is discriminant. Globally, Cross notes, “There is this really interesting disconnect between the way that air pollution has been measured in rich parts of the world and the way it's never measured at all in poor parts of the world.” Even with improvements in global satellite databases of air quality, localized monitoring is imperative to safeguarding vulnerable populations. Cross’s company measures ground level air quality and he explains, “The most relevant domain for measuring air pollution is the surface domain, and that's the hardest thing to measure accurately from space.” Further, studies in low- and middle-income countries found that fixed in place measurements of household air pollution is insufficient to predict individual exposure,

⁷ Gacal, Funda. Air quality health impacts for vulnerable groups. Interview by author. June 23, 2020.

which varies by age, gender, location, and household role.⁸ As a result, in-depth human health studies, with source-specific air pollution exposure measurements, are necessary for setting priorities in taking environmental control measures.⁹

There is no single best practice for air quality monitoring. A Dubai-based urban planner shared that air quality monitoring is “not something that we can just take off the shelf from somewhere else,” and that “we need to get to a point where we collect robust data locally, we analyze it, and we understand the local conditions and what that means.”¹⁰ To illustrate her point, she noted that dust storms are frequent in her region and that satellite data is often not able to pick up this form of air pollution. She underlines, “We need to collect more data, collect better data, and then communicate the data and actions we need after that more clearly to multiple audiences.”

Despite these challenges, there are clear benefits to collecting local air pollution data. Jill Engel-Cox, Director of the National Renewable Energy Laboratory’s Joint Institute for Strategic Energy Analysis, says that access to air quality measurements is critical for decision makers to understand the challenges and identify solutions. Additionally, “for people that are vulnerable or sensitive to air pollution, having that data and knowing that it’s a good time to be staying indoors” can drastically minimize their exposure. Similarly, Cross continues, “There’s so much more detail and so much more targeted information and impactful information that you could derive from essentially a community owned neighbourhood scale, distributed inequality monitoring network within

⁸ Stephen B. Gordon et al, “Respiratory risks from household air pollution in low and middle income countries,” *The Lancet Respiratory Medicine* 2, no. 10 (2014): 823-860.

⁹ Xianglu Han, Luke P. Naeher, “A review of traffic-related air pollution exposure assessment studies in the developing world,” *Environment International* 32, no. 1 (2006): 106-120.

¹⁰ Anonymous. UAE air quality challenges. Interview by author. July 2, 2020.

any given urban environment.” Thus, ownership of reliable air quality information can significantly reduce residents’ exposure to pollutants.

Air Quality Communication

Even when data exists, its communication can be skewed towards less-vulnerable groups. Gacal highlighted that, “Unfortunately what I have been just saying for years is that we are mainly talking with mid- or high-income [people].” Why may this be? First, it can be more challenging to target information to vulnerable groups. For instance, Gacal conjectured that it is difficult or impossible “to reach the poor because they [are] exposed to several other unhealthy chemicals or other pollution types during their work” that can make air quality seem insignificant to short-term needs. The result is that some populations remain uninformed about air pollution. For instance, one interviewee from the Middle East reflected, “Less than a handful of people that I've met really understand and can talk about the air quality challenges in the region, because [...] until recently, it just wasn't discussed at all.”¹¹

Second, there may be disincentives to publicize air pollution. Cross suggested that “from a community's perspective, there's actually a pretty strong incentive to not know, not to want to know, because in some ways, it's totally powerless. [...] If their health care companies get access to the information, their premiums could go up. And then if the real estate market ever got wise to air pollution, their home values would go down.” These disincentives can also be cultural. Reflecting on cultural norms in the Arab world, one interviewee noted, “There's the mentality of protecting oneself: if it's not

¹¹ Anonymous. Air quality communication in the Arab world. Interview by author. July 14, 2020.

good news then you don't want to talk about it; it's going to point fingers or it's going to be a challenge to deal with; let's find a solution first, and then we can talk about it.”¹²

These barriers cannot be overcome until governments and organizations build capacity to effectively communicate air quality information. Generally, Cross says, we have not yet mastered “teaching individuals [...] about the true impacts of the activities that they experience within their environments; how those activities impact the air that they breathe and the health outcomes that they suffer from.” For instance, the way that air quality information is currently “smushed out onto a 24 hour base scale, city wide scale” is inadequate to understand immediate hazards.

Ultimately, air pollution has to be solved at the root level. Gacal emphasized that “it's impossible to escape from air pollution. You're going to have to stop it at the source and you have to think that it is not only polluting nearby but it is polluting hundreds of kilometers.” Therefore it is important to pursue long-term pollution reduction measures. Yet more immediately, governments and organizations can create inclusive data collection and communication strategies to represent, highlight and engage with vulnerable populations.

UAE CASE STUDY

This section focuses on the question, *how* we can best share air quality information? In order to find answers, a survey asked UAE residents about their content and format preferences for public health information.

¹² Anonymous. Air quality communication in the Arab world. Interview by author. July 14, 2020.

Methodology

The survey was designed and conducted in partnership with the Data Driven EnviroLab and the Environment Agency - Abu Dhabi, and collected 263 responses. Given the diverse population of the UAE, the survey was translated from English into Arabic, Filipino, Hindi, and Urdu to increase its accessibility. Additionally, in order to attract people who are less interested in air quality and to compensate respondents for their time, the survey included a raffle of grocery gift-cards. Respondents were recruited via social media and snowball sampling. Weights based on gender and age were used to alter the sample to be more representative of the total population.

The survey questionnaire was designed to collect (1) basic demographic information, and assess the (2) content and (3) format in which residents prefer to receive public health information. The purpose of the survey was two-fold: to inform the content of a social media air quality information campaign as well as the Environment Agency - Abu Dhabi's long-term communication strategy.

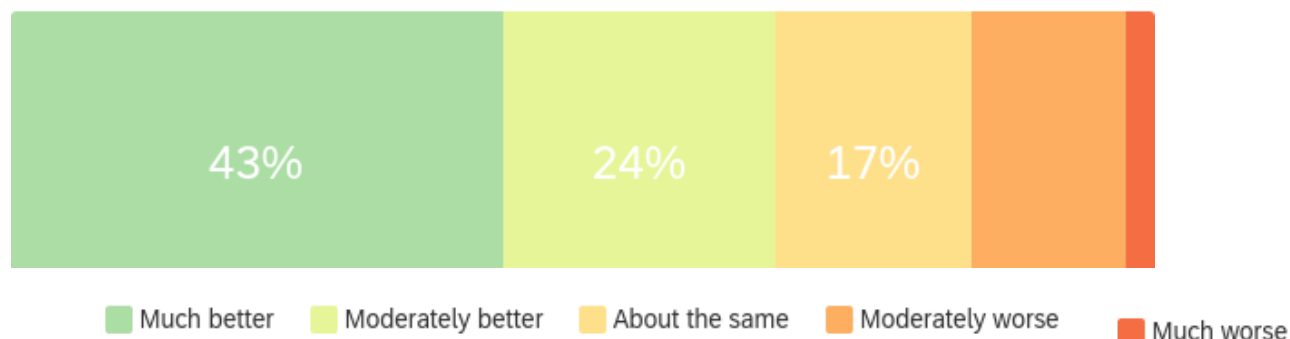
While effort was placed into making the survey as accessible as possible, there are limitations to the methodology. For instance, most respondents completed the survey in English despite the linguistic mix that exists in the UAE (Appendix 1). In addition, while the Environment Agency sent out the survey to their mailing list for a wider reach, this was disproportionately composed of educators and individuals already active in sustainability circles. This should be taken into account when considering the results.

Findings

This section focuses on the degree to which survey respondents were informed about air quality and their preferences for receiving information. Firstly, as was highlighted in expert interviews, the survey finds a lack of understanding of air quality in the UAE. For instance, the majority of respondents thought that air quality was improving, while in fact air pollution has markedly worsened in the UAE since 1980.¹³ At the same time, only 26% of respondents felt uninformed about air quality,¹⁴ which could indicate a general optimism and overconfidence by respondents in the sample.

Figure 1. Perceived changes to the UAE's air quality

Air pollution in the UAE is getting...



Next, when asked whether they are affected by air quality, while most respondents said they are affected “a little”, respondents predominantly working at home or in kitchens were more likely to say they are “not affected by air pollution at all” rather than “very much” affected. Considering that kitchens are often the most polluted indoor spaces due to combustion from gas stoves, these responses may demonstrate a lack of understanding around indoor air pollution.

¹³ Ahmed A. Al-Taani et al, “Long-Term Trends in Ambient Fine Particulate Matter from 1980 to 2016 in the United Arab Emirates,” *Environmental Monitoring and Assessment* 191, no. 3 (2019).

¹⁴ Of the respondents, younger respondents and those who do not use air quality monitoring applications feel especially less informed about air quality (Appendix 2).

Meanwhile, topics that respondents were most interested in were (1) how to protect themselves against outdoor and (2) indoor air pollution, followed by (3) the health impacts of air pollution. Respondents were less interested in the causes, economic or social impacts of air pollution. Therefore, communication may be more effective in the form of tangible content that focuses on practical strategies to safeguard from air pollution.

In terms of source, the vast majority of respondents preferred to receive air quality information from the national or city (in this case, Emirate) governments.¹⁵ This may reflect the exceptionally high level of trust in government found in the UAE. In regard to frequency of communication, the majority of those using air quality applications wanted daily updates, while those who do not use applications said they would want monthly air quality updates. In other words, current habits predict their desired level of engagement.

Finally, depending on age, the most popular platforms and formats in which to receive information varied. Respondents over the age of 24 by far preferred Facebook and WhatsApp for sharing and receiving information and said they learn best from videos. Meanwhile, for respondents under 24, Instagram was an additional popular social media tool, and infographics were a preferred learning tool. Thus, understanding the intended audience is crucial when designing air quality communications.

¹⁵ English speakers slightly preferred Emirate/city government communication while Arabic speakers slightly preferred to receive public health information from the national government.

RECOMMENDATIONS

The following recommendations are informed by the aforementioned interviews and survey results.

1. Actively reach out to populations that may not usually receive public health information

Conversations with the Environment Agency - Abu Dhabi and other air quality experts highlighted the need for active outreach to vulnerable populations. At present, air quality information is often technical, in languages only accessible by elite groups and consumed by people who are already interested in environmental issues. In order to reach those most impacted, governments and organizations must make conscious efforts to translate their data into simple, multilingual resources. Further, targeted information campaigns for caretakers of young, old and sick people – such as parents, teachers and nurses – as well as for people working in hazardous industries or more polluted neighbourhoods should be prioritized.

2. Tailor air quality communication for different demographic groups

As demonstrated by the survey results, varying demographic groups are engaged by differing formats of information and platforms. Further, the complexity of content, and the language that it is presented in, can limit the audience that has access to the information. Therefore, in order to reach groups most exposed to air pollution, researchers, advocates and policymakers must have a clear idea about who makes up at-risk groups and how they prefer to communicate and receive information.

3. Actively pursue air pollution mitigation strategies at the city level

While air quality monitoring and communication is important, mitigating the disproportional exposure to pollution that vulnerable populations face is imperative. One intervention that was separately recommended by three experts is to implement warning systems that alert all residents of extreme weather conditions such as dust storms and create regulations that require school children, hospital patients and at-risk workers to stay inside during these events. In addition, improving building standards for air tightness, limiting the number of vehicles on the road and investing in green spaces are all ways to enhance air quality.

CONCLUSION

Environmental safety is fundamental to belonging, and access to air quality information gives communities the agency to safeguard and self-advocate for a clean environment. Given that air pollution exposure, monitoring and communication systematically disadvantages already vulnerable populations, more effort must be made to listen to the needs of these at-risk groups. Targeting air quality information campaigns to reach vulnerable communities and mitigating air pollution are ways to tackle both environmental and social challenges.

IMPACT

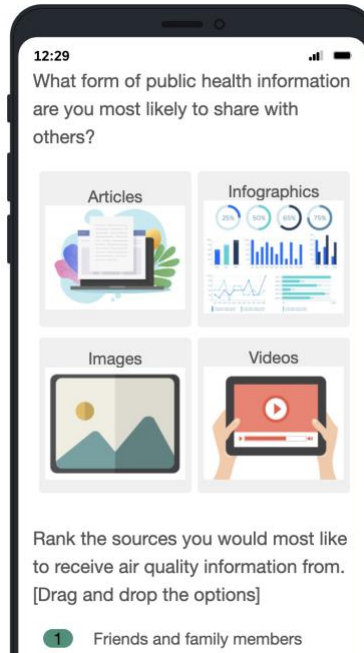
To engage further with the community of interest during the Fellowship, an informational video, based on the survey content, was created to inform UAE residents on ways to limit air pollution exposure. The next phase of this project will be to

disseminate the content. In addition, the Environment Agency - Abu Dhabi will use this report to consider pathways for an inclusive communication strategy moving forward.

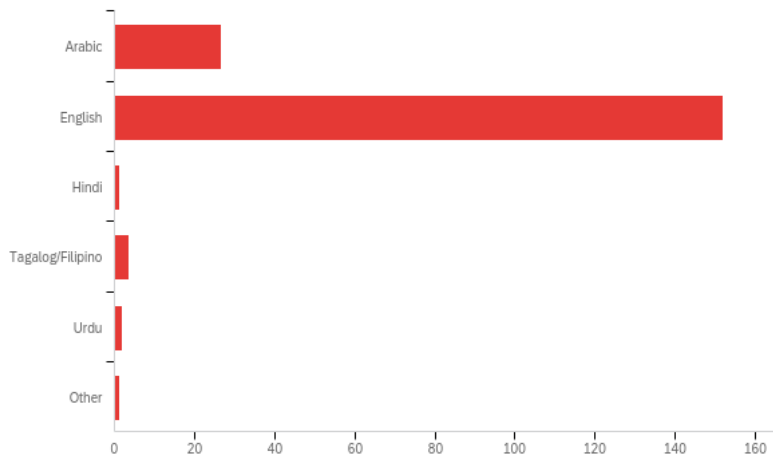
More broadly, Data-Driven Envirolab should consider inclusive methods for communicating their Urban Environment and Social Inclusion Index data. Finally, the Samuel Centre for Social Connectedness should continue to highlight the intersections between environmental hazards and identity, particularly as it relates to the Black Lives Matter movement.

APPENDIX

Appendix 1. Visual sample of Survey

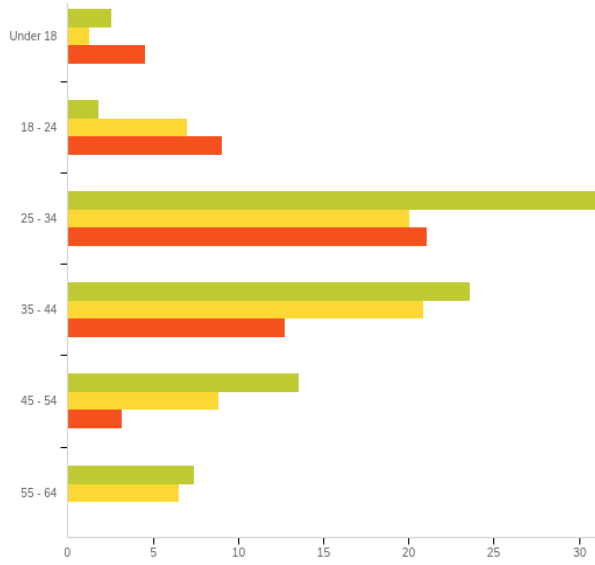


Appendix 2. Survey respondents' preferred language

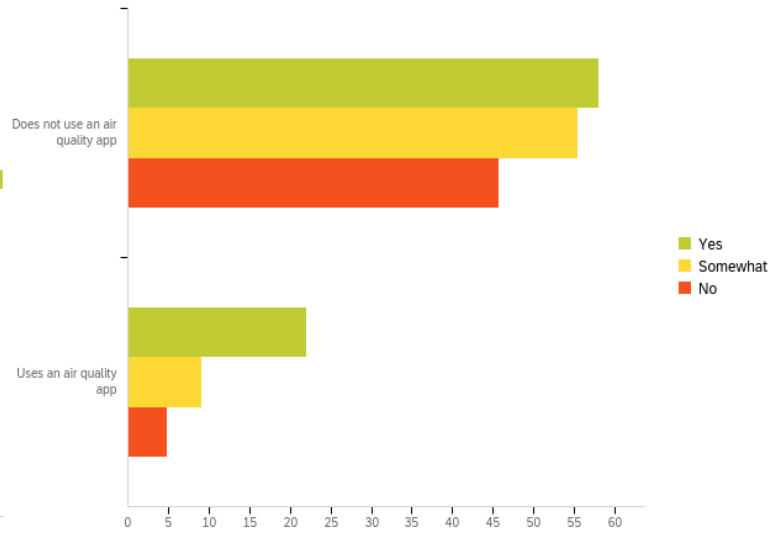


Appendix 3. Do you feel informed about air quality?

(a) Separated by age



(b) Separated by air quality monitoring app use



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