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REVIEW ARTICLE OPEN ACCESS

A Critical Evaluation of the WHO's Air Pollution Harm Reduction Strategy in Dhaka: Health Promotion, Behaviour Change, and Ethical Implications

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Abstract:

Introduction: *Air pollution is the causative factor for considerable morbidity and premature death worldwide. This review critiques the WHO's Air Pollution Harm Reduction Strategy in Dhaka, Bangladesh, through the lens of the HBM by analysing its effectiveness and ethical implications.* ***Materials and Methods:*** *This critical review synthesises findings from WHO publications, peer-reviewed journals, and public health data on Dhaka's air quality management. The approach involves thematic analysis of health promotion strategies and behavioural change interventions.* ***Discussion:*** *The findings highlight that while the WHO strategy is successful in raising awareness and providing a policy direction, it continues to be hampered by economic barriers, weak enforcement, and absence of local engagement. HBM explains personal motivation toward cleaner practices but falls short on systemic inequities and gendered exposures.* ***Conclusion:*** *A multi-sectoral policy enforcement, equity-focused planning, and culturally sensitive communication are some of the basic tenets for structuring Dhaka's air pollution strategy toward sustainable impact. Strengthening community ownership and data-driven governance bridges the gap between global frameworks and local realities.*

Keywords: *Air Pollution, Health Belief Model, Dhaka, WHO Strategy, Health Promotion, Environmental Ethics.*

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Introduction:

Health promotion refers to processes that enable individuals and communities to have greater control over the determinants of health and improve it in a holistic way. For the World Health Organization (WHO), health promotion not only involves individual behaviour but also social and environmental interventions (World, 2024a)[1]. For this purpose, behaviour change theories offer frameworks for understanding and managing health choices. One of these models is the Health Belief Model (HBM) that suggests human beings are most likely to behave differently when they perceive a direct threat to their health and understand that specific habits will reduce such a risk accordingly (Hatteberg and Kollath-Cattano, 2022)[2]. This essay critically evaluates the WHO's Air Pollution Harm Reduction Strategy, more specifically its

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application in Dhaka, Bangladesh, where urban air pollution has reached a crisis level (Trishul Basak Dibya, Amrin Yeasin Proma and Syed, 2023)[3]. Air pollution is a leading environmental risk factor, responsible for over 7 million premature deaths annually worldwide (World, 2024b)[4]. Indoor and outdoor air pollution in Dhaka is attributed largely to sources like biomass fuel use, emissions from transport, and industrial pollutants (Weaver et al., 2019)[5]. The dominant theory of behaviour change under consideration in this essay is the Health Belief Model, chosen for its applicability to risk communication and preventive actions. Although theories like the Theory of Planned Behaviour can explain social influences, the Health Belief Model is more suitably used in contexts like Dhaka where personal risk belief plays a vital role in shaping reactions to environmental health risks. The essay evaluates the strategy's compatibility with global health promotion goals and social, cultural, and ethical appropriateness within the Bangladeshi environment. It does this by highlighting individual behaviour, public policy, and broader socio-environmental systems' interdependence in health promotion. Strategy Description and Justification: WHO harm reduction strategy of air pollution is made up of multiple interventions including the setting up of air quality guidelines, development of sustainable urban planning, facilitating clean energy, and building campaigns of awareness to drive behaviour change (World, 2024a)[1]. In Bangladesh, especially urban areas like Dhaka, this strategy is vital. Dhaka is among the world's most polluted cities, with the major pollutants being industrial effluents, motor vehicle emissions, and domestic burning of solid fuels (Rahman et al., 2021)[6]. Research by Weaver et al. (2019)[5] found that indoor air pollution from biomass stoves in one household was discovered to raise pollution levels in neighbouring households, a testament to the communal nature of the problem. The WHO strategy aims to reduce reliance on biomass through subsidizing clean cookstoves and conducting public awareness campaigns that emphasize the health risks of traditional cooking methods. Efforts are guided by the Health Belief Model (HBM). It has been suggested that change occurs because of perceived high susceptibility and severity of a health danger, with apparent benefits to the change, having low barriers to it (Kim et al., 2024)[7]. Increased risk perception as well as proposing viable alternatives will be achieved with the WHO's effort in promoting cleaner choices for individuals. From a public health perspective, the strategy is called for: alone in Dhaka, air pollution is linked with rising levels of asthma, cardiovascular disease, and premature mortality (Trishul Basak Dibya, Amrin Yeasin Proma and Syed, 2023)[3]. It also addresses the social determinants of health, like poverty and education, by targeting vulnerable populations most at risk to the environment (World, 2024b)[4].

Materials and Methods:

This critical review was performed to appraise systematically the WHO's Air Pollution Harm Reduction Strategy as applied in the dense urban environment of Dhaka.

Search Strategy and Data Sources: A comprehensive search was executed across three primary data streams:

1. Peer-reviewed Literature: Searches were performed in PubMed, Scopus, and Google Scholar using a combination of keywords: "Dhaka," "Air Pollution," "WHO Strategy," "Health Belief Model," "Health Promotion," "Bangladesh," and "Environmental Justice." Inclusion criteria mandated studies published within the last 10 years, focusing on air quality, health outcomes, or policy interventions in Dhaka/Bangladesh.

2. Grey Literature and Policy Documents: Key publications from WHO, such as the WHO Global Air Quality Guidelines, regional strategy documents, and national governmental reports concerning environmental management from Bangladesh, were reviewed.

3. Public Health Data: Relevant epidemiological data on respiratory and cardiovascular morbidity in Dhaka, linked to air quality indices (PM2.5, NO_2), were synthesized from established public health databases and recent cohort studies.

Analytical Framework and Approach: The review used a thematic analysis approach, organized around three key evaluative domains:

1. Policy Efficacy: The stated aims of the WHO strategy are assessed against real-world implementation challenges, such as enforcement, structural capacity, and multi-sectoral coordination within Dhaka.

2. Behavioural Theory Applicability: To critically appraise the use of HBM in predicting and enabling change among Dhaka's diverse population, with particular reference to its limitations in accounting for socioeconomic and infrastructural barriers.

3. Ethical and Equity Compliance: Review if the strategy adheres to international bioethical principles, especially distributive and procedural justice, autonomy, beneficence, and non-maleficence, with particular reference to vulnerable populations and gender-differentiated impacts. Synthesis for this review involved comparative triangulation of evidence across these domains to generate a structured critique regarding both the theoretical basis and practical outcomes of the strategy.

Discussion:

The findings confirm that the WHO strategy has served to meet international health promotion goals in terms of setting air quality standards and calling for clean technology. The actual operational scenario of Dhaka, however, denotes several shortfalls that affect its long-run sustainability.

Structural Deficiencies and Policy Implementation Gaps: The strategy intends to cut down on major pollutants, such as those emanating from biomass fuel use and transport emissions, in line with international standards. Research by Weaver et al. (2019)[5] demonstrated the communal impact of indoor air pollution, validating the strategy's focus on clean cookstoves. However, policy translation is severely impeded by structural deficits. Economic barriers, such as prohibitive costs of cleaner alternatives-for example, subsidised LPG or electric stoves-create a gap between perceived benefit and capability for change that is real and

unaddressed. In addition, lack of effective multisectoral integration-public health agencies, urban planners, environmental regulators-precludes the systemic approach called for by a social model of health (Rahman et al., 2021)[6]. Weak application of emission standards for industries and motor vehicles further makes policy intent lifeless, confirming that the fundamental constraint lies not in the conceptual design but in governance and political will.

Limitations of the Health Belief Model (HBM) in Systemic Contexts: The WHO strategy is heavily reliant on the HBM, such that an increase in perceived susceptibility and severity of air pollution will drive behavioral change toward cleaner practices. While it may prove useful at the level of individual risk communication, the HBM has profound limitations within the highly constrained environment of Dhaka. The model cannot adequately consider "structural violence," defined as the systemic ways in which social and economic structures harm individuals, which determines exposure and vulnerability in the urban poor (Hatteberg and Kollath-Cattano, 2022)[2]. An individual may have high perceived risk-severity but might not possess the financial resource or housing security as barriers to transition from biomass to cleaner fuel. This critique leans toward the assertion that overreliance on HBM-based interventions inadvertently shifts responsibility from state and industry actors onto the economically less well-off individual, thereby entrenching, rather than mitigating, health inequities.

Governance of Data, Monitoring Gaps, and Policy Effectiveness: One critical reason why the strategy does not work is the absence of sophisticated real-time environmental surveillance infrastructure in Dhaka (Rahman et al., 2021)[6]. Poor monitoring negates evidence-informed decision-making and thus delays emergency responses, which are so important in highly episodic pollution events. More poignantly, the absence of disaggregated place-based data by socioeconomic status and gender renders policymaking blind to spatial and demographic inequities (Trishul Basak Dibya, Amrin Yeasin Proma and Syed, 2023)[3]. The intervention cannot be precisely directed to the hotspots and populations facing the highest disproportionate burden without such granular data; therefore, both the procedural and distributive components of health equity will be violated.

Ethical Considerations: Any WHO strategy implemented in Dhaka should be put through a vigorous, evidence-based implementation process in light of fundamental principles underlying environmental health ethics, to ensure that harm reduction does not inadvertently translate into harm redistribution or social injustice.

Environmental and Procedural Justice: Air pollution in Dhaka has a distinct pattern of environmental injustice, where informal settlement residents and poor communities near industrial areas and major-traffic corridors are predominantly affected. Such an outcome is in violation of the principle of distributive justice, whereby the benefits of clean air and burdens of pollution control should be distributed fairly. Moreover, the reliance on a top-down approach in policy formulation, usually without participation by affected low-income groups, is also a violation of procedural justice. Ethical compliance requires the incorporation of knowledge co-production, ensuring that local populations take part in the design and validation of the interventions as a way of giving autonomy and culturally appropriate solutions.

Gendered Exposures and Equity: A critical ethical failing of the current approach is its inattention to gendered exposure differentials, particularly with respect to indoor air pollution. Women and children in Dhaka spend significantly more time exposed to biomass fuel combustion in domestic settings than their male counterparts (Rahman et al., 2020[8]; Weaver et al., 2019)[5]. A 'one-size-fits-all' household intervention that does not tackle the underlying power dynamics-where women do not have a say in deciding on fuel purchase or kitchen ventilation-goes against equity. Ethical practice requires gender-sensitive interventions and structural reforms that empower disadvantaged groups and make upstream system actors, such as clean technology producers and landlords, accountable.

Principles of Autonomy and Non-Maleficence: While the strategy should be informed by the principle of beneficence (to do good by reducing harm), interventions need to respect non-maleficence (to do no harm) and autonomy. Interventions that are economically infeasible or culturally insensitive risk causing financial stress or violating local practices without consent. For example, the coercive replacement of traditional cooking methods without sufficient, sustained support or informed community choice can be understood as an infringement of household autonomy. Thus, it is incumbent upon ethical deployment to embody transparent risk communication, informed consent, and a continuous feedback loop with the community to ensure interventions will be effective and respectful of local lifeways. Criticism of Global Health Promotion Targets against the Strategy: The WHO Global Air Quality Guidelines set international health promotion targets for reducing the health impacts of air pollution through evidence-based recommendations (World, 2019)[9]. The standards focus on nations achieving air quality levels that decrease the health threats, particularly from fine particulate matter (PM2.5), nitrogen dioxide (NO_2), and other pollutants. In the case of Dhaka, Bangladesh, the WHO approach of decreasing harm from air pollution aligns with these international goals by advocating for interventions such as a transition to cleaner cooking fuel, improved public transport, and tighter emission standards (Trishul Basak Dibya, Amrin Yeasin Proma and Syed, 2023)[3]. Yet, the success of these interventions relies on their implementation in national policies and the local authorities' determination to enforce them (Campbell et al., 2024)[10]. This social model approach is observed in the reduction of biomass fuel use, which is a major cause of indoor air pollution in Dhaka (Weaver et al., 2019)[5]. Despite these initiatives, the WHO's air quality standards remain elusive. Economic limitations, absence of public awareness, and infrastructural weaknesses stand in the way of the universal use of cleaner technologies. Furthermore, enforcement of environmental regulations is uneven, adding to the complexity of the

realization of global health promotion goals in the region (Martenies, Wilkins and Batterman, 2015)[11]. Closing these gaps will require a multi-dimension intervention building policy architecture, community mobilization, and sustainable behaviour infrastructure (Kelly and Fussell, 2015)[12]. Outside the WHO guidelines, the Sustainable Development Goals (SDGs) present a broader context linking environmental health to economic and social equity. In fact, SDG 3.9 aims to "substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination" by 2030 (World, 2024a)[1]. The air pollution strategy aligns with this objective through its emphasis on multi-sectoral coordination and preventive health interventions. Development remains sluggish in most low-income cities like Dhaka due to poor integration between public health agencies, environmental agencies, and urban planners (Rahman et al., 2021)[6]. Inadequate coordination hinders the translation of strategic intentions into effective local policies. Additionally, while awareness is part of the strategy, there is evidence that public understanding of risk regarding air pollution in urban Bangladesh is weak, especially among lower-educated groups (Trishul Basak Dibya, Amrin Yeasin Proma and Syed, 2023)[3], eroding the efficacy of behaviour-based interventions and validating the need for more sweeping education-based reforms. Constrained, outdated infrastructure for monitoring in Dhaka inhibits real-time, evidence-informed decision-making, hindering emergency intervention and equitable policymaking (Rahman et al., 2021)[6]. Detailed, place-based data on air quality are required, the WHO argues, to track progress and identify pollution hotspots (World, 2024b)[4]. If reliable environmental surveillance systems do not exist, policymakers are unable to adequately respond to health emergencies or direct interventions to those areas with the greatest impact. Furthermore, the absence of data broken down by socioeconomic status or by gender constrains policymaking for equity. Emphasizing the fact that certain groups in Dhaka experience much higher exposure due to their proximity to factories and roads, yet interventions at times fail to account for these spatial inequities, Trishul Basak Dibya, Amrin Yeasin Proma and Syed (2023)[3] refer to how strengthening data systems is key to achieving both WHO targets and health equity goals more broadly.

Critical Analysis of the Health Promotion Plan: The WHO's air pollution harm reduction project in Dhaka applies an integrated approach to health promotion that involves policy advocacy, community mobilization, and behaviour change communication (Rahman et al., 2020)[8]. It is grounded on the Health Belief Model (HBM), whose premise is that individuals embrace health behaviours once they perceive they are under threat and believe that something will lower it. While the HBM provides a valuable model to predict individual behaviour, it is weak when used to describe the situation of air pollution in Dhaka. The model is based on individual perceptions and does not completely consider external influences such as socioeconomic status, cultural norms, and environmental constraints (Hatteberg and Kollath-Cattano, 2022)[2]. For instance, people would notice the health issues regarding biomass burning but lack the financial resources or the means to acquire cleaner alternatives. Ethically, the strategy must address notions of justice and fairness. It is crucial that all groups within the population, especially vulnerable groups, receive access to clean air. It is not just a matter of providing accessible clean energy solutions but also bringing communities on board in decision-making to make interventions socially acceptable and culturally responsive (Kelly and Fussell, 2015)[12]. The strategy also raises autonomy, beneficence, and non-maleficence concerns. One must ensure that interventions do not inadvertently cause harm or tread on individuals' autonomy. This requires clear communication, informed consent, and cultural sensitivity to and respect for local practices and culture (Kim et al., 2024)[7]. With the model, the approach has components of both health persuasion and legislative action (Kelly and Fussell, 2015)[12]. Health persuasion refers to education and mobilizing individuals to change their behaviour, and legislative action refers to policy efforts to implement environmental mandates. The approach may be augmented by more individual counselling and social organization, formulating a more grassroots and empowering strategy (Kim et al., 2024)[7]. An equally important shortcoming in the application of the strategy is its lack of adequate attention to gender and intra-household inequalities, particularly regarding indoor air pollution exposure (Rahman et al., 2020)[8]. Both children and women are highly impacted by indoor air pollution in the home because they spend more time exposed to biomass fuel combustion in kitchens (Weaver et al., 2019)[5]. However, the WHO strategy and most related policy tend to utilize a one-size-fits-all approach, failing to recognize the necessity for gender-sensitive interventions. Ethically, the failure to consider gender in the approach might contravene the principles of equity and justice. Moreover, interventions aimed at only households without considering the role of landlords, local governments, and producers in making clean technologies available shift responsibility to individuals who may lack decision-making power (Kim et al., 2024)[7]. An environmental health promotion strategy rooted in rights should therefore encompass not only educating individuals, but also structural reform that empowers disadvantaged groups and makes larger systems accountable (World, 2024b)[4]. The ethical basis of the WHO's strategy should also be critically assessed with reference to environmental justice. In Dhaka, air pollution impacts disproportionately on informal settlements and poor communities that tend to be excluded from planning efforts (Trishul Basak Dibya, Amrin Yeasin Proma and Syed, 2023)[3]. This violates not only distributive principles of justice but also procedural justice, as such groups do not participate in policy decisions concerning their living conditions and health. Top-down processes without participation mechanisms risk entrenching marginalization. Integrating co-production of knowledge, where local populations help design, implement, and

evaluate interventions, has the potential to improve effectiveness as well as justice (Weaver et al., 2019)[5]. Furthermore, this aligns with the ethical principle of autonomy, that is, that individuals and populations must have jurisdiction over decisions affecting their health. Lacking these ethical safeguards, the strategy could incidentally perpetuate health inequities and appear equitable in appearance. In summary, whereas the WHO air pollution harm reduction strategy in Dhaka includes essential features of health promotion, its success rests in addressing cultural, social, and structural determinants. A more comprehensive approach that involves individual behaviour change as well as system interventions is needed to attain sustainable health gains.

Conclusion:

WHO air pollution harm reduction strategy is an important program to address a critical public health issue in Dhaka, Bangladesh. By establishing air quality standards, promoting cleaner technology, and lobbying for policy action, the strategy achieves global health promotion objectives and applies a social model of health. Yet, the strategy's over-dependence on the Health Belief Model can be a limitation to its success in the Dhaka context, where cultural practices, economic limitations, and infrastructural issues affect health behaviours. To increase the impact of the strategy, it is important to take a more holistic approach that considers these external factors. Ethical principles such as justice, equity, autonomy, beneficence, and non-maleficence need to be core to the implementation of the strategy (Martenies, Wilkins and Batterman, 2015)[11]. Making sure that interventions are culturally appropriate, socially inclusive, and economically feasible will ensure greater community participation and sustainability. Adapting aspects of the model, including personal counselling and community empowerment, can reinforce the strategy even more by equipping individuals and communities to make their health ownership a reality. By tackling both individual behaviour and determinants within the system, the WHO strategy can better prevent air pollution and its related health hazards in Dhaka.

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