Misbeliefs, Experience, and Technology Adoption: Evidence from Air Purifiers in Bangladesh*

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Abstract

Despite some of the worst air quality in the world, fewer than 1% of middle-class households in Dhaka, Bangladesh, own an air purifier. Why don't these households, who can afford air purifiers, adopt them despite the extremely high levels of air pollution? We find that while indoor air is nearly as polluted as outdoor air, households believe indoor air is much cleaner. Furthermore, although air purifiers are highly effective at removing pollutants, households are uncertain about their effectiveness. Consistent with these misbeliefs, the average willingness to pay for an air purifier is less than a tenth of its retail cost. In a multi-phase field experiment, we provided free air monitors and purifiers to households. Those receiving monitors realized that their indoor air was more polluted than those without monitors, but this did not increase their willingness to pay for purifiers. Similarly, providing free air purifiers reduced uncertainty about their effectiveness, yet households rarely used them, even when compensated for electricity costs. However, households that received both technologies significantly increased their air purifier use by 236%. They also increased their valuation of the purifiers by 26% after more than two months of ownership. In a second experiment, households given a brief demonstration of both an air quality monitor and an air purifier corrected their beliefs about indoor air pollution severity and purifier effectiveness, yet showed no increase in willingness to pay for an air purifier. Overall, our findings suggest that correcting misperceptions about both the problem's severity and the solution's effectiveness is necessary to increase the use of certain preventive health technologies; extended personal use in turn increases valuation by allowing households to directly experience the technology.

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1 Introduction

Many life-improving technologies struggle to achieve widespread adoption. Price commonly represents the primary barrier, especially in developing countries. Seminal research in development economics has demonstrated that free or subsidized distribution effectively increases the use of preventive health technologies like insecticide-treated bednets (Cohen and Dupas, 2010; Dupas, 2014*a*). Moreover, one-time free distribution or temporary subsidies can positively influence neighbors and increase longer-term willingness to pay as beneficiaries discover a product's true value through actual use (Dupas, 2014*b*).

However, these positive effects depend crucially on the direct beneficiaries using the freely distributed or subsidized product. Other similarly influential research has found that larger price subsidies do not necessarily translate into increased use of other such technologies like chlorine solutions (Ashraf, Berry and Shapiro, 2010). Households reluctant to pay high monetary prices might similarly be unwilling to bear the everyday costs—both monetary and non-monetary—of regular use. This reluctance may stem from fundamental misbeliefs about the problem's severity or the product's effectiveness, a challenge particularly relevant in less mature markets, where the health concern or its technological solution are new to consumers.[1]

We conducted two field experiments in Dhaka, Bangladesh, examining adoption and use of consumer-grade air purifiers, a relatively recent innovation in developing countries. Air purifiers only became affordable and relevant in developing countries during the past 10-12 years, coinciding with dramatic increases in ambient fine particulate matter (PM2.5) levels and growing media attention to air quality concerns (Sarkar, 2019; Shao, 2013; Duggan, 2014). We find that correcting misperceptions about indoor air pollution levels *and* effectiveness of air purifiers is necessary to promote sustained use of freely distributed air purifiers. This enables households to experience the technology firsthand, consequently raising their perceived value of it. These results suggest that complementing targeted free distribution or price subsidies with information campaigns that correct beliefs about both the problem *and* the solution is a necessary first step to achieve widespread diffusion of life-improving technologies in nascent markets.

Today, air pollution stands as one of humanity's most urgent environmental crises, causing over 8 million deaths annually worldwide and imposing catastrophic health and economic burdens on billions of people (Health Effects Institute, 2024). This invisible killer reduces life expectancy (Chen et al., 2013; Ebenstein et al., 2017), damages cognitive performance (Zhang, Chen and Zhang, 2018), decreases labor supply (Hanna and Oliva, 2015), diminishes labor productivity (Graff Zivin and Neidell, 2012; Adhvaryu, Kala and Nyshadham, 2022), and increases in-

[1] Ashraf, Berry and Shapiro (2010) conjecture that one factor that may help explain the differences between their findings and those of Cohen and Dupas (2010) is that markets in Africa for insecticide-treated bednets are more mature than those for chlorine bleach solution, as indicated by the non-health use (e.g., household cleaning) of chlorine. They argue that "If non-health uses arise because households are uninformed about a product's health uses, such effects might also diminish over time as information improves, in which case screening effects would be mitigated as the market matures."

fant mortality (Jayachandran, 2009; Arceo, Hanna and Oliva, 2016; Greenstone and Hanna, 2014; Heft-Neal et al., 2018).

Bangladesh epitomizes this crisis at its most extreme: the annual average exposure to fine particulate matter in Bangladesh is more than 15 times the WHO annual guideline and roughly eleven-fold the US average (IQAir, 2024), causing 235,000 annual deaths, the second largest cause of deaths and disability (Health Effects Institute, 2024), and imposing economic costs of approximately 4% of GDP (Raza, Mahmud and Rabie, 2021). Indeed, reducing Dhaka's ambient air pollution to recommended levels would increase life expectancy by 5.6 years (AQLI, 2024).

Air purifiers offer a powerful defense against the threat of air pollution, trapping 99.97% of microscopic particles (EPA, 2024). It is even more effective for larger particles, such as PM2.5 (particles with a diameter of ≤ 2.5 μm) and PM10 (particles with a diameter of ≤ 10 μm). Multiple recent research efforts—including experimental studies, observational studies, and meta-analyses—find that air purifiers in residential settings decrease PM2.5 levels by around 50% and improve human health outcomes (for a review, see EPA, 2018). Health benefits include reduced allergy and asthma symptoms (measured via peak expiratory flow, bronchial inflammation markers, self-reported medication use and symptoms) as well as decreased cardiovascular morbidity (assessed via lung function, exhaled breath condensate, blood pressure, heart rate, microvascular endothelial function, inflammation, oxidative stress) (Allen et al., 2011; Lanphear et al., 2011; Walzer et al., 2020; Xia et al., 2021; Sublett, 2011; Park et al., 2020; Li et al., 2018).[2]

Our descriptive statistics paint a bleak picture of the state of indoor air pollution (IAP) in Dhaka and reveal significant misconceptions among households regarding its severity and the effectiveness of air purifiers. First, using IAP monitors we installed in households, we show that during the winter months, IAP is staggeringly high, with a daily average of 150 $\mu g/m^3$, 10 times higher than the WHO 24-hour recommendation. Importantly, indoor air can be nearly as polluted as outdoor air, with an average indoor to outdoor ratio of 0.88. However, while over 70% of households believe that outdoor air pollution (OAP) is a serious problem, they greatly underestimate the severity of indoor pollution, with the same percentage reporting that indoor air pollution is not a serious issue.

Second, fewer than 1% of middle-class Dhaka households we surveyed own an air purifier, despite many having the means to purchase one. We find that households are uncertain about and significantly underestimate the effectiveness of air purifiers in removing indoor pollution.

[2] Air purifiers typically cost between $100-200 for standard models, consume 50 watts of electricity at high settings (Verywell Home, 2024), produce noise levels of 60dB at maximum power (Consumer Analysis, 2024), and require periodic filter replacements every 6-12 months costing at least 20% of the air purifier's initial purchase price for optimal performance (Consumer Reports, 2024). Cost-wise, air purifiers fall between two common household technologies: ceiling fans and air conditioners. Ceiling fans generally cost between $50-150 (Pick HVAC, 2024*a*), use 55-100 watts depending on size (Pick HVAC, 2024*b*), produce noise levels of 35-60dB (Brasseurs Air RE2020, 2024; Fanzart, 2024), and require only occasional cleaning and rare lubrication. On the other hand, air conditioners represent a significantly higher investment, with window units costing $150-800 (NerdWallet, 2024) They consume substantially more electricity—500-1,500 watts depending on type and size (Bardi, 2024), generate noise levels of 37-70dB (Airconco, 2024), and may require professional maintenance approximately once per year.

Fewer than half of the households had formed an opinion on purifier effectiveness, and less than a third believed that purifiers removed more than 25% of air pollution from the rooms where they were used, which contrasts sharply with the actual effectiveness of air purifiers—80% in controlled conditions and over 40% in real-world household environments. Consequently, households have an extremely low willingness to pay (WTP) for air purifiers; the average household WTP was USD 12.2, or 8.4% of the retail cost of air purifiers.

To correct these misconceptions, we conducted a multi-phase field experiment providing air monitors and purifiers to households. In November 2023, we recruited 1,008 households from three large housing associations. Eligibility required a functioning Wi-Fi connection and no existing air purifier. These are middle-income households with an average annual household labor income above US$6,000 (US$21,000 PPP adjusted or roughly 2.3 times the PPP-adjusted per-capita income in Bangladesh); 34% own an air conditioner that costs more than twice as much and consumes substantially more electricity than an air purifier.

Immediately following recruitment, in November, we conducted a short Phase 1 survey on perceptions of indoor and outdoor air quality. Then, 512 randomly selected households received a free IAP monitor displaying real-time PM2.5 levels along with a chart that categorized these levels from "good" to "hazardous." These monitors recorded and transmitted minute-by-minute data on indoor PM2.5 levels. Among households receiving an IAP monitor, half were randomly assigned to an "attention" treatment, receiving a small incentive to correctly report monitor readings and corresponding hazard levels from an information card we provided.

In January 2024, two months later, we conducted the Phase 2 survey, again gathering information on household beliefs about OAP and IAP. We used a modified Becker-DeGroot-Marschak (BDM) mechanism to elicit households' willingness to pay for air purifiers. Before the elicitation, we informed households about the air purifier's purpose of removing indoor air pollution. Subsequently, we randomly provided over 300 households with a free air purifier retailing for BDT 16,500 (approximately $150). Each purifier was connected to a Wi-Fi-enabled smart socket that relayed minute-by-minute usage data. This allowed us to capture use of a health-improving technology with unusually high precision and frequency. We further randomly assigned these purifier-owning households to receive either no electricity compensation, compensation paid daily, or compensation paid monthly.

In March 2024, we conducted the Phase 3 survey, collecting data on perceptions of air purifier benefits, and their willingness to accept (WTA) cash to sell back their existing purifiers (that we had provided them more than two months ago). In Phase 3, like in Phase 2, we collected household member data on physical and mental health, sleep, labor income and supply, plus health biomarkers (blood pressure and blood oxygen levels).

We report three sets of findings. First, households that were provided with a monitor believe that the air in their homes is more polluted and more likely to increase health risks to adults and children compared to households who were not provided a monitor. However, importantly, access to IAP monitors did not increase households' willingness to pay for an air purifier, even though they were informed about its purpose in removing indoor air pollution before elicitation.

Second, households that were provided with a free air purifier are less uncertain about its effectiveness compared to households who were not provided an air purifier; they are 28 percentage points (72.90%) more likely to perceive air purifiers as effective. However, households did not seem to value the devices, as they rarely used them, even when we compensated them for the (low) electricity costs of operating them. Specifically, even with compensation, the average household used the air purifier for less than 40 minutes per day.

Third, households that received both monitors and purifiers not only increased their usage but also their valuation of the purifiers. These households dramatically increased both self-reported and directly measured air purifier use relative to households that received only the purifier. Data from smart sockets indicate that monitors increased purifier use by 236%, equivalent to an additional 73 minutes per day. This increase was sustained until the end of the intervention, a period of nearly three months. Moreover, after more than two months of ownership, households that received both monitors and purifiers increased the price they were willing to accept to sell back the air purifiers by 26%, compared to households that received only the purifier.

What factors are responsible for an increase in air purifier valuation? Since we measured WTA after more than two months of ownership, the valuation increase may be due to belief correction alone or due to belief-correction-induced purifier use. The policy implications differ significantly depending on which mechanism drives the increase. If extended personal use is required, then information campaigns must be paired with targeted free or heavily subsidized distribution to ensure effective diffusion. However, if belief correction alone is sufficient, then information campaigns by themselves may be adequate. Furthermore, if belief correction about both IAP severity and air purifier effectiveness raised valuation, did it result from a demonstration effect; specifically, the monitor's ability to reveal poor indoor air quality while simultaneously showcasing the purifier's effectiveness in improving that air quality? This distinction may be important for designing effective information campaigns. Unrelatedly, could access to credit also be a friction for middle-income households in Dhaka?

To investigate these questions, between November 2024 and January 2025, we conducted a second experiment with 2,400 different households from four other housing associations in the same neighborhood. We randomly assigned households to six treatment arms: a control group; a group offered a 12-month interest-free loan to purchase a purifier; and four groups that received brief one-time demonstrations - one with just the purifier turned on for 5 minutes; one with just the monitor turned on for 5 minutes; one with the monitor turned on for 5 minutes and the purifier turned on for 5 minutes separately; and one with the monitor turned on for 5 minutes followed by activating the purifier for 5 minutes while the monitor remained on.

Our findings replicate results from the first experiment while also revealing additional insights. First, access to credit had no impact on households' beliefs or WTP for air purifiers. Second, households who only observed a demonstration of air purifiers became more certain about purifier effectiveness but showed no increase in WTP. Third, households exposed only to air monitors recognized their indoor air was more polluted but did not increase their WTP for purifiers. Fourth, households exposed to both devices separately (monitor first, then purifier) recognized both indoor pollution severity and purifier effectiveness, yet still showed no increase in WTP. Fifth, households exposed to both devices simultaneously directly observed a 44% average decline in PM2.5 levels from an average reading of 159 $\mu g/m^3$ before the purifier was turned on. Despite this clear demonstration of effectiveness and their resulting recognition of both indoor pollution severity and purifier effectiveness, this group also showed no increase in WTP.

Overall, our results suggest that households will not value or use freely distributed air purifiers until misbeliefs about both indoor pollution severity and purifier effectiveness are corrected. However, addressing these misbeliefs alone is insufficient to increase valuation. This could also explain why companies don't sell air purifiers through door-to-door demonstrations. The pathway to increasing valuation requires both: providing free or heavily subsidized air purifiers and correcting these dual misperceptions. This combination drives extended personal use, which in turn increases valuation by allowing households to directly experience the technology.

In the final, speculative part of the paper, we examine why meaningful purifier use is necessary to increase valuation. We find that although purifier ownership reduces average indoor PM2.5 levels by 14%, we detect no improvements in objective and self-reported health outcomes, sleep, mental health, labor income, or labor supply after close to three months. These findings suggest that following correction of perceptions about both the problem and the solution's effectiveness, short-run valuation of preventive health technology is tied to expected rather experienced health returns. We conjecture that the observed increase in short-run valuation may be attributed to three mechanisms tied to use: clean air functioning as an experience good (Kahn, Sun and Zheng, 2022), belief correction about operational or non-health aspects of the technology use (e.g., durability, noise) (Mobarak et al., 2012), or more accurate or certain belief calibration about the solution's effectiveness through extended personal use (Dupas, 2014*b*).

Besides contributing to the policy debate on price subsidies and their sustainability for health products in lower-income countries (Adhvaryu, 2014; Kremer and Miguel, 2007; Dupas, 2014*a*,*b*; Ashraf, Berry and Shapiro, 2010), we also contribute to the literature on the role of beliefs and learning-by-doing in technology adoption in these contexts (for reviews, see Dupas, 2011; Magruder, 2018; Verhoogen, 2023; Kremer, Rao and Schilbach, 2019). In theory, individuals must form accurate beliefs about both the severity of the problem a technology addresses and the technology's effectiveness in mitigating it to make informed adoption decisions. However, empirically little is known about exactly which beliefs matter or how strongly they affect the use and valuation of preventive health technologies.

We are the first to experimentally demonstrate that accurate beliefs about both the severity of the problem and the effectiveness of the solution are necessary for sustained use and increased valuation of preventive health technologies in nascent markets. Critically, while these accurate beliefs alone are also sufficient to increase use, they are insufficient to increase valuation; increased valuation also requires extended personal experience with the technology.

We also contribute to a growing literature in environmental economics that examines why the marginal willingness to pay for environmental quality improvements is so low in developing countries (Greenstone and Jack, 2015). To the best of our knowledge, only three prior studies have experimentally examined the low adoption of protective technologies against outdoor air pollution.[3] Two of these studies focus on the impact of simple information provision regarding either the health effects of air pollution or air quality forecasts on the adoption of pollution masks by low-SES individuals in India and Pakistan (Baylis et al., 2024; Ahmad et al., 2023). Both found that information increased demand for these masks. On the other hand, Greenstone, Lee and Sahai (2021), similar to a part of our design, deployed IAP monitors in Delhi households across the SES spectrum during peak winter air pollution and, consistent with our findings, found no impact on demand for air purifier rentals. This contrasts with non-experimental evidence from China, where air purifiers are popular household appliances used to mitigate the effects of severe air pollution (Ito and Zhang, 2020). In fact, Barwick et al. (2024) show that access to pollution information, due to the establishment of monitoring stations, led to a notable reduction in health risks associated with air pollution, primarily due to heightened use of preventive measures such as masks and air purifiers.[4]

Our results offer a compelling explanation reconciling these seemingly inconsistent findings. In South Asia, people generally have accurate beliefs about the protective effects of face masks but lack fully accurate beliefs about the health effects of air pollution or about OAP levels. In this context, providing information about OAP levels or its health impacts leads to increased demand for face masks. Similarly, in China, while beliefs about the effectiveness of air purifiers are accurate, beliefs about OAP and IAP levels were inaccurate. Therefore, the establishment of monitoring stations, which provided reliable information about OAP (and consequently IAP) levels, led to an increase in the demand for face masks and air purifiers. However, in South Asia, while households correctly perceive outdoor pollution severity, they underestimate indoor pollution and air purifier effectiveness. Thus, increased valuation and use only occur when households simultaneously experience air quality monitors and air purifiers.

[3]This stands in stark contrast to the extensive literature on the adoption and use of other protective environmental technologies in developing countries, such as improved cook stoves or water filters (e.g., Jalan and Somanathan, 2008; Ashraf, Jack and Kamenica, 2013; Madajewicz et al., 2007; Kremer et al., 2011; Ashraf, Berry and Shapiro, 2010; Guiteras et al., 2016; Berry, Fischer and Guiteras, 2020; Mobarak et al., 2012; Miller and Mobarak, 2013; Levine et al., 2018; Pattanayak et al., 2019; Hanna, Duflo and Greenstone, 2016; Berkouwer and Dean, 2022).

[4]Our study is also related to the literature on air quality information interventions and their behavioral effects in the developed world. This includes (i) research examining public air quality alerts in the United States, which demonstrates that such alerts can reduce acute diseases and healthcare utilization (e.g. Neidell, 2009; Anderson, Hyun and Lee, 2022), and (ii) recent European studies on household-level air quality information, including research on revealing indoor air pollution peaks from cooking activities (Metcalfe and Roth, 2025) and other information treatments that prompt low-cost protective behaviors (e.g. Sater et al., 2021; Baquié et al., 2024).

Lastly, this paper contributes to the emerging economics literature on air purifiers' impacts on socioeconomic outcomes. We are the first to experimentally test the effects of air purifiers in a real-world, low-income, high-pollution residential setting. Our result that households provided purifiers alone (no monitors) barely used the technology echoes empirical findings from Hanna, Duflo and Greenstone (2016) and theoretical results from Chassang, Padró i Miquel and Snowberg (2012). We follow these papers in cautioning against extrapolating external validity about the effectiveness of a new technology, where use depends on complementary household action, from lab experiments or controlled field experiments where researchers ensure high compliance. As Chassang, Padró i Miquel and Snowberg (2012) note, such studies will not be able to distinguish whether low effectiveness is because "true returns are low or because most agents believe they are low and therefore expend no effort using the technology."

Our experimental design explicitly resolves this ambiguity. Correcting household beliefs significantly increased purifier usage, generating meaningful reductions in indoor PM2.5. Crucially, however, we detect no short-run improvements in health or socioeconomic outcomes, contrasting sharply with much of the experimental public health and epidemiology literature on residential air purifiers (for a review, see EPA, 2018). This prior literature mainly features small samples (fewer than 30 participants) selected based on pre-existing health conditions in high-income, low-pollution countries. The most comparable evidence—five larger-sample studies not restricted by participant health—uniformly finds positive health impacts: three in developed countries (baseline levels 15–45 $\mu g/m^3$, 20–70% reductions) and two short-term interventions in urban China (baseline levels 95 and 60 $\mu g/m^3$, $\sim$60% reductions). Examining our results through the lens of this literature suggests one reason why our observed PM2.5 reductions did not translate into measurable health improvements: the average reductions of 14% may be too modest given extremely high baseline pollution levels and possible non-linearities in the dose-response relationship (Apte et al., 2015).

2 Experiment 1: Dual Misbeliefs, Air Purifier Use, and Valuation

2.1 Context, research design, and data collection

We conduct our study in the Mirpur area of Dhaka, Bangladesh, a city notorious for its severe air pollution. Even compared to Los Angeles—the city with often the most polluted air in the US—Dhaka's levels stand out as exceedingly high (Figure 1a). During the study months of December through March, PM2.5 levels routinely exceed 10 times the WHO's 24-hour safe limit of 15 $\mu g/m^3$ (Figure 1b). If Dhaka were to meet WHO air pollution guidelines, life expectancy there could increase by 5.6 years (AQLI, 2024).

We enrolled 1,008 households in Mirpur, housed in apartment blocks managed by three large housing associations that granted permission for our experiment.[5] Each association comprises multiple multi-story buildings ranging from 3 to 8 floors, with several apartment units on each floor. Appendix Figure A.1 shows a map of our study area.

We selected this population for three reasons. First, middle-income apartment blocks represent a common form of housing in urban South Asia, making this group somewhat representative of a substantial demographic. Second, their economic status suggests that purchasing an air purifier would not constitute an overwhelming financial burden. The retail price of the air purifier used in our experiment is less than 30% of the monthly household income. Moreover, 34% of the households in our sample own an air conditioner; air conditioners typically cost at least two to three times as much as an air purifier and consume substantially more electricity. Finally, unlike many slum dwellers, middle-class families living in apartments can create a stronger barrier against most outside elements by closing their windows and doors, increasing the effectiveness of air purifiers.[6]

During the listing, we sampled households by visiting each building within each of the three housing associations. To minimize spillovers between households, we then sampled one household per floor in each building. We asked three screening questions to determine whether the household was eligible for the study. Specifically, we inquired whether the household had a Wi-Fi connection, whether they owned an air purifier, and whether they were interested in acquiring an air purifier and/or air monitor for their household. Only 0.8% of the households we contacted owned an air purifier, while 73% had a Wi-Fi connection, and 58% of households expressed interest in an air purifier and/or air monitor. We included households that had a Wi-Fi connection (to allow real-time data collection and transmission from air purifiers and air monitors), were interested in obtaining either an air purifier and/or air monitor, and did not already own an air purifier. Although excluding households that were not interested makes our sample less representative of the overall population, it allows us to focus on a group more likely to adopt and use air purifiers. This group is crucial for policymakers, as they are significantly impacted by measures designed to boost air purifier adoption and use.[7]

Figure 2a offers a visual representation of the research design for Experiment 1. This diagram illustrates the structure of our study, which includes four distinct randomized interventions, each designed to investigate different parts of our research questions. Figure 3 presents the timeline for the different phases and interventions of the survey, as well as the distribution of survey dates within and across each phase.

[5] All three housing associations are located within a 2 square kilometer area.

[6] Furthermore, we conducted our experiment during winter, a period when PM2.5 levels are very high but when households are more likely to keep windows closed for comfort; the average daily minimum temperatures in Dhaka are 15°C in December, 14°C in January, and 17°C in February.

[7] Examples of such measures include cutting taxes and import duties or government recommendations to use air purifiers, akin to the promotion of hand-washing and other preventive health actions.

2.1.1 Phase 1 Survey

After screening households and obtaining consent, we conducted a short survey from November 12 to November 30, 2023. The survey included questions about the age and education of the household head, beliefs about health risks from air pollution, and perceptions of indoor and outdoor air quality. After completing the survey, households tossed a digital coin on the survey tablet, and a half were randomly selected to receive an indoor air quality monitor. Amongst these households, we further randomized half to receive an attention treatment, where they were incentivized to read the monitor once per week and send a text message with the reading to the research team. See Appendix A.1 for more information about how the survey data was processed.

Treatment 1: Air quality monitors. We provided 512 randomly selected households with air quality monitors that use optical signatures to measure levels of indoor PM2.5 levels (Figure A.2). These monitors have a small display screen that reports PM2.5 in standard units of micro grams per cubic meter ($\mu g/m^3$). Along with these monitors, households received a chart (in English and Bengali) categorizing PM2.5 levels into six levels: good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy, and hazardous (Figure A.3). The chart also shows the health risks associated with these air pollution levels in terms of increased likelihood of heart disease, stroke, and lung cancer in adults, and respiratory issues in children under 5.[8] Once randomly selected households received a monitor, the field team helped set up the monitor and connect it to Wi-Fi, ensuring that data was being transmitted before leaving the household.

Each household with an air monitor received a small daily incentive of BDT 15 (USD 0.14) if their monitor transmitted data for at least 16 hours. To mitigate any risk of incentive-driven effects, households without air monitors received the same payment as a randomly matched household in the monitor group. For uniformity in data collection, we suggested placing the air monitors in the bedroom of the household head.

Treatment 2: Air quality attention incentives. Among the 512 households receiving an air pollution monitor, 255 were randomized to receive an attention treatment. In this treatment, they earned a weekly reward of BDT 30 (USD 0.28) for accurately reporting their home's air quality category and the associated increased disease risk via a WhatsApp message. The remaining 257 households received a payment equal to that of a randomly selected household in the attention group. This approach ensures balanced payouts between the monitor group, the monitor and attention incentive group, and the group without monitors.

[8] The hazard ratings were adapted from the US EPA's air quality dial found on `www.airnow.gov`. The health risks were adapted from Apte et al. (2015).

2.1.2 Phase 2 Survey

We conducted the Phase 2 survey from January 5 to February 4, 2024, approximately two months after the Phase 1 survey.[9] The Phase 2 survey collected information on household beliefs about air pollution and its health impacts. We also employed a modified BDM mechanism to elicit willingness to pay for air purifiers (Berry, Fischer and Guiteras, 2020; Berkouwer and Dean, 2022). See Appendix A.2 for more information about the willingness to pay elicitation. We included questions about physical and mental health, sleep, and questions about labor income and labor supply. We also collected data on health bio-markers—specifically blood pressure and blood oxygen levels—of household members who slept in the bedroom of the household head.

Treatment 3: Air purifiers. Of the 1,008 households, we randomly selected 372 households to receive air purifiers during the Phase 2 survey. The model of air purifier used in the experiment is the "Squair Air Purifier" from Smart Air (see Figure A.4 for a picture).[10] At the time of the experiment, the retail price in Bangladesh was BDT 16,500 (approximately USD 150). The randomization was conducted as part of the BDM willingness to pay elicitation.[11] Treatment households were randomly selected to have a 'draw price' set at zero, ensuring that they will receive an air purifier while control households were given a 'draw price' equal to the market price.[12] We encouraged households to place these air purifiers in the bedroom of the household head. We attached smart sockets to each of the air purifiers so we could directly measure air purifier use (Figure A.5).

Treatment 4: Electricity compensation. We randomly assigned the 372 households equipped with air purifiers to one of three groups: two groups received compensation for the electricity used by the air purifiers, while one control group did not receive any compensation. Each of the two treatment groups consisted of 106 households, while the group that did not receive compensation had 160 households. The compensation for the treatment groups was equal to the electricity cost incurred by the air purifier, tracked via the smart socket.[13] All households received their first payment one week after our visit to build trust. After this initial payment, households in the first treatment group received daily payments, whereas those in the second group received

[9] 97% of surveys were conducted during this period. The remaining surveys were rescheduled and completed by March 12, 2024. The average time between the Phase 1 and Phase 2 survey was 61 days.

[10] For more details on the air purifier, see: `https://smartairfilters.com/en/product/sqair-air-purifier/`.

[11] In a BDM exercise, households are asked to report the amount they would be willing to pay for an air purifier in decreasing increments of 1,000 Taka, starting at the market price of 16,500 Taka. Once a household declares a price they would be willing to pay, a random draw price is selected. If the drawn price is below what the household said they would pay, the household receives the air purifiers at the draw price. Otherwise no transaction takes place.

[12] Only one control household stated a willingness to pay equal to the market price.

[13] To avoid households using different devices in the smart socket we used a small amount of glue, attaching the air purifier plug in the smart socket. Furthermore, we only compensated for electricity usage within the range of wattage used by the air purifier.

monthly payments.[14]

2.1.3 Phase 3 Survey

We conducted the Phase 3 survey from February 23 to March 31, 2024, approximately seven weeks after the Phase 2 survey.[15] In the Phase 3 survey, we collected endline data, including beliefs about purifier effectiveness, and via a BDM mechanism, households' willingness to pay for an additional air purifier and their willingness to accept cash to sell back purifiers they already had.[16] We repeated many questions from the Phase 2 survey to observe the purifiers' effects on responses. We also collected health bio-markers.

Incentives to use air purifiers. Once all our incentives ended on March 31, we re-randomized the households in the purifier group, to receive larger incentives for increasing usage of air purifiers. This was done to assign an equivalent monetary value to the effects of other treatments aimed at driving increased air purifier usage. We randomized households with purifiers into three groups. The first group received no additional incentives for increasing their usage of air purifiers. A second group was incentivized with 5 BDT per hour of use, and a third group received 10 BDT per hour. These incentives, provided from April 1 to April 30, 2024, were considerably larger than the compensation for electricity costs, which for running the purifier on medium speed are approximately BDT 0.24 per hour. Thus, the incentive treatment payments were 20-40 times greater per hour of use than the electricity compensation. Put another way, households in the two incentivized groups that operated their purifiers continuously throughout the 30-day intervention could earn between 3,600 and 7,200 Taka, amounting to a significant 6% and 12% of the average monthly household labor income in our sample, respectively.

2.1.4 Other Data Sources

In addition to data from the three surveys, we collected data from three other sources. First, we collected continuous minute-by-household level indoor air pollution data from households equipped with air monitors. Second, we installed outdoor air pollution monitors in the study regions. Third, we recorded continuous minute-by-household level air purifier usage data, which

[14] There is progressive electricity pricing in Dhaka, with prices being higher for users consuming more electricity. We base our compensation on the highest marginal price of electricity, 13 BDT (0.12 USD) per kwh. This means that no household is under-compensated for their electricity use, but households that used small amounts of electricity overall were slightly over-compensated compared to their true marginal cost of electricity.

[15] 99% of surveys were completed during this period. The remaining surveys were rescheduled and completed by April 20, 2024. The average time between the Phase 2 and Phase 3 survey was 63 days.

[16] A total of 36 air purifiers were distributed for free during the Phase 3 survey. Among them, 12 households received an additional air purifier, as they had also received one during the Phase 2 survey. In the Willingness to accept exercise, we purchased one air purifier from a household for 16,000 Taka.

was collected via the smart sockets connected to the air purifiers.

Indoor air pollution. In Phase 1, we installed air pollution monitors in a random subset of our sample. These monitors are designed to record and push to the server minute-by-minute data on PM2.5, PM10, temperature, and humidity.[17] We incentivized households to keep the air monitors on by providing BDT 10 for each day that the device was turned on for more than 16 hours. Overall, we received data from 67% of the potential hour-by-household observations among those with monitors installed. We winsorize the data at the 1st and 99th percentiles.

Outdoor air pollution. On December 1, 2023, we installed two outdoor air pollution monitors to cover all three housing associations, providing us minute-by-minute data on PM2.5 and PM10.[18] We winsorize the data at the 1st and 99th percentiles. Appendix A.3 shows that the indoor and outdoor monitors do not substantially differ in their pollution measurements when placed in the same room. We impute outdoor air pollution data for the period between November 1 and 30 from the air quality monitors of the US Embassy.[19]

Air purifier use. Each air purifier was connected and glued to a smart socket. The smart socket were connected to Wi-Fi and recorded electricity usage of the connected device, pushing data to the server every minute on how many watts were used. Figure A.6 shows that the smart sockets' recorded electricity usage aligns with the manufacturer's labeling of the air purifier's wattage at various speeds. We classify electricity usage between 3 and 60 watts as indicative of the purifier being in use.

2.1.5 Attrition and Balance

Phase 1 to Phase 2 attrition. We experienced 18.8% attrition between Phase 1 and Phase 2; of our Phase 1 sample of 1,008 households, 818 households consented to the Phase 2 survey. We regress whether or not a household left the sample in Phase 2 on the monitor and attention treatment to see if treatment is correlated with attrition (Table A.1). We fail to find evidence for differential attrition between monitor and non-monitor households. There was also no differential attrition between households receiving the monitor with or without the attention treatment. Finally, we test for balance in the unattrited groups for both monitor (Table A.2) and attention treatments (Table A.3). Balance on observables from the Phase 1 survey is maintained in the unattrited sample. Joint test p-values of 0.39 and 0.35 confirm no significant differences in Phase 1 attributes

[17] We used Qingping Lite monitors, a model that has performed well in tests in other highly polluted environments: `https://smartairfilters.com/en/blog/how-accurate-are-qingping-qp-pm2-5-air-quality-monitors/`.

[18] We used AirVisual outdoor monitors by IQair. For more information, see `www.iqair.com/products/air-quality-monitors/airvisual-outdoor-2-pm`.

[19] The correlation between our outdoor monitors and the US embassy monitor is 0.96 (Appendix A.3).

between monitor vs. non-monitor households and attention vs. non-attention households that consented to Phase 2, respectively.

Phase 2 to Phase 3 attrition. Of the 818 households surveyed in Phase 2, 758 consented to participate in the Phase 3 survey, representing an attrition rate of 7.3%.

We find differential attrition by purifier assignment (Table A.4): households receiving purifiers were less likely to drop out than non-purifier households by 5.9 percentage points. However, balance tests show the unattrited purifier and non-purifier groups remain comparable (Table A.5). Differences between purifier and non-purifier households in the unattrited sample are small and statistically insignificant for all Phase 2 observables (joint test p-value = 0.90).

Table A.4 also shows that households receiving daily electricity compensation were less likely to attrit than those receiving monthly or no compensation. However, again, balance tests confirm the three unattrited compensation groups remain comparable (Table A.6). Differences are small and statistically insignificant for all but one of Phase 2 observables.

Next, we examine differential attrition within the purifier group by monitor assignment, and within the monitor group by purifier assignment.

We find differential attrition by purifier assignment within the monitor group (Table A.7): households receiving purifiers were less likely to drop out than non-purifier households. However, balance tests show the unattrited purifier and non-purifier households remain comparable (Table A.8). Differences between these groups in the unattrited monitor sample are small and statistically insignificant for all Phase 2 observables (joint test p-value = 0.78).

Importantly, we find no differential attrition by monitor treatment amongst purifier households (Table A.9). Moreover, differences between monitor and non-monitor households in the unattrited purifier sample are small and always statistically insignificant for the vast majority of Phase 2 observables (Table A.10), with a joint test p-value of 0.57.

To summarize, we find no evidence for differential attrition across our various comparison groups. Even if we ignore the balance tests for unattrited samples across our various comparison groups and simply take the differential attrition rates for some comparison groups as evidence of bias, this would only possibly affect four of our results: (i) impact of purifier and/or monitor assignment on beliefs about purifier effectiveness, (ii) impact of electricity compensation on purifier use, (iii) impact of purifier assignment on indoor PM2.5 levels, and (iv) impact of purifier and/or monitor assignment on health and other socioeconomic outcomes.

However, these concerns are mitigated for several reasons. First, since we replicate the belief results from Experiment 1 in Experiment 2, where no differential attrition occurred, concern (i) is unlikely to bias our findings. Second, concerns (ii) and (iii) are addressed because we rely on real-time data from smart plugs and air monitors rather than Phase 3 survey data. Attrition here, defined as households explicitly returning equipment or indicating their withdrawal from the study, is less than 0.1%. That is, households withdrew from sharing monitor readings or purifier use data on fewer than 0.1% of the days between Phase 2 and April 1. Moreover, we find no differential attrition in purifier withdrawal based on electricity compensation nor in monitor withdrawal based on purifier assignment. (Table A.11).

2.2 Descriptive and stylized Facts

Our descriptive statistics reveal an alarming picture of the state of indoor air pollution in Dhaka and reveal significant misconceptions among households regarding its severity and the effectiveness of air purifiers.

2.2.1 Both outdoor and indoor air pollution levels are alarmingly high, but households believe indoor air is much less polluted than outdoor air

Between the Phase 1 and Phase 2 surveys, at our study sites, average outdoor PM2.5 levels were 185 $\mu g/m^3$, roughly 12 times the WHO's 24-hour safe limit of 15 $\mu g/m^3$. Importantly, indoor air pollution levels are also alarmingly high. The average indoor air pollution during this time was 162 $\mu g/m^3$, or 11 times the WHO's 24-hour recommendation. Figure 4a shows the average indoor air pollution readings in households, alongside outdoor air pollution. The average ratio of indoor air pollution to outdoor air pollution is 0.95.[20] This is consistent with the ability of finer particulate matter such as PM2.5 to easily penetrate buildings (Ozkaynak et al., 1996; Vette et al., 2001), making exposure difficult to avoid.

Data collected from the Phase 1 survey at the study's outset suggest that while the modal household accurately perceived outdoor air pollution as exceedingly high, rating it 10 on a scale of 10 (Figure 4b),[21] they perceived indoor air quality as better than moderately polluted, rating it 4 on a scale of 10. In Figure 4c, we display the distribution of households' perceptions of indoor versus outdoor air pollution. The overwhelming majority of households believe their indoor to outdoor ratio is 0.5 or lower, indicating a significant underestimation of indoor air pollution's extent. Perhaps because families living in apartments can create stronger barriers against most outside elements by simply closing windows and doors, it skews their perceptions of indoor versus outdoor air quality and influences their demand for air purifiers.

[20] This is similar to the finding of Saha et al. (2025) who estimate an indoor to outdoor ratio of 0.97 during the winter season, using data from 17 households in Dhaka.

[21] This even though a majority of households do not regularly check outdoor air pollution levels (Appendix Figure A.7); nearly 83% rarely or never monitor these levels, and only 8% do so daily.

2.2.2 Air purifiers are very effective in filtering polluted indoor air but demand for air purifiers is low and households are uncertain about their effectiveness

Although our air purifiers are factory-tested,[22] we conducted our own controlled tests in January 2024 by closing the doors and windows in two rooms, slightly larger than typical bedrooms, at our field office in Dhaka. We randomly assigned an air purifier to one room and turned it on for two hours. We recorded PM2.5 levels in both rooms and repeated this procedure six times. Figure 5a presents the results from these tests. When the air purifier is turned on, air pollution levels start to decrease almost immediately, with an overall decrease from $134 \mu g/m^3$ to $26\ \mu g/m^3$ within 30 minutes—an 81% decline in PM2.5 levels. Importantly, when the purifiers were turned off, air pollution levels began to increase immediately even with doors and windows closed, gradually returning to baseline levels, again highlighting how PM2.5 can easily penetrate buildings.

We also analyzed real-world pre-post patterns of indoor air quality when households that received free purifiers in Phase 2 turned them on between Phase 2 and Phase 3 (Figure 5b). The levels of indoor air pollution before households turned on their purifiers were alarmingly high ($131\ \mu g/m^3$),[23] but decreased significantly once the purifier was turned ($75\ \mu g/m^3$)—a 43% decrease in PM2.5 levels.[24]

However, we find that demand for air purifiers is low and households are uncertain about their effectiveness. First, as we noted earlier, in our screening of households to be included in the sample we excluded those who already had an air purifier; only 15 of the 1,841 households – less than 1% – reported having an air purifier. Second, we elicit households' willingness to pay for air purifiers in the Phase 2 survey. In the control (non-monitor) group, we find an average household willingness of BDT 1,431 (USD 12.17) or 8.4% of their retail cost. In fact, no household in our sample was willing to pay the retail price (Figure 5d). This is consistent with non-ownership; hardly anyone in our listing survey owned an air purifier similar to Greenstone, Lee and Sahai (2021), who found no demand for air purifier rentals among middle-income households in urban Delhi. Third, low adoption rates for air purifiers may partially stem from uncertainty about their effectiveness. In the non-purifier group, fewer than half of the households had formed an opinion on purifier effectiveness, and less than a third believed that purifiers removed more than 25% of air pollution from the room where they were used (Figure 5c).

[22] The manufacturer's own test found the purifier to remove 98% of PM2.5 pollution (compared to outdoor levels) when used on the highest setting in a 15m^2 bedroom and outdoor PM2.5 levels at $40\ \mu g/m^3$ (Vanzo, 2021). However, in a separate test, they show that for most types of purifiers, the percentage of PM2.5 removed compared to outdoor levels decreases at higher levels of outdoor pollution and is around 85% at the outdoor pollution levels present in our study (Talhelm, 2017).

[23] The spike in PM2.5 levels immediately before the purifier was turned on may be consistent with specific household behaviors: either the household head opening doors and windows when returning home from work and then turning on the purifier, or opening the bedroom door before going to sleep and then activating the purifier.

[24] The smaller effect on air pollution, compared to effects observed in our controlled setting, may be due to the air purifiers often being used on the lowest setting or because doors or windows in the room were open.

2.3 Households with monitors correctly update their beliefs about indoor air quality, but do not increase their willingness to pay for purifier

In this section, we examine the effects of providing air pollution monitors on beliefs about indoor air quality and willingness to pay for air purifier. We find that despite monitors correcting perceptions of indoor air pollution levels, they do not affect willingness to pay for air purifiers.

Econometric specification. We begin our experimental analysis by examining how monitors, provided at the end of the Phase 1 survey, influenced households' perceptions of air pollution and willingness to pay for air purifiers by the time of the Phase 2 survey. We estimate the following regression specification:

$$Y_i = \alpha + \beta_1 \times Monitor_i + \beta_2 \times \mathbf{X}_i + \varepsilon_i \tag{1}$$

where Y_i represents either the belief of household i regarding the severity of indoor air pollution levels in the Phase 2 survey or the WTP for household i at the time of the Phase 2 survey, determined through a modified BDM mechanism. The term $Monitor_i$ indicates whether a household was randomly selected to receive an air quality monitor two months earlier, in Phase 1, while $\mathbf{X}_i$ includes $MonitorXAttention_i$, which denotes whether the household was given both a monitor and an incentive to report their air quality monitor readings, thereby increasing their attention to the indoor air pollution levels. We use heteroskedasticity robust standard errors.

We use three questions to capture perceptions of air pollution. First, households were asked to rate indoor air pollution on a scale from 0 to 10, where 10 corresponds to 'extremely polluted' and 0 to 'not polluted at all.' Second, we asked them to rate outdoor air pollution on the same scale. Finally, households rated indoor air quality relative to outdoor air quality on a scale from 0 to 10, where 10 indicates 'Indoor is equally polluted as outdoor' (implying an indoor to outdoor ratio of 1), 5 suggests 'Indoor is half as bad as outdoor' (implying an indoor to outdoor ratio of 0.5), and 0 implies there is almost no indoor air pollution.[25]

Results. We present these results in Table 1. Figure A.8 presents the corresponding shifts in the underlying distribution. We find that the monitor treatment significantly increases households' perception of indoor air pollution, with the estimate showing an increase of 0.45 points or 10% (Column 1). However, monitors have a small positive, albeit statistically insignificant, effect on perceptions of outdoor air pollution (Column 2), likely because, unlike for indoor air, the typical household already recognizes the poor quality of outdoor air. Furthermore, Column 3 shows that the monitors help reduce the misconception that indoor air quality is substantially better than outdoor air quality, increasing the perceived indoor to outdoor air pollution ratio by 3.1

[25] We removed the option "Indoor is more polluted than outdoor" in the Phase 2 survey as virtually no household chose this response in the Phase 1 survey.

percentage points. Collectively, our results indicate that monitors effectively update households' beliefs about the severity of indoor air pollution.

We also examine the effect of air pollution monitors on perceived health risks from indoor air pollution, including lung cancer and stroke in adults, and acute respiratory infections in children. Our measure of risk perceptions start with 'no effect' (coded as 1), a 20% higher risk, (coded as 1.2), and so on. Therefore, the coefficients can be interpreted as a percentage point change in the risk of developing a disease as a consequence of air pollution. We report results in Table A.12. We find that monitors increase households' perceptions of the health risks from indoor air pollution during the Phase 2 survey. In particular, the perception of the effect of air pollution on adults increased by 14 percentage points (Column 1) and the perception of the effect on children increased by 11 percentage points (Column 2), although this latter coefficient is estimated with less precision.

However, we did not find a significant positive effect of monitors on willingness to pay for an air purifier during the Phase 2 survey, as shown in Column 4 of Table 1. The lack of a positive effect of air pollution monitors on WTP for air purifiers contrasts with our finding that monitors correctly increased households' perceptions of indoor air pollution levels and associated risk of illness in adults and children. These seemingly contradictory results suggest that simply providing information from air pollution monitors is not enough to boost adoption of air purifiers among such middle-income households. For instance, although the monitor treatment may lead households to update their beliefs about indoor air pollution and its health effects, they might still doubt the effectiveness of air purifiers as a strategy to reduce pollution.

Interestingly, we find no evidence that our attention incentives affected beliefs about indoor air pollution (Table A.13). This suggests that the monitor's impact on beliefs operates through providing new information about pollution levels rather than merely increasing the salience of existing information.

2.4 Households with purifiers are less uncertain about their effectiveness but rarely used them even when compensated for electricity costs

Next, we estimate the impact of receiving an air purifier in Phase 2 on opinion formation and perceptions of their effectiveness. We find that households that were provided with an air purifier are less uncertain about its effectiveness compared to households who were not provided an air purifier. However, households did not seem to value the devices, as they rarely used them, even when we compensated them for the electricity costs of operating them.

Econometric specification. To assess the impact of receiving an air purifier, we estimate the following regression specification:

$$Y_i = \alpha + \beta_1 \times Monitor_i + \beta_2 \times Purifier_i + \beta_3 \times Monitor_i * Purifier_i + \beta_4 \times \mathbf{X}_i + \varepsilon_i \qquad (2)$$

where Y_i represents the binary variables described below for household i at the time of the Phase 3 survey. The term $Purifier_i$ indicates whether a household was randomly selected to receive an air purifier about three months earlier during the Phase 2 survey, while $\mathbf{X}_i$ includes $MonitorXAttention_i$ and the interaction term between $MonitorXAttention_i$ and $Purifier_i$. We use heteroskedasticity robust standard errors.

In our Phase 3 survey, we asked households how effective they believe commercially available air purifiers in Dhaka are at removing air pollution from a room. The response options were "remove no air pollution", "remove only a quarter of the air pollution", "remove half of the air pollution", "remove three-quarters of the air pollution" and "remove almost all air pollution". We coded these responses into four binary variables. Each variable takes the value of 1 if a household believes the air purifier removed at least some, more than a quarter, more than half, or more than three-quarters of the air pollution, respectively, and 0 otherwise. Households were also given the option to select 'don't know.' Given the substantial number of households that chose this response, we created a binary variable 'has opinion.' This variable is set to 1 if the household selected any of the specific effectiveness options instead of 'don't know,' and 0 otherwise.

Results. We report these results in Table 2. Figure A.9 presents the corresponding shift in the distribution of air purifier perceptions. We find that households provided with an air purifier in the Phase 2 survey are 28 percentage points more likely to have an opinion about air purifier effectiveness (Column 1). This represents a 74% increase in the likelihood of forming an opinion. Interestingly, we also find that households provided with a monitor in the Phase 1 survey are 11 percentage points (29%) more likely to form an opinion about air purifier effectiveness. However, having both the purifier and monitor does not further influence opinion formation.

In Columns 2-5, we report the effects of providing households with an air purifier during the Phase 2 survey on perceptions of their effectiveness. We find that these households are 28 percentage points (78%) more likely to perceive air purifiers as effective, 30 percentage points (107%) more likely to believe they are more than 25% effective, 27 percentage points (135%) more likely to think they are more than 50% effective, and 13 percentage points (162%) more likely to consider them more than 75% effective. Conversely, households provided with a monitor in the Phase 1 survey are 11 percentage points (31%) more likely to perceive air purifiers as effective, 12 percentage points (43%) more likely to perceive them as more than 25% effective, and 10 percentage points (50%) more likely to view them as more than 50% effective. However, there is no significant effect on the perception that air purifiers are more than 75% effective among those provided with a monitor.[26] Again, we find no evidence that having both the purifier and monitor significantly alters households' perceptions of air purifiers' effectiveness compared to households that only received an air purifier, with one exception: households provided with both an air purifier and a monitor are 10 percentage points (125%) more likely to perceive that air purifiers are more than 75% effective, although this result is not statistically significant at conventional levels (p-value = 0.16).

These findings raise the question of how purifier ownership alone is sufficient to improve perceptions of their effectiveness. Several mechanisms might explain this effect. Households may perceive a noticeable difference in air quality, experiencing reduced odors or easier breathing after running the purifier. Seeing the physical device and understanding how it works after interacting with it could build familiarity and trust. Finally, examining the filter and observing accumulated dirt after the purifier has been used provides visible evidence of pollutant capture. Of these explanations, households' perceived difference in air quality is unlikely to drive the effect since, as we discuss below, households who were provided an air purifier alone rarely used it.

2.4.1 Households rarely use their air purifier

In the Phase 1 survey, before the start of any intervention, we asked households how often they would use an air purifier during the winter months if they owned one (Figure A.10). 58% of households said they would use the air purifiers continuously when at home, nearly 23% indicated they would use them at least once per day, and another 9% would use them a few times a week. In contrast, fewer than 9% of households stated they would never use the air purifiers.

However, households' predicted use of air purifiers far exceeds their actual usage. In Figure 6 the gray bars shows the number of minutes an air purifier is used at the household-day level among households that were randomly selected to receive air purifiers but were not chosen to receive a monitor or electricity compensation for air purifier use. The typical household in this group used an air purifier for less than 20 minutes (Figures 6a and 6b). Most households, on most days, do not use the air purifier at all, with more than 80% of household-days seeing no air purifier usage (Figure 6c). Household-level data paint an even starker image (Figure 6d). More than a third of households never used an air purifier, and only 5% of households use the purifier for more than 81 minutes per day.

Electricity costs do not explain low air purifier use. We also examine whether electricity costs — approximately BDT 0.24 per hour of use — can explain low usage of air purifiers. Households

[26] It may be that because air monitors let households observe daily PM2.5 fluctuations from cooking, traffic, weather, and other sources, they somewhat shifts beliefs about how effective air purifiers can be.

that received an air purifier were randomized into three groups: those receiving no compensation, those receiving daily compensation, and those receiving monthly compensation.

Econometric specification. We estimate the following regression specification:

$$Use_{it} = \alpha + \beta_1 \times Compensation_i + \beta_2 \times DailyCompensation_i + \tau_t + \varepsilon_{it} \quad (3)$$

where $Compensation_i$ signifies whether the household receives any compensation for the electricity cost, $DailyCompensation_i$ indicates daily compensation, and τ_t indicates date fixed effects. Standard errors are clustered at the household level.

We included two compensation approaches to explore whether 'present bias' – the tendency to prioritize immediate benefits over future gains – influences air purifier usage. Given that present-biased individuals might be less likely to use the purifiers due to their reluctance to wait for long-term benefits, we hypothesize that air purifier usage will be higher in the daily compensation group compared to the monthly compensation group.

Results. We report these results in Figure 6 and Table 3. Compensation does increase air purifier use, although the effects are not always precisely estimated (Columns 1 and 2). Incentives increase purifier use by approximately 14 minutes per day, roughly 26% higher than households receiving no incentive (Column 2). Daily incentives further increase usage by 9 minutes compared to monthly payments, though this estimate is also imprecise.

Recall that we made the first payment to all compensated households at the end of the first week to establish uniform trust across both compensation groups. This suggests that the modest additional effect of daily compensation likely stems from factors other than differences in trust.

When restricting our sample to households without monitors, we find a statistically significant 20-minute daily increase in purifier use for compensated households compared to uncompensated ones (Column 3). However, Figure 6b reveals that this increase is concentrated in the first few weeks of purifier ownership.

Overall, while these results indicate that electricity costs and present-bias may contribute somewhat to low air purifier usage, the magnitude of the effect is small in absolute terms and not sustained over time. As we discuss next, these effects are much smaller compared to the dramatic impact of air pollution monitors, which substantially increase purifier use.

2.5 Households with both air monitors and purifiers increased both usage and valuation of purifiers

Next, we analyze how air pollution monitors affect different measures of air purifier use—both self-reported in surveys and actual use recorded by smart sockets.

Self-reported use. To measure self-reported purifier use, we asked households in the Phase 3 survey how often they used an air purifier. Response options were (a) all the time when home, (b) at least once per day, (c) a few times per week, (d) once per week, (e) once per month, (f) very rarely, (g) never, (h) don't know or (i) refused. We also asked households how many days they used the air purifier for 30 minutes or more in the past 7 days.

Econometric specification. We estimate following regression specification:

$$SelfUse_i = \alpha + \beta_1 \times Monitor_i + \beta_2 \times \mathbf{X}_i + \varepsilon_i \tag{4}$$

where $SelfUse_i$ represents the self-reported use of household i in the Phase 3 survey. X_i includes $MonitorXAttention_i$. We use heteroskedasticity robust standard errors.

Results. We report the effects of the monitor treatment on this outcome in Table A.14. In Column 1, we show that households in the monitor group reported using air purifiers for at least 30 minutes on an extra half day in the past 7 days, compared to the only-purifier group's average of 5 days (p-value = 0.11). In Column 2, we show that the monitor treatment increased the likelihood of households self-reporting air purifier usage as "all the time when home" by a statistically significant 14 percentage points, or 58% (Column 3), compared to households who did not receive a monitor.

Use recorded by smart sockets. We also estimate the effect of air pollution monitors on an objective measure of air purifier use, based on continuous minute-by-minute data from smart sockets that we attached to air purifiers.

Econometric specification. We estimate the following regression specification:

$$Use_{it} = \alpha + \beta_1 \times Monitor_i + \beta_2 \times \mathbf{X}_i + \tau_t + \varepsilon_{it} \tag{5}$$

where Use_{it} indicates how many minutes household i used their air purifier during date t. τ_t indicates date fixed effects, while $\mathbf{X}_i$ includes $MonitorXAttention_i$. Standard errors are clustered at the household level.

Results. We report these results in Table 4 and Figure 7a. Households with an air monitor increase their use of an air purifier by 73 minutes per day (Column 1). This is an extremely large 236% treatment effect.[27] Importantly, these effects represent a sustained increase in air purifier use and are consistently observed in households that received a monitor before getting a

[27] As before, we fail to find evidence that our attention incentives had an additive effect on air purifier use (Table A.15).

purifier (Figure 7b). This increase can be graphically observed in the rightward shift of both the household-day usage distribution and the distribution at the household level (Figures 7c and 7d).

Next, using data from the smart sockets, we constructed a weekly measure of air purifier usage similar to the self-reported measure: the number of days per week the purifier was used for more than 30 minutes. This metric was generated for all intervention weeks and specifically for the week preceding the Phase 3 survey (Columns 2 and 3). We find that households in the monitor group used their air purifiers for at least 30 minutes on an additional half-day, compared to an average of one day among households without a monitor. The absolute increase is qualitatively and quantitatively consistent with increases estimated using self-reported data. This consistency is reassuring and suggests that, although discrepancies exist between the self-reported and objective measures of air purifier use, they are consistent across both treatment and control groups.[28]

2.5.1 Monitors increase purifier use to the same extent as an hourly incentive of BDT 4.5 to use the air purifier

To assess the value of the information from air pollution monitors in promoting air purifier use, we randomized additional incentives at the conclusion of our planned study, from April 1, 2024 to April 30, 2024. Specifically, once all our incentives ended on March 31, we randomized households that had received an air purifier into three groups: (a) a control group, (b) a group that received an incentive of BDT 5 for each hour of air purifier use, and (c) a group that received an incentive of BDT 10 for each hour of air purifier use. These incentives significantly exceed the electricity costs (roughly BDT 0.24 per hour) associated with operating the air purifiers.

Econometric specification. We estimate the following regression specification:

$$Use_{it} = \alpha + \beta_1 \times AnyIncentive_i + \beta_2 \times BDT10Incentive_i + \tau_t + \varepsilon_{it} \quad (6)$$

where $AnyIncentive_i$ indicates whether the household was offered at least a 5 BDT per hour incentive, and $BDT10Incentive_i$ indicates if the household was offered the larger incentive of 10 BDT per hour of air purifier use. τ_t indicates date fixed effects. Standard errors are clustered at the household level.

Results. We report these results in Table A.16. Column 1 shows that providing households with at least 5 BDT per hour increases air purifier usage by 113 minutes per day, compared to a 69 min-

[28]The smart sockets data show extremely low use of air purifiers among households that were not provided an air quality monitor; households not provided a monitor used an air purifier for at least 30 minutes for just 1 day out of the past 7 days. This is much smaller than the self-reported usage of 5 days. Discrepancies between self-reported and objective measures of health technology usage are quite common. For example, a similar magnitude of discrepancy was found in the usage of face masks during the COVID-19 pandemic in Kenya (Jakubowski et al., 2021).

utes increase from providing a monitor. Column 2 breaks down these estimates further; we find that the BDT 5 per hour incentive increased air purifier use by 82 minutes per day, roughly equal to the effect of providing a monitor. These effects are substantial: the 5 BDT per hour incentive increases usage by over 500% relative to the control mean, while the increase from monitors is just under 500%. This treatment allows us to quantify the value of the indoor air quality information provided by monitors in promoting air purifier use. Figure A.11 visually compares the effects of monitors and incentives on air purifier usage. Assuming a linear increase in usage from a zero incentive to a 5 BDT incentive, the effective incentive equivalent to the monitor's impact would be BDT 4.4 per hour or 1750% of the hourly electricity costs associated with operating the air purifier.

The substantial monetary incentives raise an intriguing puzzle: why do households leave money on the table by not running purifiers continuously? This behavior suggests either significant disutilities associated with purifier use or behavioral constraints that prevent optimization. Potential disutilities include noise pollution that disrupts daily activities and sleep, maintenance burdens, space constraints in small homes, and concerns about accelerating filter degradation or device wear that would necessitate costly replacements. Alternatively, behavioral explanations may dominate: cognitive load from remembering to operate the device and track usage may prove burdensome. Social norms around appliance use or satisficing behavior—where households aim for "adequate" rather than optimal air quality—could also limit usage. Nevertheless, the finding that air quality monitors increase usage as much as monetary incentives suggests informational barriers may be particularly important. Without updating beliefs about the quality of indoor air and/or visible feedback on air quality improvements, households may doubt the purifier's effectiveness, leading them to underuse the device despite financial incentives that far exceed electricity costs.

2.5.2 Effects of Monitor on Valuation of Air Purifiers

In this section, we examine: (a) the impact of monitor provision on the willingness to accept (WTA) selling back purifiers among households that received an air purifier in Phase 2, close to three months earlier, (b) the effect of monitor provision on the willingness to pay (WTP) for an air purifier among households that did not receive one in Phase 2, and (c) the differences between the impact of purifier provision alone and the combined impact of monitor and purifier provision on the willingness to pay for a second purifier among households that received their first purifier in Phase 3.[29]

Before we report these effects, it is important to note that the price at which households are

[29] Recall that we cannot test the effects of air purifiers on WTA since only households that had already received an air purifier from us were eligible for the WTA exercise. Similarly, we cannot capture the willingness to pay for their first air purifier among households that received one in Phase 2. For these households, we can only elicit willingness to pay for a second air purifier.

willing to sell back their air purifiers after using them is, on average, ten times higher than their initial (Phase 2) WTP (BDT 14,000 versus BDT 1,400), suggesting a substantial valuation increase after usage. This difference may be influenced by an endowment effect from loss aversion, although such effects are typically much lower. Brown et al. (2024) finds that, across numerous studies, the average loss aversion coefficient is 2.0, with coefficients above 5 being extremely rare. Furthermore, Tunçel and Hammitt (2014) observes that the WTP/WTA gap tends to be smaller in studies using incentive-compatible elicitation mechanisms. Therefore, the substantial difference between WTP and WTA suggests that experience with air purifiers significantly enhances its valuation by households.

We report two main findings: First, monitors increase the price that purifier-owning households are willing to accept to sell their purifier. Second, monitors increase WTP for an additional, second purifier during the Phase 3 survey among purifier-owning households, but do not increase WTP for a first purifier among non-purifier owning households.

Econometric specifications. To examine the impact of monitor provision on the willingness to accept selling back purifiers among households that received an air purifier in Phase 2, we estimate the following regression specification:

$$WTA_i = \alpha + \beta_1 \times Monitor_i + \beta_2 \times \mathbf{X}_i + \varepsilon_i \tag{7}$$

where WTA_i represents the WTA for household i at the time of the Phase 3 survey, determined through a modified BDM mechanism. $\mathbf{X}_i$ includes $MonitorXAttention_i$. We restrict the sample to households that were randomly assigned to receive an air purifier in Phase 2. We use heteroskedasticity robust standard errors.

To examine the effect of monitor provision on the willingness to pay (WTP) for an air purifier among households that did not receive one in Phase 2, and the differences between the impact of purifier provision alone and the combined impact of monitor and purifier provision on the willingness to pay for a second purifier among households that received their first purifier in Phase 3, we estimate the following regression specification:

$$\begin{aligned} WTP_{it} = \alpha &+ \beta_1 \times Monitor_i + \beta_2 \times Purifier_i + \beta_3 \times Phase3_t \\ &+ \beta_4 \times Monitor_i \times Purifier_i \\ &+ \beta_5 \times Monitor_i \times Phase3_t + \beta_6 \times Purifier_i \times Phase3_t \\ &+ \beta_7 \times Monitor_i \times Purifier_i \times Phase3_t + \beta_8 \times \mathbf{X}_i + \varepsilon_{it} \end{aligned} \tag{8}$$

where WTP_i represents the WTP for household i at the time of the Phase 2 or Phase 3 survey, determined through a modified BDM mechanism. $\mathbf{X}_i$ includes $MonitorXAttention_i$ and all the interaction terms between $Monitor_i$, $Purifier_i$, $Phase3_t$ and $MonitorXAttention_i$. Standard errors are clustered at the household level. β_5 captures the difference in the change in the willingness to pay for an air purifier between Phase 2 and Phase 3 amongst households that received a monitor versus those who did not receive a monitor. β_6 captures the difference in the change in the willingness to pay for an air purifier between Phase 2 and Phase 3 amongst households that received an air purifier in Phase 2 versus those who did not receive an air purifier. β_7 captures the difference in the change in the willingness to pay for an air purifier between Phase 2 and Phase 3 amongst households that received a monitor (in Phase 1) and an air purifier (in Phase 2) versus those who did not receive a monitor or an air purifier.

Results. First, we estimate Equation 7. We find that possession of a monitor increases the willingness to accept by BDT 3,839.3, which is 26% above the control mean (Table 4, Column 4) among households that received an air purifier. Specifically, while the control group's mean WTA is approximately BDT 14,500—below the retail price—households that received both a purifier and a monitor placed a higher valuation on the purifiers, exceeding the retail price of BDT 16,500. Figure A.12 presents the corresponding shift in the WTA distribution.

In Table A.17, we present estimates from Equation 8. While these estimates are statistically insignificant, the magnitude of the point estimates is still informative. We find that households receiving both a monitor and a purifier increased their valuation of the purifier between Phase 2 and Phase 3 by BDT 632.7, which is 45% of the control mean, although the p-value is 0.23. In contrast, households that received only the purifier did not show a similar increase in valuation, with a point estimate of just BDT 80.85. Likewise, households that received only a monitor did not increase their valuation of the air purifier.

3 Experiment 2: Is Correcting Misbeliefs Sufficient to Increase Valuation or is Experience Necessary?

What factors are responsible for an increase in air purifier valuation? Since we measured WTA after close to three months of ownership, the valuation increase may be due to belief correction alone or due to belief-correction-induced purifier use. The implications differ depending on whether belief correction alone increases valuation or whether meaningful use is also necessary. If experiencing meaningful use is required, then information campaigns must be paired with targeted free or subsidized distribution to ensure effective diffusion. However, if belief correction alone is sufficient, then information campaigns by themselves may be adequate.

In this section, we determine whether the correction of misbeliefs about both IAP severity and air purifier effectiveness alone raised valuation. If so, did this valuation increase result from a demonstration effect; specifically, the monitor's ability to reveal poor indoor air quality while simultaneously showcasing the purifier's effectiveness in improving that air quality? Understanding this mechanism may be crucial for designing effective information campaigns, as such a demonstration effect would suggest marketing strategies that pair an air purifier with a monitor. Or alternatively, as mentioned above, did the actual usage experience with air purifiers—motivated by belief correction—increase households' valuation of air purifiers? Finally, we also explore the possibility of a standard development feature, that is, could access to credit also be a friction for middle-income households in Dhaka?

3.1 Research design and data collection

To investigate these questions, we conducted a second experiment with 2,400 households from four additional housing associations in the Mirpur neighborhood of Dhaka between November 2024 and January 2025. As shown in Figure A.13, these housing associations were located near those in our first experiment and as such were likely to have a similar air quality experience.

In this experiment, we visited households only once. Before implementing any treatments, enumerators collected baseline information including household demographics (age and education of the household head), beliefs about health risks from air pollution, perceptions of indoor and outdoor air quality, and views on air purifier effectiveness. We then randomly assigned households to one of six experimental arms:

1. Control: A control group receiving no intervention
2. Credit Only: A group offered a 12-month interest-free Equal Monthly Installments (EMI) payment plan to purchase a purifier. The enumerators carried an official contract of the EMI from our implementation agency
3. Purifier Only: A group experiencing a 5-minute demonstration of just the air purifier which included a tutorial on how it worked
4. Monitor Only: A group experiencing a 5-minute demonstration of just the air quality monitor allowing for a stable calibrated reading
5. Both (Separately): A group where the monitor was turned on for 5 minutes, then turned off and then the purifier was turned on for 5 minutes as distinct demonstrations
6. Both (Together): A group where the monitor was turned on for 5 minutes followed by activating the purifier for 5 minutes while the monitor remained on, allowing households to observe pollution levels drop on the monitor screen in real-time

Figure 2b offers a visual representation of our research methodology. For all households in treatment groups involving the air quality monitor,[30] our enumerators recorded the displayed pollu-

[30]Similar to Experiment 1, along with these monitors, households received a chart (in English and Bengali) categorizing PM2.5 levels into six categories: good, moderate, unhealthy for sensitive groups, unhealthy, very unhealthy, and hazardous. The chart also described the health risks associated with each pollution level, including increased likelihood of heart disease, stroke, and lung cancer in adults, and respiratory issues in children under 5.

tion levels. Starting December 8, for the 'Both (Together)' group, enumerators began recording air quality levels both before and after the purifier was activated to precisely measure the change in pollution levels each household observed. Figure A.14 shows the variation in air purifier effectiveness. Households in the 'Both (Together)' group observed a 44% average decline in PM2.5 levels from an average reading of 159 $\mu g/m^3$ before the purifier was turned on.[31]

After administering these treatments, we repeated our questions about health risk beliefs, air quality perceptions, and views on purifier effectiveness to measure how each intervention affected these outcomes. We then employed a modified BDM mechanism to elicit households' willingness to pay for air purifiers, using the same methodology as in our first experiment to ensure comparability of results.[32] Table A.18 confirms our successful randomization, demonstrating balance across all but one pre-treatment variables between the different treatment groups.

3.2 Correcting beliefs about both IAP severity and purifier effectiveness is not sufficient to increase purifier valuation

Our findings replicate results from the first experiment while also revealing two additional insights: (i) access to credit has no impact on households' WTP for air purifiers; (ii) beliefs correction alone is insufficient to increase purifier valuation.

Econometric specification. We estimate the following regression specification:

$$\begin{aligned} Y_i = &\alpha + \beta_1 \times PurifierOnly_i + \beta_2 \times MonitorOnly_i + \\ &\beta_3 \times Both(Separately)_i + \beta_4 \times Both(Together)_i + \\ &\beta_5 \times CreditOnly_i + \varepsilon_i \end{aligned} \tag{9}$$

where Y_i represents either the belief of household i regarding the severity of indoor air pollution levels or air purifier effectiveness or the WTP for household i, determined through the modified BDM mechanism like in Experiment 1. Similarly, both perceptions of air pollution and air purifier effectiveness are measured using the same survey questions as in Experiment 1. We use heteroskedasticity robust standard errors.

Results. We present these results in Tables 5 and 6. First, access to credit had no impact on households' beliefs or WTP for air purifiers. This result is perhaps unsurprising, given that this

[31] This variation in air purifier effectiveness is not experimental and depends on numerous factors during the demonstration: structural elements (room size, ceiling height, number of windows and doors, whether they're open or closed, air circulation patterns); placement factors (purifier position, distance from monitor); and circumstantial variables (protocol adherence by enumerators, time of day, date, number of people present, ongoing activities like cooking or smoking).

[32] We set up the random price draw to sell no more than one purifier for either BDT 500 or 1,000 in each treatment group. Among these low-price opportunities, only one household stated a valuation above the drawn price (BDT 1,000), and we successfully sold the purifier to this household.

sample resembles the one from Experiment 1: residents of middle-income apartment blocks, 34% of whom own air conditioners, which cost at least twice as much as air purifiers. Indeed, households in our sample are significantly richer than those studied by Berkouwer and Dean (2022), who find that credit constraints explain low adoption of energy-efficient charcoal cookstoves in Kenya. Average annual household income (from labor alone) in our setting exceeds US$6,000, compared to US$2,500 in their sample.

Second, households that only observed a demonstration of air purifiers became more certain about purifier effectiveness. These households were 12 percentage points more likely to form an opinion about air purifier effectiveness, representing a 22% increase in the likelihood of forming an opinion. However, this effect is less than half the size of what we observed in Experiment 1, where households were actually provided with a free air purifier. We also report effects on perceptions of purifier effectiveness. Again, the coefficients across the distribution of perceived effectiveness are less than half the size of those observed in Experiment 1 for households that received an air purifier. Households that only saw a demonstration of air purifiers did not change their beliefs about IAP severity. Given our research design featuring a non-subtle, one-time demonstration, this selective updating is reassuring; it suggests that participants were responding specifically to information about purifier effectiveness rather than experiencing a general priming effect about air quality concerns. If participants had been merely primed to think more about air quality issues overall, we would expect to see changes in both purifier effectiveness *and* IAP severity beliefs. Finally, we found no effects on WTP, which is consistent with Experiment 1, where households given a free purifier did not appear to use it.

Third, households exposed only to air monitors recognized that their indoor air was more polluted. These households updated their beliefs about OAP severity, IAP severity, and the infiltration coefficient between OAP and IAP. The effects on all three outcomes were roughly double the magnitude of those observed in Experiment 1. Specifically, we find that exposure to the monitor significantly increases households' perception of the poor quality of indoor air, with the estimate showing an increase of 0.790 points or slightly below 20%. Unlike in Experiment 1, we also observe a statistically significant increase in household perception of outdoor air pollution. Overall, exposure to the monitor reduces the misconception that indoor air quality is substantially better than outdoor air quality, increasing the perceived indoor to outdoor air pollution ratio from 0.43 in the control group to 0.5.[33] However, we found that exposure to air monitors alone had no effect on beliefs about purifier effectiveness. We also didn't observe any impacts on WTP, which is consistent with our findings in Experiment 1.

Fourth, households exposed to both devices separately (monitor first, then purifier) recognized both indoor pollution severity and purifier effectiveness, yet still showed no increase in

[33]Consistent with Experiment 1, we also find that households exposed to a monitor are more likely to believe that indoor air pollution carries health risks, although these estimates are not always statistically significant (Table A.19).

WTP. The size of the effect for perceived purifier effectiveness was similar to that observed in households exposed only to a purifier. Similarly, the magnitude of the effects for IAP severity is largely similar to that observed in households exposed only to the monitor. The consistency of these magnitudes is reassuring, as these three groups of households didn't fundamentally observe anything different when exposed to either or both devices. However, despite recognizing both the problem (indoor pollution) and the solution (purifier effectiveness), these households did not demonstrate an increased willingness to pay for air purifiers.

Fifth, as mentioned above, households exposed to both devices simultaneously directly observed a 44% average decline in PM2.5 levels from an average reading of 159 $\mu g/m^3$ before the purifier was turned on. Here, the size of the effect for perceived purifier effectiveness is larger than that observed in households exposed only to a purifier or than that for households exposed to both devices separately, but still smaller than that observed in Experiment 1. The magnitude of the effect for IAP severity, is largely similar to that observed in households exposed only to a monitor or for households exposed to both devices separately. Overall, despite the clear demonstration of effectiveness and their resulting recognition of both indoor pollution severity and purifier effectiveness, this group also showed no increase in WTP.

4 Why Is Meaningful Purifier Use Necessary to Increase Valuation?

Our results suggest that households will not value or use freely distributed air purifiers until misbeliefs about both indoor pollution severity and purifier effectiveness are corrected. Yet correcting these misbeliefs alone appears to be insufficient to raise valuation, perhaps explaining why companies avoid door-to-door demonstrations to sell air purifiers. Increasing valuation requires both providing free or subsidized air purifiers and correcting these dual misperceptions. This combination drives meaningful usage, which through direct experience ultimately increases households' valuation of the technology.

While we do not take a definitive stance on the specific mechanism by which actual use increases valuation, several possibilities stand out. First, if clean air functions as an experience good, and meaningful use reduces PM2.5 levels, it could increase purifier valuation. Second, households may experience direct health benefits that lead them to value purifiers more highly. Third, extended personal use helps correct misconceptions about the operational costs or practical considerations associated with purifier use. Fourth, extended personal purifier use may matter because it produces larger shifts in beliefs and reductions in uncertainty. In this section, we discuss these possibilities in detail.

4.1 Households with purifiers experienced PM2.5 reductions

If clean air acts as an experience good, then experiencing lower indoor PM2.5 should increase households' valuation of the device. For context, Kahn, Sun and Zheng (2022) document that China's mid-2020 COVID-19 lockdowns sharply improved urban air quality, which immediately triggered more online discussion of the environment and faster adoption of green subsidies, consistent with the "experience-good" idea.

To test whether purifiers deliver such experience-driven gains in our setting, we first verify that they actually reduce indoor pollution. We use indoor PM2.5 readings from Experiment 1, collected by monitors in randomly assigned purifier and non-purifier homes between the Phase 2 survey and April 1 (end of Phase 3). Monitor use is potentially endogenous to purifier assignment because the two devices are complements: getting a monitor spurs purifier use (our main result), and receiving a purifier prompts households to switch the monitor on (Table A.20). To avoid bias, we impute indoor PM2.5 whenever a household's monitor is off. We multiply the outdoor PM2.5 reading by the mean outdoor-to-indoor infiltration ratio observed in non-purifier households with monitors. This approach assumes the purifier is off whenever the monitor is off, yielding a conservative estimate of the treatment effect.

We find that air purifiers lower daily-average PM2.5 by 5.72 $\mu g/m^3$ (5%) from a baseline of 112 $\mu g/m^3$ (Table 7). In the log specification, the same data imply a 14% reduction.[34] When we split the day into six four-hour windows, the biggest absolute gains appear in the late afternoon and evening—about 9–11 $\mu g/m^3$ between 4 p.m. and midnight—while midday effects are smaller and imprecise. The log results echo this pattern, showing fairly uniform 10–16% drops across the day but peaking after 4 p.m. The larger evening gains may stem from behavior. After work, the household may switch the purifier on and keep it running while everyone is indoors, then power it down before sleep. At the same time, windows tend to be closed in the cooler evening hours during winter, so less outdoor smoke or traffic dust leaks in, letting the purifier clean the air more effectively.

Restricting the sample to hours with observed indoor-monitor readings produces coefficients that closely match the main results in both level and log models, though with wider confidence intervals. Because these non-imputed estimates line up with the imputed ones, missing data are unlikely to bias our findings: purifiers consistently cut indoor PM2.5, with the largest drops occurring in the evening when households are usually at home (Table A.21).

Overall, purifiers lower PM2.5, and that firsthand experience of cleaner air could contribute to households' higher valuation of the purifiers.

[34] Purifier efficiency declines on the dirtiest days (Talhelm, 2017); therefore the level regression, driven by high-pollution observations and divided by a large sample mean, delivers a muted 5% change. The log regression, which weights each day's proportional change equally, captures the larger percentage gains seen on cleaner days.

4.2 Households with purifiers did not observe any health benefits

Households may remain uncertain about or underestimate the health benefits of purifier use (Adhvaryu, 2014). Direct extended experience allows them to observe benefits firsthand, potentially increasing purifier valuation.

To test this hypothesis, we use data from the Phase 3 survey (Experiment 1) to examine how an air purifier, after three months of ownership, affects objective and self-reported health outcomes, sleep, mental health, labor income, and labor supply.

We detect no improvements in biomarkers related to respiratory health (lung capacity, breathing capacity, blood oxygen levels) or cardiovascular health (blood pressure) among households assigned a monitor, a purifier, or both (Table A.22). Furthermore, we find no evidence of reduced self-reported medical costs or improvements in an aggregate health index combining these costs and health biomarkers. Similarly, we observe no improvements across a broad set of self-reported illness symptoms, including cough, asthma, breathing problems, high blood pressure, and migraines (Table A.23). Finally, we also find no evidence of improvements in sleep, mental health, labor income, or labor supply (Tables A.24 and A.25).

This result contrasts sharply with prior experimental work in public health and epidemiology (for a review, see EPA, 2018). Previous studies show that residential air purifiers typically decrease PM2.5 levels by around 50% and improve health outcomes, including reduced allergy and asthma symptoms (measured via peak expiratory flow, bronchial inflammation markers, self-reported medication use and symptoms) and decreased cardiovascular morbidity (assessed via lung function, blood pressure, heart rate, and markers of inflammation and oxidative stress).

Several explanations may account for this inconsistency. First, the length of time of exposure to cleaner air (less than three months) may be too short for health effects to manifest. However, this seems unlikely given that most prior studies use even shorter intervention periods (e.g., 1-2 days).

Second, health effects may concentrate among participants with pre-existing respiratory or cardiovascular conditions. Unlike most prior experimental studies with small samples (fewer than 30 participants) or participants selected based on pre-existing conditions, our sample is larger and drawn from the general population.

Third, our observed PM2.5 reductions may be insufficient to generate measurable health improvements for two complementary reasons. One, given extremely high baseline levels and potential non-linear dose-response effect (Apte et al., 2015), our 5-14% average reduction in PM2.5 may not be large enough to improve health outcomes. Two, health improvements may require consistently large reductions in PM2.5 throughout the day, rather than uneven patterns with large decreases at certain times and smaller effects at others. (Berkouwer and Dean, 2025). Among nine experimental studies with sample sizes above 30 and no selection based on pre-existing conditions, four are in developed countries with PM2.5 levels below 15 $\mu g/m^3$ (the WHO recommended annual guideline), three are in developed countries with PM2.5 levels between 15 and

45 $\mu g/m^3$ and observed average reductions of 20–70% (for a detailed description of these studies, see EPA, 2018). The remaining two studies from urban China examined intervention periods of 2 days to 2 weeks and found average reductions of 60% in PM2.5 levels from baselines of 95 and 60 $\mu g/m^3$, respectively.

Finally, we did not capture all relevant outcomes that may have improved. That is, our measurement approach, while comprehensive, is not exhaustive, and may have missed other health and socioeconomic benefits that households experienced. These would, however, have to be first order to generate the increase in valuation that we observe.

Overall, however, these results suggest that it is unlikely that direct experience of health benefits is responsible for an increase in purifier valuation.

4.3 Did extended personal use correct misconceptions about operational or practical considerations?

It may be that a one-off demo may shift beliefs about indoor air severity and purifier efficacy but leaves doubts about operational or non-health aspects of use such as durability, noise levels overnight, and filter longevity (Mobarak et al., 2012). Using both devices for weeks provides direct proof on these everyday details: households hear the real noise level, observe daily performance, and see filters lasting months. These other misbeliefs fade only with extended personal use, ultimately boosting valuation.

4.4 Are larger beliefs shifts and/or uncertainty reductions necessary to increase valuation?

Extended personal experience may outweigh a one-time demonstration if individuals trust information discovered personally more than data provided by others (Conlon et al., 2025), echoing findings from Dupas (2014*b*) regarding learning through personal experimentation.[35] Such an explanation may be rationalized under both a rational Bayesian and a non-Bayesian framework.

Under a rational Bayesian framework, extended personal purifier use may matter because it produces larger belief shifts and reduces uncertainty more (Augenblick and Rabin, 2021). As discussed earlier, households in the 'Both (Separately)' and 'Both (Together)' groups in Experiment 2 experienced smaller shifts in beliefs about purifier effectiveness and smaller reductions in uncertainty compared to households in Experiment 1. It may be that due to nonlinearities in the relationship between effectiveness beliefs and valuation, these smaller belief shifts left valuation unchanged. In contrast, extended personal use in Experiment 1 generated larger belief movements and uncertainty reductions about purifier effectiveness, significantly increasing valuation.

[35] Our finding that purifier assignment increases monitor use is consistent with such experimentation.

Alternatively, a non-Bayesian view suggests that households in the 'Both (Separately)' and 'Both (Together)' groups in Experiment 2 updated their beliefs without fully reducing uncertainty due to cognitive biases or informational processing constraints (e.g., anchoring on prior beliefs), thus limiting changes in valuation. Extended personal use in Experiment 1 allowed households to more closely align belief movements with uncertainty reductions, driving substantial increases in valuation.

5 Conclusion

Air pollution represents one of humanity's most urgent health crises, with particularly devastating impacts in South Asia. In Bangladesh, like in much of South Asia, ambient PM2.5 levels routinely exceed WHO's 24-hour guidelines by 15-fold. However, the regulatory framework for outdoor air pollution control has largely failed due to limited state capacity (Piette, 2018; Duflo et al., 2013, 2018). Even under the most ambitious regulatory scenarios for 2035, air pollution levels in South Asia will likely remain at least 7 times higher than WHO standards on an annual basis (The World Bank, 2024), making private defensive behaviors and technologies critical for public health protection. Yet, despite this urgent need, adoption of air purifiers remains extremely low.

Our results suggest that in nascent markets characterized by dual misbeliefs about both problem severity and solution effectiveness, like those for air purifiers, simple price subsidies or information campaigns alone are unlikely to facilitate diffusion of life-improving technologies. Instead, policymakers and development practitioners should consider integrated approaches that simultaneously address multiple information barriers while providing experiential learning opportunities through initial free or subsidized distribution. The increase in valuation we observed after meaningful usage suggests that such combined approaches could potentially create self-sustaining markets for these technologies over time (Dupas, 2014*b*), particularly when targeted to highly central individuals in social networks (Banerjee et al., 2019).

Our results open multiple future directions for work: While beliefs correction significantly increased air purifier usage by a dramatic 236% in relative terms, absolute use averaged only 100 minutes daily, far from continuous. This raises important questions about additional frictions that prevent fuller utilization of even freely distributed purifiers. Future research should investigate these remaining barriers, which might include fatalism, aesthetic considerations, space constraints, or other factors not captured in our experiments. Furthermore, while our research establishes that extended personal air purifier use increases households' valuation of air purifiers, the precise mechanisms driving this increased valuation remain unclear. Potential explanations include clean air functioning as an experience good, belief correction about operational aspects, or more accurate or certain belief calibration through personal experimentation. Future studies should examine these mechanisms more directly,[36] as they may have implications for the design of technology adoption programs across various domains. Lastly, future research could also examine longer-term health effects of purifier ownership as well as the sustainability of valuation changes by, for example, measuring households' willingness to pay for replacement filters after extended periods of ownership. Similarly, tracking the diffusion of beliefs about indoor air pollution severity, purifier effectiveness, and technology valuation through social networks would provide valuable insights into how information and experience spread in communities.

5.1 Policy epilogue

Based on our findings, we published multiple op-eds in national newspapers—first on the severity of indoor air pollution,[37] and then on purifier effectiveness and the burdensome 74% import duty imposed on air purifiers.[38] Following these publications, we briefed the National Board of Revenue (NBR), who expressed interest in reducing duties but required ministerial support.

We then presented our findings to the Adviser to the Ministry of Environment, Forest and Climate Change (MoEFCC), who publicly endorsed reducing duties,[39] and requested our assistance in drafting a formal request. Our letter, transmitted via MoEFCC, urged the NBR to act.

On February 20, 2025, the NBR issued a Statutory Regulatory Order that reduced the cumulative import-tax burden on air purifiers from 74% to 47%—a 27 percentage point reduction.[40] This significant policy shift marks the first government action directly aimed at making indoor clean air more affordable.

While challenges remain, we view this reform as a promising first step. We are now collaborating with government agencies to promote purifier use in firms (Garg, Jagnani and Lozano-Garcia, 2025), schools, and hospitals, and to incorporate purifier recommendations into national air quality management advisories.

[36] For instance, Sun, Sorin and Resosudarmo (2025) in ongoing work in Indonesia examine whether clean air is an experience good.

[37] https://www.tbsnews.net/thoughts/hidden-danger-how-indoor-air-pollution-mirrors-outdoor-threats-1005066

[38] https://www.tbsnews.net/thoughts/breathing-easier-making-clean-air-affordable-everyone-1015181

[39] https://www.dhakatribune.com/bangladesh/dhaka/368560/rizwana-dhaka-s-air-pollution-bus-emissions

[40] https://www.tbsnews.net/bangladesh/nbr-relaxes-duty-air-purifier-import-amid-widespread-air-pollution-1048381

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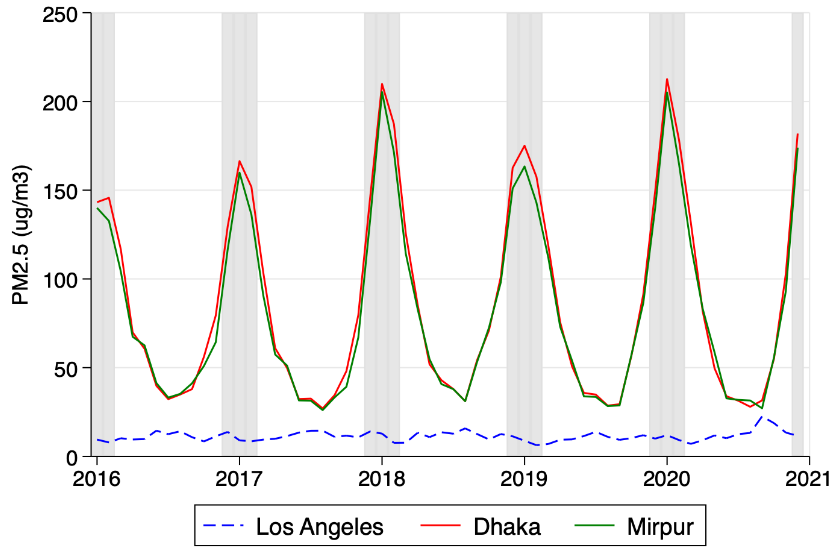
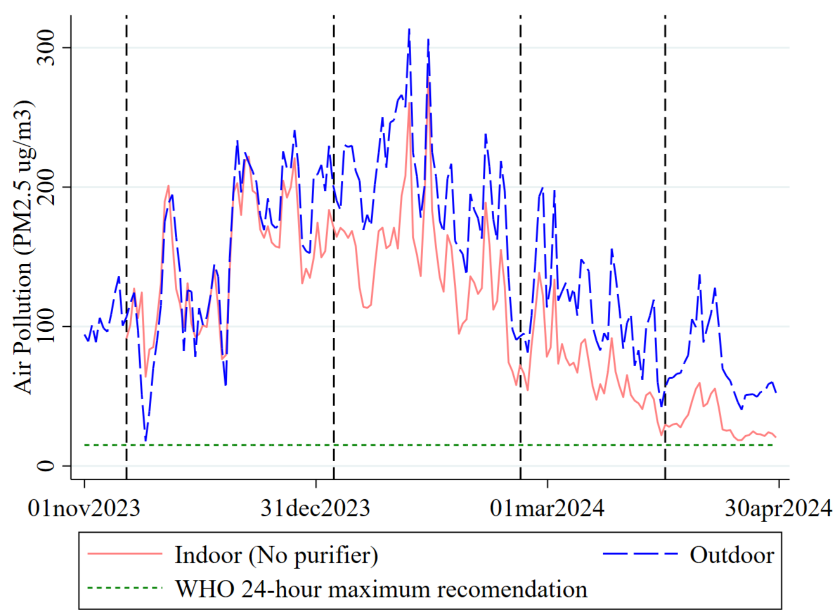
Figures

Figure 1: Timelines of Air Pollution Levels

(a) Air Pollution Levels in Dhaka vs. Los Angeles: 2016-2021



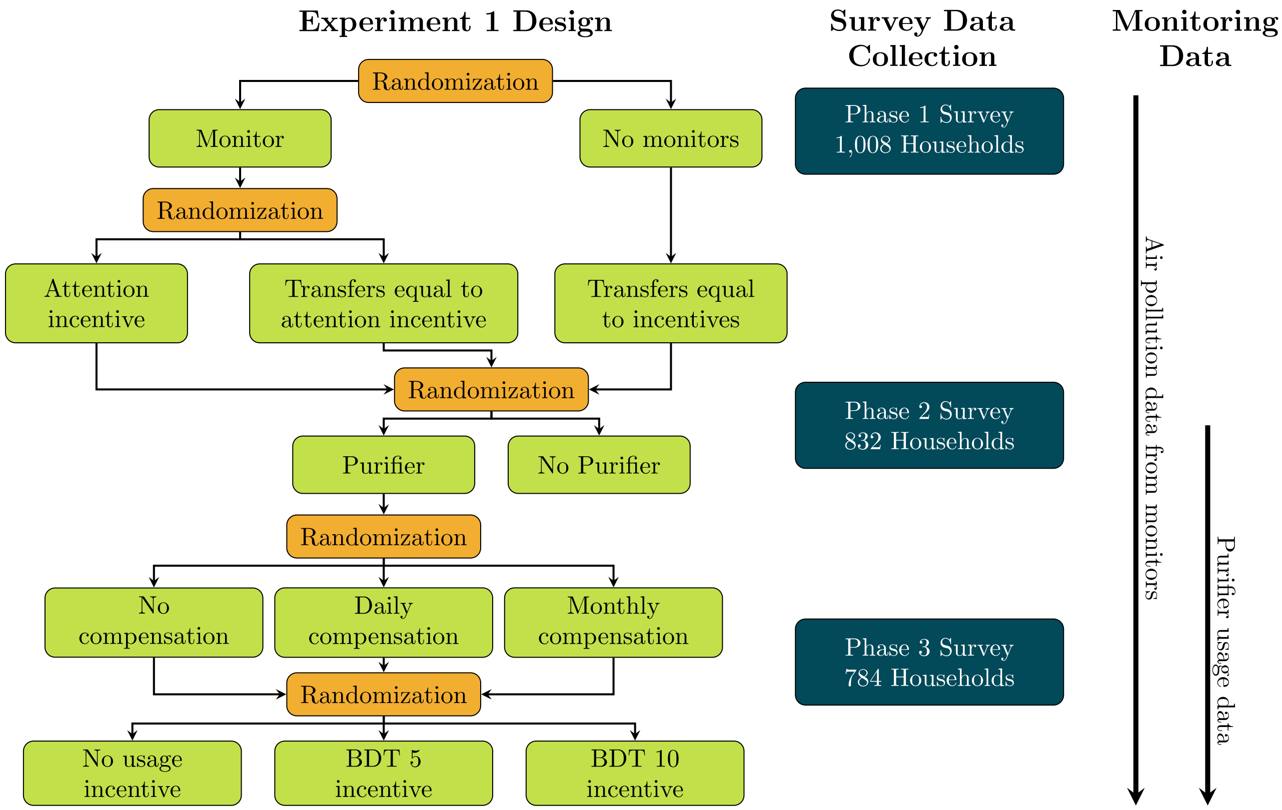
(b) Indoor vs. outdoor air pollution



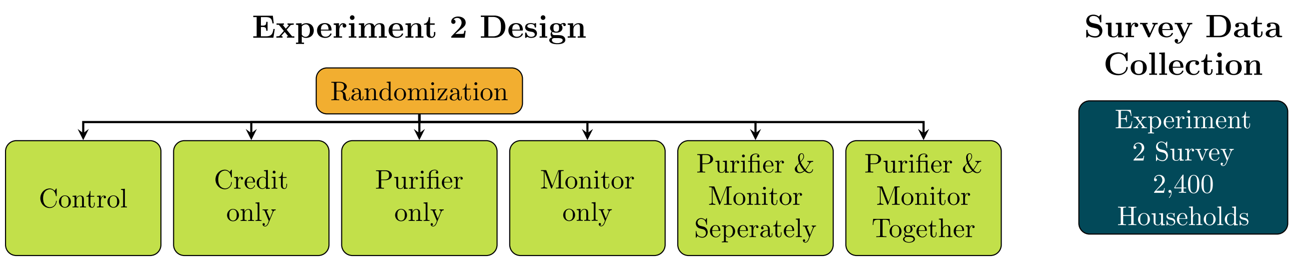
Notes: Panel (a) shows monthly satellite-derived air pollution levels in Dhaka, Mirpur (the locality in Dhaka where the experiments are carried out), and Los Angeles (for reference). The months when most of the experiment took place are shaded in gray (December, January, and February). Data is from van Donkelaar et al. (2021). Panel (b) shows the average daily air pollution outdoors and indoors for households without air purifiers. The four vertical dashed lines indicate the start of the Phase 1, 2, and 3 surveys as well as the start of the incentive experiment. Outdoor air pollution data from November 1 until November 30 is imputed using US Embassy monitor readings.

Figure 2: Flowchart Visualizing of Research Design

(a) Experiment 1



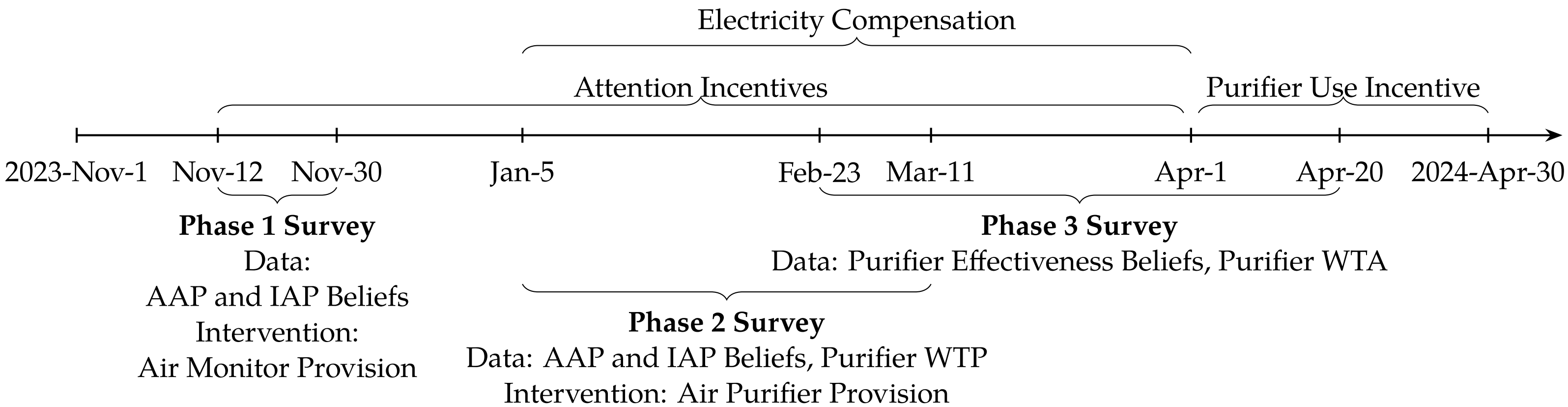
(b) Experiment 2



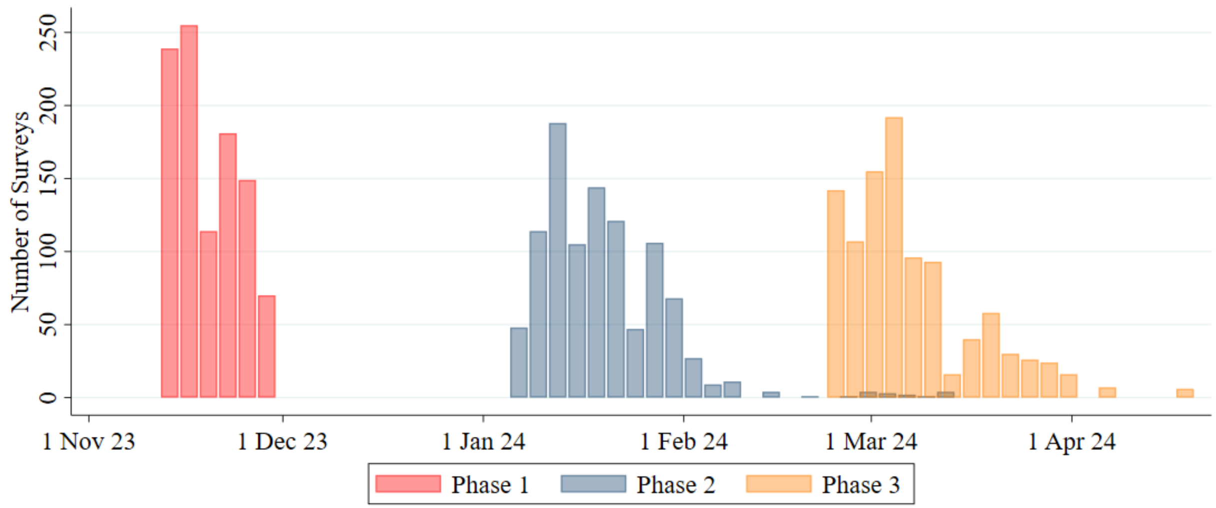
Notes: This figure shows the research design and data collection for Experiment 1 and Experiment 2. The Experiment 1 Phase 1 survey started on 12 November 2023 and concluded on 30 November 2023. The Experiment 1 Phase 2 survey started on 5 January 2024 and concluded on 11 March 2024. The Experiment 1 Phase 3 survey started on 23 February 2024 and concluded on 20 April 2024. Experiment 2 started on 19 November 2024 and concluded on 22 January 2025.

Figure 3: Timeline of Experiment 1 Interventions and Survey Data Collection

(a) Experiment 1 Interventions and Survey Data Collection



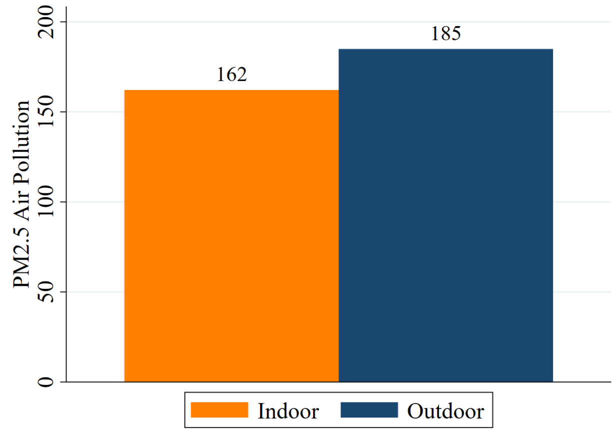
(b) Distributions of Experiment 1 Survey Dates



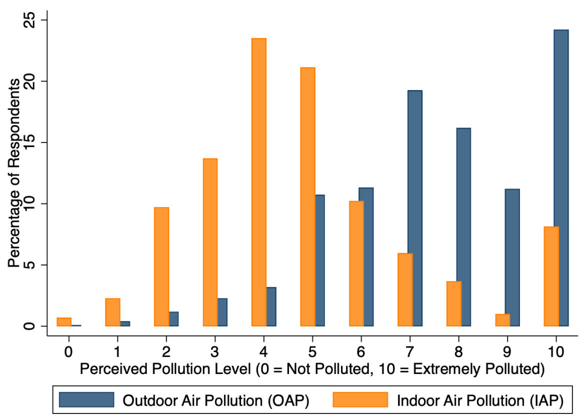
Notes: This figure shows the timeline of the interventions and data collection for Experiment 1. Sub-Figure (a) shows the sequence in which we implemented the interventions and collected the data. Sub-Figure (b) shows the distributions of the individual survey dates for each survey. The surveys were carried out in the same sequence so that the households first surveyed in Phase 1 were contacted first in Phase 2 and so on.

Figure 4: Indoor vs. outdoor air pollution: Reality and Phase 1 Perceptions

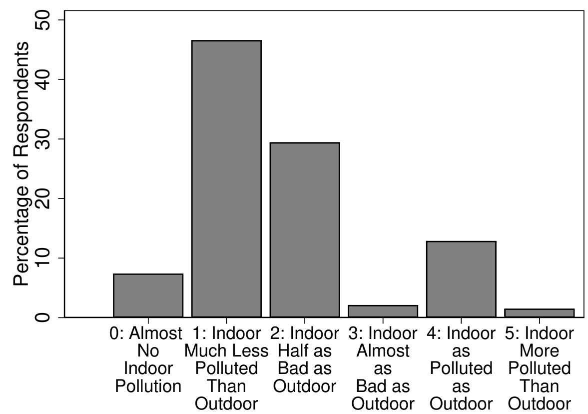
(a) Indoor vs. Outdoor Pollution



(b) Beliefs About Air Pollution



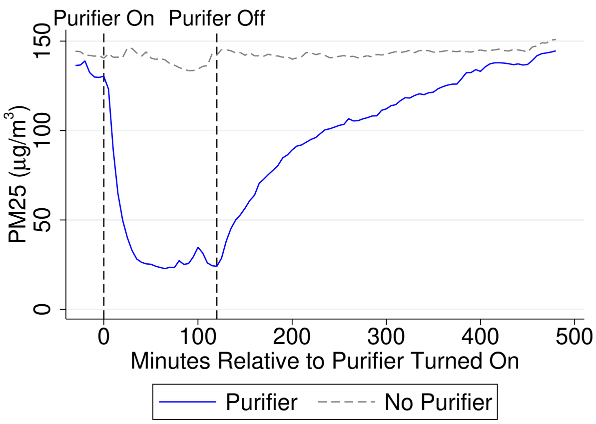
(c) Beliefs About Indoor-Outdoor Ratio



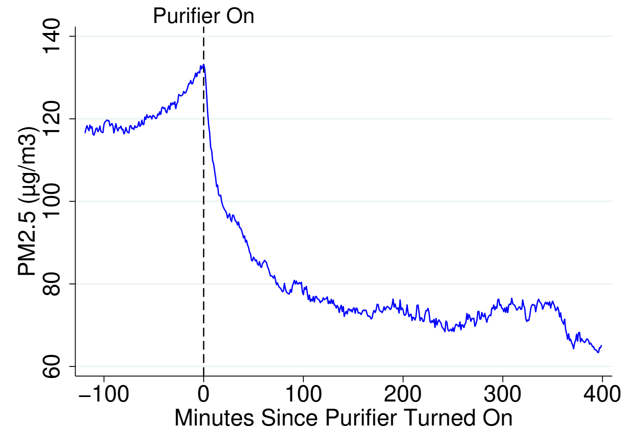
Notes: This figure provides descriptive statistics on actual and perceived air pollution levels during Experiment 1. Panel (a) shows average indoor and outdoor air pollution (measured in $\mu g/m^3$) between the Phase 1 and Phase 2 surveys using data from indoor and outdoor monitors. Panel (b) shows beliefs the severity of indoor and outdoor air pollution levels during the Phase 1 survey. Panel (c) shows households' beliefs about the relative severity of IAP and OAP during the phase 1 survey.

Figure 5: Air Purifier Effectiveness: Actual Effects vs. Perceptions

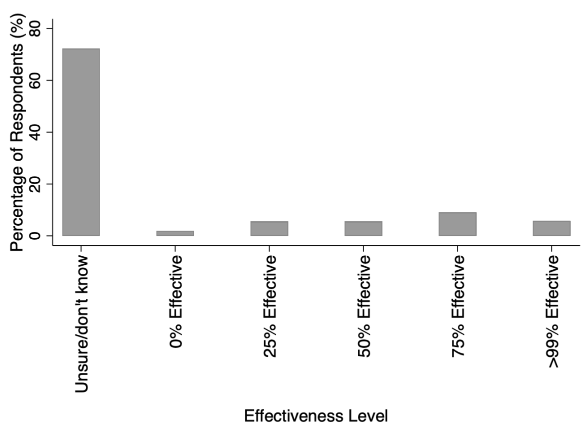
(a) Purifier Effectiveness: Controlled Conditions



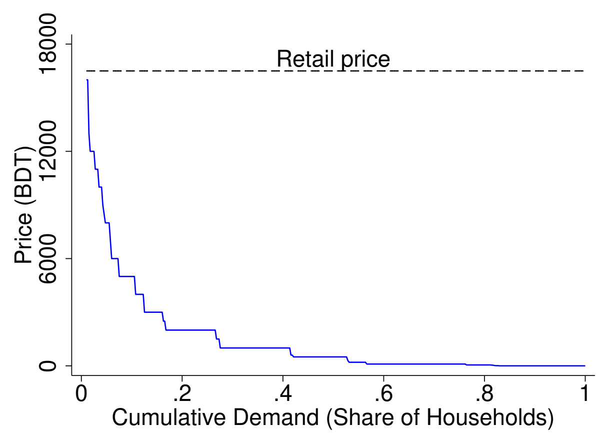
(b) Purifier Effectiveness: Households Provided Free Purifier



(c) Purifier Effectiveness Perceptions (No Purifier or Monitor)

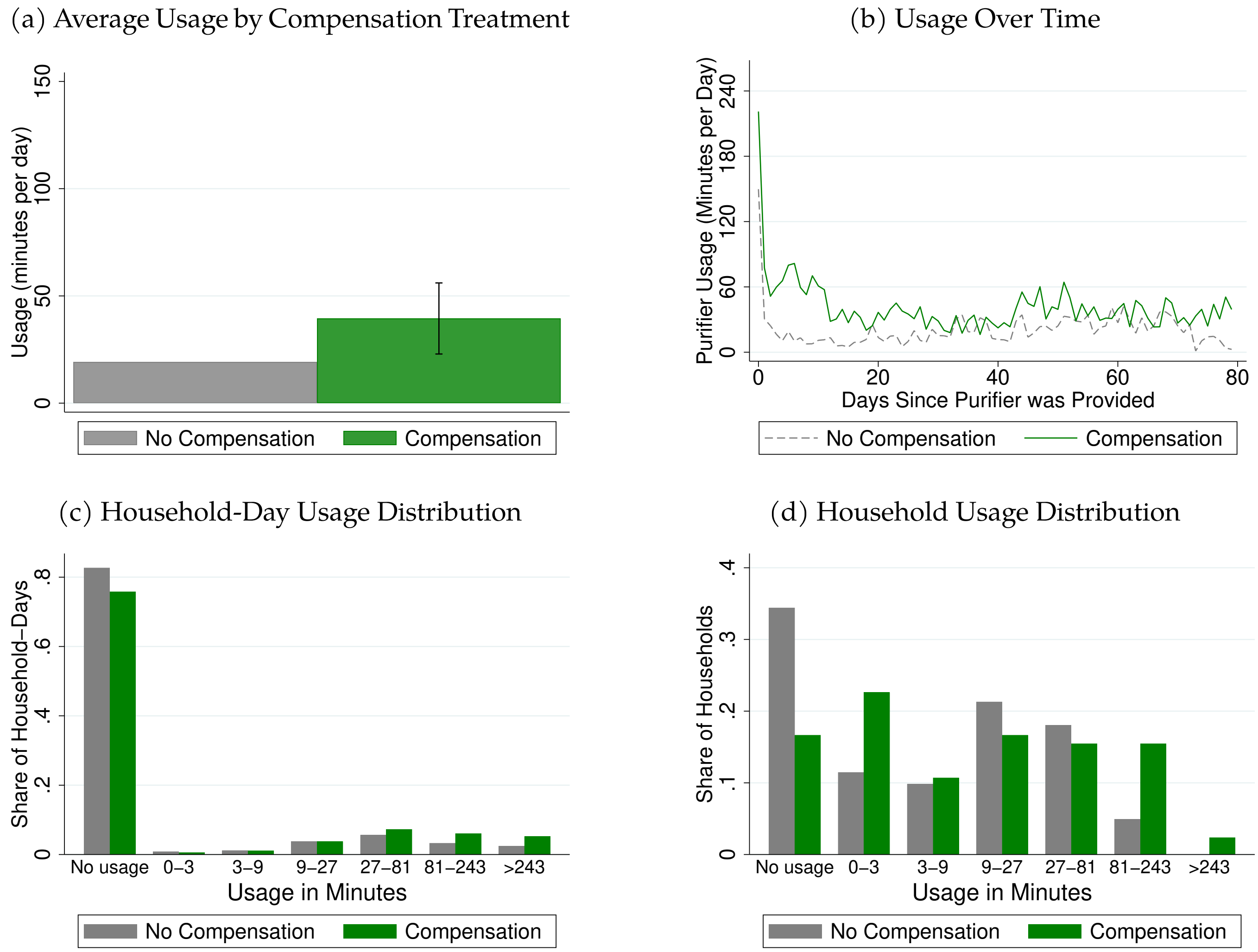


(d) Demand for Purifiers (No Monitor)



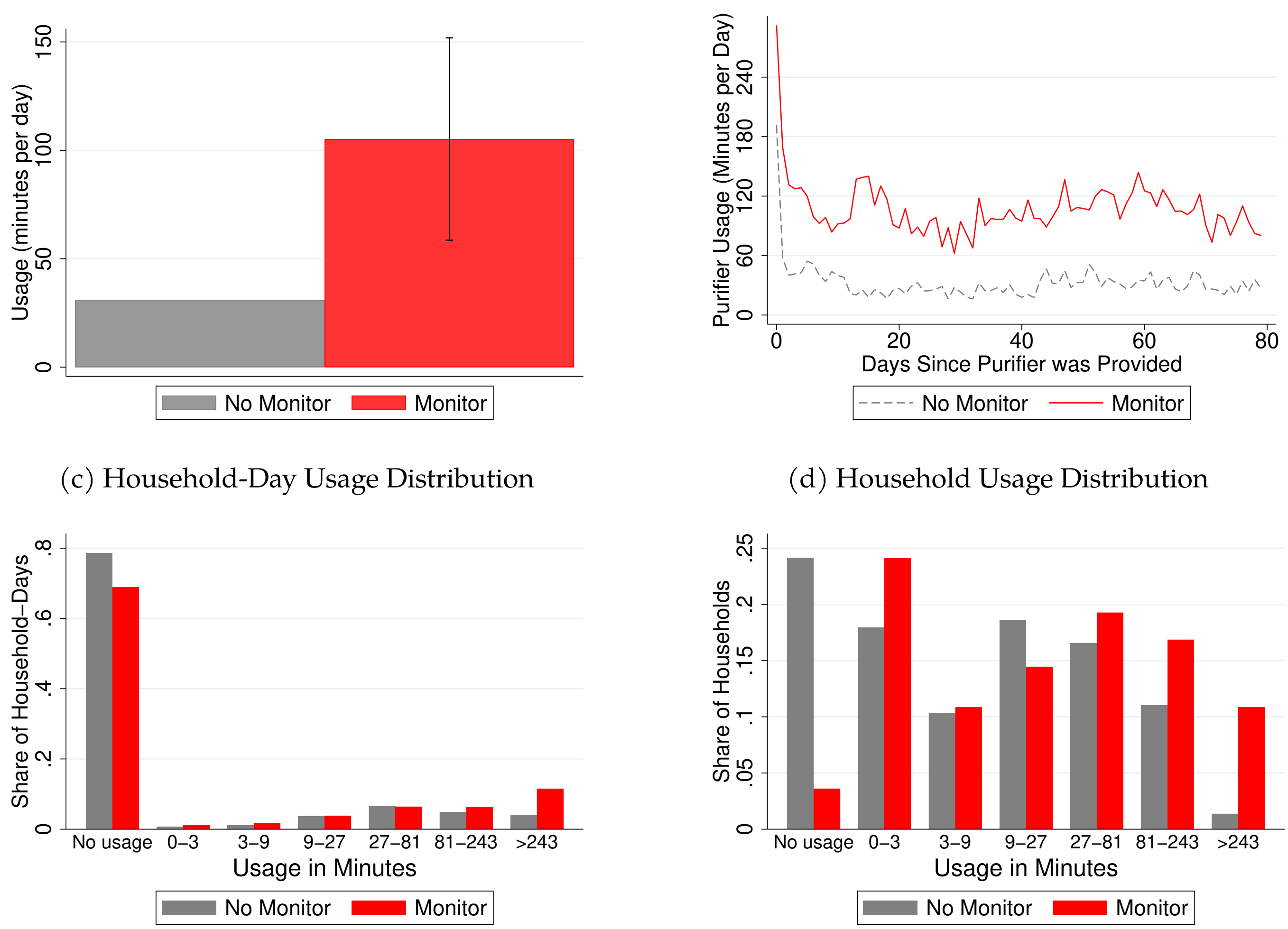
Notes: This figure describes the effectiveness of air purifiers, households' perception of their effectiveness, and households willingness to pay for purifiers during Experiment 1. Panel (a) shows how air pollution changes after an air purifier is turned on. This experiment was carried out six times in a setting similar to the apartments of the subjects in the main experiment. The air purifier was used on the medium setting and doors and windows were closed. Panel (b) shows how air pollution changes after an air purifier is turned on by the households in the experiment. Data is from the monitors and smart sockets and include each time a purifier was turned on during the time from the Phase 2 survey until 1 April 2024. Panel (c) shows beliefs about purifier effectiveness at the time of the Phase 3 survey among households who had not received an air purifier. Panel (d) shows households willingness to pay for a purifier at the time of the Phase 2 survey among households did not receive a monitor.

Figure 6: Air Purifier Usage: Effect of Electricity Compensation Treatment (without Monitor)



Notes: This Figures use smart socket data to show the difference in purifier usage among households receiving electricity compensation, compared to households not receiving compensation during Experiment 1. Only households without a monitor are included in the figure. Panel (a) compares the average minutes of purifier usage per day. The confidence interval is constructed using standard errors of the difference between the two means. Panel (b) shows the minutes of purifier usage over time. Appendix B shows the share of households represented in this analysis of air purifier use over time. Panel (c) shows the distribution of minutes of purifier usage in a household on a particular day (i.e. each observation is a household on a specific day). Panel (d) shows the distribution of average minutes the purifier was used in a household per day (i.e. each observation is a household). In panels (c) and (d), each bin is three times wider than the previous bin. Data is from the Phase 2 survey until 1 April 2024.

Figure 7: Air Purifier Usage: Effect of Monitor



(a) Average Usage by Monitor Treatment

(b) Usage Over Time

(c) Household-Day Usage Distribution

(d) Household Usage Distribution

Notes: This figure uses smart socket data show the difference in purifier usage among households in the monitor treatment (without the attention treatment), compared to those households not receiving the monitor treatment during Experiment 1. Only households with purifiers are included in the data. Panel (a) compares the average minutes of purifier usage. The confidence interval is constructed using standard errors of the difference between the two means. Panel (b) shows the minutes of purifier usage over time. Appendix B shows the share of households represented in this analysis of air purifier use over time. Panel (c) shows the distribution of minutes of purifier usage in a household on a particular day (i.e. each observation is a household on a specific day). Panel (d) shows the distribution of average minutes the purifier was used in a household per day (i.e. each observation is a household). In panels (c) and (d), each bin is three times wider than the previous bin. Data is from the Phase 2 survey until 1 April 2024.

Tables

Table 1: Effect of Monitors on Households' Perception of Indoor and Outdoor Air Quality and Willingness to Pay for Purifiers (Experiment 1, Phase 2 Survey)

	(1) Beliefs about Severity of IAP	(2) Beliefs about Severity of OAP	(3) Beliefs about IAP Relative to OAP	(4) WTP (In BDT)
Monitor	0.447***	0.161	0.0305*	-242.7
	(0.151)	(0.161)	(0.0176)	(191.8)
Observations	818	818	818	814
Control mean	4.54	7.05	0.43	1408.65

Notes: This table shows the effect of air quality monitors treatment on households' perception of indoor and outdoor air pollution. All outcome variables are measured during Phase 2 survey of Experiment 1. Observations are at the household level. Column 1: "Beliefs about Severity of OAP" is households' response to: "How would you rate the current outdoor air quality in your area? [On a scale of 1-10, with 1 being "not polluted at all" and 10 being "extremely polluted.]" Column 2: "Beliefs about Severity of IAP" is households' response to: "How would you rate the current indoor air quality in your area? [On a scale of 1-10, with 1 being "not polluted at all" and 10 being "extremely polluted.]" Column 3: "Beliefs about IAP v. OAP" is households' response to: "How polluted do you believe the air in your home is compared to the air outdoors?" The variable is measured from 0-10. Column 4: Revealed preference willingness to pay for an air purifier elicited using a modified-BDM mechanism. WTP values are winsorized at the 99% level. Significance levels are denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

Table 2: Effect of Purifiers on Perceptions of Purifier Effectiveness (Experiment 1, Phase 3 Survey)

	(1) Has Opinion	(2) $> 0\%$ effective	(3) $> 25\%$ effective	(4) $> 50\%$ effective	(5) $> 75\%$ effective
Monitor	0.112**	0.114**	0.125**	0.104**	-0.007
	(0.056)	(0.055)	(0.054)	(0.050)	(0.030)
Purifier	0.280***	0.279***	0.304***	0.273***	0.134***
	(0.052)	(0.052)	(0.052)	(0.050)	(0.039)
Purifier x Monitor	0.004	0.018	-0.052	-0.070	0.098
	(0.083)	(0.083)	(0.086)	(0.086)	(0.069)
Observations	758	758	758	758	758
Control mean	0.384	0.357	0.281	0.205	0.080

Notes: This table shows the effects of purifier, monitor, the interaction between the two on perception of air purifier effectiveness measured during Phase 3 survey. We also control for the interaction of purifier and electricity incentive treatments (monthly or daily). The outcome is the response to a question asking how effective the household thinks regular air purifiers that can be bought in shops in Dhaka are at removing air pollution from the room in which they are being run. This variable ranges from 0 being completely ineffective to 1 being (almost) completely effective. Column 1 is a binary variable equal to 1 if the household selected any option other than "Don't know/unsure". Columns (2) - (5) are binary variables equal to 1 if the household said the purifier was more than 0%, 25%, 50% or 75% effective. Observations are at the household level during Phase 3 survey. Significance levels are denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

Table 3: Effect of Compensation for Electricity Costs on Purifier Use (Experiment 1, Smart Socket Data)

	Minutes of Usage per Day		
	(1)	(2)	(3)
Purifier x Any Compensation	17.47	13.15	19.86**
	(16.16)	(18.47)	(8.385)
Purifier x Daily Compensation		8.823	
		(24.09)	
Time FE	Yes	Yes	Yes
Sample	Full	Full	Without monitor
Observations	22,536	22,536	10,708
Clusters	304	304	145
Control mean	54.7	54.7	19.2

Notes: This table shows the effect of providing compensation for the cost of electricity used by the purifier. Each observation is at the day-by-household level. Column (1) and (2) includes all households with purifiers. Column (3) excludes households with monitors. The outcome variable is the minutes of the day that the air purifier was turned on. Data is from the Phase 2 survey until 1 April 2024. Standard errors are clustered at the household level. $***p < 0.01$; $**p < 0.05$; $*p < 0.1$.

Table 4: Effect of Monitors on Air Purifier Use And WTA (Experiment 1)

	(1)	(2)	(3)	(4)
	Min per Day	Days Used (30+ min)	Days Used (30+ min)	WTA (In BDT)
Monitor	74.58***	0.630***	0.492*	3983.0*
	(23.80)	(0.234)	(0.281)	(2365.2)
Time FE	Yes	Yes	No	No
Sample	All Days	All Weeks	Week Before Survey	Households
Observations	22,536	3,497	297	298
Clusters	304	304	297	298
Control mean	31.11	1.08	0.96	14,332.84

Notes: This table shows the effect of providing monitors on purifier use and willingness to accept (WTA) for air purifiers in the Phase 3 survey of Experiment 1. We control for if the household also receives the attention incentive. In column (1) observations are at the day-by-household level. In column (2) observations are at the week-by-household level. Data is only from households who participated in the Phase 2 survey and were assigned a purifier. In columns (3) and (4) observations are at the household level, and the sample is further restricted to households who also participated in the Phase 3 survey. Columns (1) and (2) use smart socket data from the dates between the Phase 2 survey and 1 April 2024. Column (3) use smart socket data from the week before the Phase 3 survey, making it directly comparable to the self-reported data in Appendix Table A.14. Column (4) is a revealed preference WTA for selling back an air purifier elicited using a modified-BDM mechanism. WTA values are winsorized at the 99% level. Columns (1) and (2) use standard errors clustered at the household level while columns (3) and (4) use robust standard errors. $***p < 0.01; **p < 0.05; *p < 0.1$.

Table 5: Treatment Effects - Purifier Effectiveness (Experiment 2)

	(1) Has Opinion on Purifier Effectiveness	(2) Perceived Reduction: $> 0\%$	(3) Perceived Reduction: $> 25\%$	(4) Perceived Reduction: $> 50\%$	(5) Perceived Reduction: $> 75\%$
Purifier Only	0.117***	0.130***	0.120***	0.1000***	0.0675***
	(0.0350)	(0.0351)	(0.0344)	(0.0295)	(0.0183)
Monitor Only	0.00750	0.0150	0.0125	0.0325	0.0200
	(0.0354)	(0.0352)	(0.0337)	(0.0280)	(0.0154)
Both (Separately)	0.137***	0.135***	0.140***	0.0925***	0.0400**
	(0.0348)	(0.0351)	(0.0345)	(0.0293)	(0.0168)
Both (Together)	0.153***	0.182***	0.200***	0.157***	0.0600***
	(0.0347)	(0.0347)	(0.0344)	(0.0304)	(0.0179)
Credit Only	-0.0200	-0.0250	-0.0375	-0.00500	0.0300*
	(0.0354)	(0.0351)	(0.0330)	(0.0269)	(0.0161)
Observations	2400	2400	2400	2400	2400
Control Mean	0.49	0.45	0.34	0.18	0.04

Notes: Purifier only: household is shown the purifier and that it works. Monitor only: household is shown that the monitor works and allowed to see the reading. Both (separately): first the household is shown the monitor works and the reading on the monitor. The monitor is then put away the household is shown the purifier and that it works. Both (together): the household is first shown the monitor and it's reading. Then while the monitor is still on and visible, the purifier is turned on for five minutes and the household is allowed to see the changes in the reading. Credit only: the household is offered a zero-interest option for financing the purifier purchase. Each of the five treatment arms are measured against a control group. The outcome is the response to a question asking how effective the household thinks regular air purifiers that can be bought in shops in Dhaka are at removing air pollution from the room in which they are being run. This variable ranges from 0 being completely ineffective to 1 being (almost) completely effective. Column 1 is a binary variable equal to 1 if the household selected any option other than "Don't know/unsure". Columns (2) - (5) are binary variables equal to 1 if the household said the purifier was more than 0%, 25%, 50% or 75% effective. Observations are at the household level. Significance levels are denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

Table 6: Treatment Effects - Beliefs, WTP (Experiment 2)

	(1) Beliefs about Severity of IAP	(2) Beliefs about Severity of OAP	(3) Beliefs about IAP v. OAP	(4) WTP (In BDT)
Purifier Only	0.180	-0.142	0.00450	199.3
	(0.153)	(0.169)	(0.0156)	(220.3)
Monitor Only	0.790***	0.492***	0.0663***	-250.4
	(0.153)	(0.163)	(0.0157)	(210.2)
Both (Separately)	0.665***	0.245	0.0375**	-168.9
	(0.155)	(0.168)	(0.0159)	(208.4)
Both (Together)	0.695***	0.563***	0.0630***	-47.89
	(0.157)	(0.163)	(0.0159)	(205.3)
Credit Only	0.115	-0.110	-0.00950	-213.9
	(0.161)	(0.169)	(0.0163)	(218.9)
Observations	2400	2400	2400	2400
Control Mean	4.21	6.66	0.43	2699.55

Notes: This table shows the effect of the treatment arms in Experiment 2. Purifier only: household is shown the purifier and that it works. Monitor only: household is shown that the monitor works and allowed to see the reading. Both (separately): first the household is shown the monitor works and the reading on the monitor. The monitor is then put away the household is shown the purifier and that it works. Both (together): the household is first shown the monitor and it's reading. Then while the monitor is still on and visible, the purifier is turned on for five minutes and the household is allowed to see the changes in the reading. Credit only: the household is offered a zero-interest option for financing the purifier purchase. Each of the five treatment arms are measured against a control group. Column 1: "Beliefs about Severity of AAP" is households' response to: "How would you rate the current outdoor air quality in your area? [On a scale of 1-10, with 1 being "not polluted at all" and 10 being "extremely polluted.]" Column 2: "Beliefs about Severity of IAP" is households' response to: "How would you rate the current indoor air quality in your area? [On a scale of 1-10, with 1 being "not polluted at all" and 10 being "extremely polluted.]" Column 3: "Beliefs about IAP v. AAP" is households' response to: "How polluted do you believe the air in your home is compared to the air outdoors?" Column 4: "Willingness to Pay for Air Purifier" is the revealed valuation of an air purifier by the household during a BDM game measured in Bangladeshi Takas. WTP is winsorized at the 99% level. Observations are at the household level. Significance levels are denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

Table 7: Effect of Purifiers on Pollution (Experiment 1)

Panel A:	PM2.5 ($\mu g/m^3$, with imputed values)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Purifier	-5.72*	-7.65*	-3.88	-1.23	-1.13	-9.44**	-10.90**
	(3.12)	(4.25)	(4.20)	(2.72)	(4.62)	(4.27)	(4.49)
Baseline PM2.5 (w. imputed)	0.42***	0.51***	0.34***	0.25***	0.33***	0.52***	0.58***
	(0.05)	(0.08)	(0.08)	(0.05)	(0.08)	(0.08)	(0.08)
Panel B:	ln(PM2.5, with imputed values)						
Purifier	-0.140***	-0.155***	-0.143**	-0.116**	-0.102*	-0.160***	-0.163***
	(0.053)	(0.057)	(0.062)	(0.056)	(0.056)	(0.053)	(0.055)
ln(Baseline PM2.5, w. imputed)	1.198***	1.284***	1.253***	1.122***	1.006***	1.202***	1.318***
	(0.168)	(0.183)	(0.196)	(0.171)	(0.170)	(0.161)	(0.175)
Hours	All	0-4	4-8	8-12	12-16	16-20	20-24
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	744,450	123,200	123,582	123,186	124,256	124,968	125,258
Clusters	416	416	416	416	416	416	416
Control mean	112	138	117	86	87	110	132

Notes: This table shows the effect of providing air purifiers on average air pollution during Experiment 1, using imputed values for air pollution when monitors are turned off. The imputed values are calculated using the average ratio between the indoor and outdoor pollution in households without an air purifier and multiplying that by the outdoor pollution reading during the hour that the household's monitor was turned off. Each observation is at the hour-by-household level among households with air monitors who remained in the survey until the Phase 2 survey (when the purifiers were provided). Note that all days are included, regardless of whether the purifier was turned on or not. The outcome variable in Panel A is the average air pollution in that hour. In Panel B, the outcome variable is the log of the average air pollution. Column (1) shows results for all hours of the day. Columns (2)-(7) show results for specific times of the day, divided into 4-hour periods. Data is from the date of the Phase 2 survey until 1 April 2024. Standard errors are clustered at the household level. $***p < 0.01; **p < 0.05; *p < 0.1$.

Appendix

A Data Collection, Cleaning, and Validation

A.1 Data Preprocessing: Winsorization

To improve the reliability of the data and mitigate outliers from misreporting or measurement errors, we winsorize our data at the 1st and 99th percentiles. This procedure replaces values below the 1st percentile with the 1st percentile value, and values above the 99th percentile with the 99th percentile value for each variable.

A.2 Willingness to Pay Elicitation

To elicit willingness to pay (WTP), we implemented a modified Becker-DeGroot-Marschak (BDM) mechanism following the approach of Berry, Fischer and Guiteras (2020). In this procedure, households first reported their WTP, after which a random price was drawn. If the household's stated WTP exceeded the random price, they were offered the opportunity to complete the transaction by paying the random price (not their stated WTP). This mechanism creates incentive compatibility, encouraging households to truthfully reveal their actual WTP.

Households were informed that the random price would fall somewhere between zero and the market price of the air purifier, which was disclosed to them, but they were not shown the full distribution of possible random prices. To familiarize participants with this elicitation method before the main task, we conducted a real-stakes practice round using the same protocol to elicit WTP for a plastic container box with a market price of BDT 60.

A.3 Air Quality Monitoring Devices

A.3.1 Comparing readings from indoor and outdoor monitors

We deployed two distinct models of air quality monitors in our data collection efforts. For indoor monitoring, households used Qingping Lite monitors, while outdoor measurements were conducted using IQAir AirVisual Outdoor monitors. To validate the equipment and ensure that observed differences between indoor and outdoor air pollution measurements were not artifacts of different monitoring technologies, we conducted a calibration test. We placed one outdoor monitor alongside three indoor monitors in the same room for a one-week period and analyzed their hourly average readings. The average difference in $PM_{2.5}$ readings between the indoor and outdoor monitors was 1.3 $\mu g/m^3$ or 2.2%. The correlation coefficient between the indoor and outdoor monitor readings was 0.96. These results confirm that systematic measurement differences between the two monitor types are minimal, particularly when compared to the natural hour-to-hour variations in air pollution levels.

A.3.2 Comparing readings from our outdoor monitors and the US embassy monitor

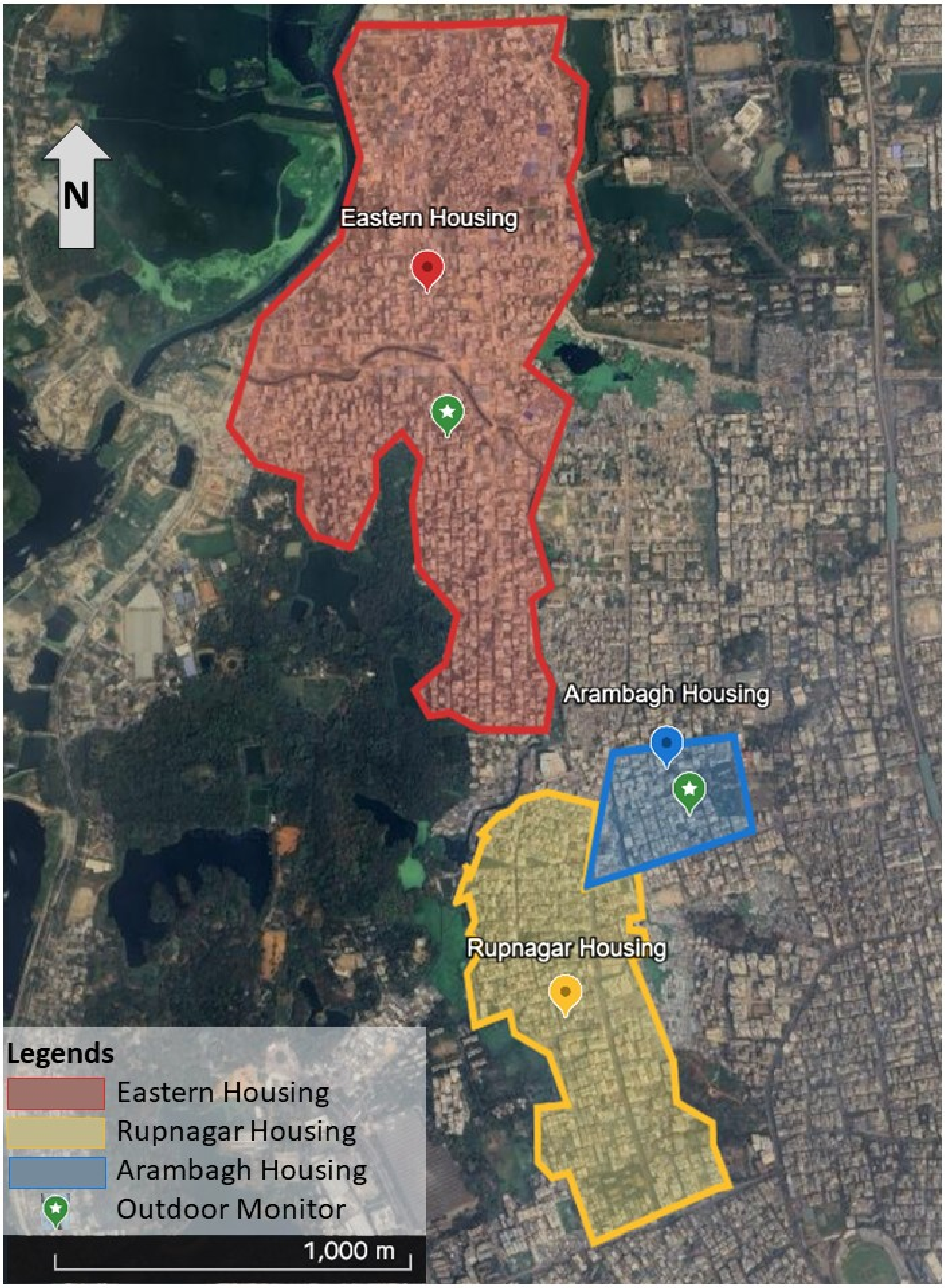
We can also measure the differences between our outdoor monitors and the reference-grade monitor of the US embassy in Dhaka. These differences could be driven by both differences in measurement as well as actual differences in air pollution between our research site and the US embassy, which are approximately 6km apart from each other. The average difference between our monitors and the US embassy monitor is -0.80 $\mu g/m^3$ or -2.99 %. The correlation between our monitors and the US embassy monitor is 0.96. Again, we conclude that when compared to the natural variations in air pollution levels the differences in measurement error are small even when amplified by geographical differences in air pollution levels.

B Share of Households Represented in Analysis of Air Purifier Use Over Time

In Figures 6b and 7b, we present the purifier usage per household over time, relative to the Phase 2 survey when the air purifier was provided to the household. The sample ends on April 1, 2024, as we then started the usage incentive treatments, which substantially altered purifier usage. However, as households received their purifiers on different dates, the number of days between provision of the purifier and April 1, 2024, differs from household to household. Figure A.15 shows how the share of households in the sample decreases over time as more households reach April 1, 2024. The vertical dashed line indicates where the timelines in Figures 6b and 7b end as the sample becomes very small.

C Figures

Figure A.1: Map of Study Area



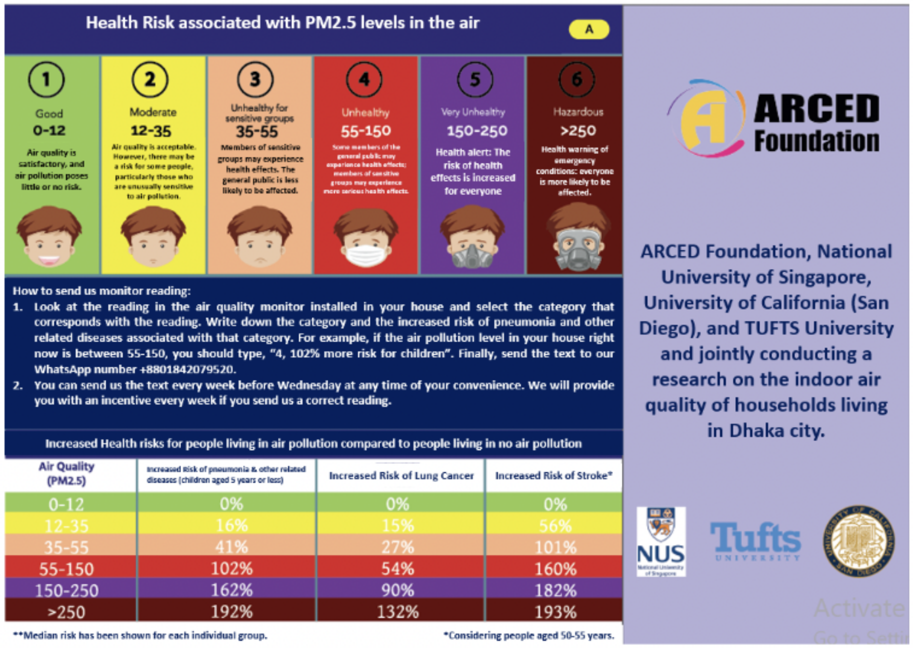
Notes: This is a map of the three housing associations in which the study was conducted. All of the housing associations are located in the Mirpur area of Dhaka, Bangladesh.

Figure A.2: Air Pollution Monitor

Notes: Image of the air quality monitor provided to the households in the monitor treatment group. For more details, see: https://www.qingping.co/air-monitor-lite/overview

Figure A.3: Air Pollution Information Charts Provided to Households

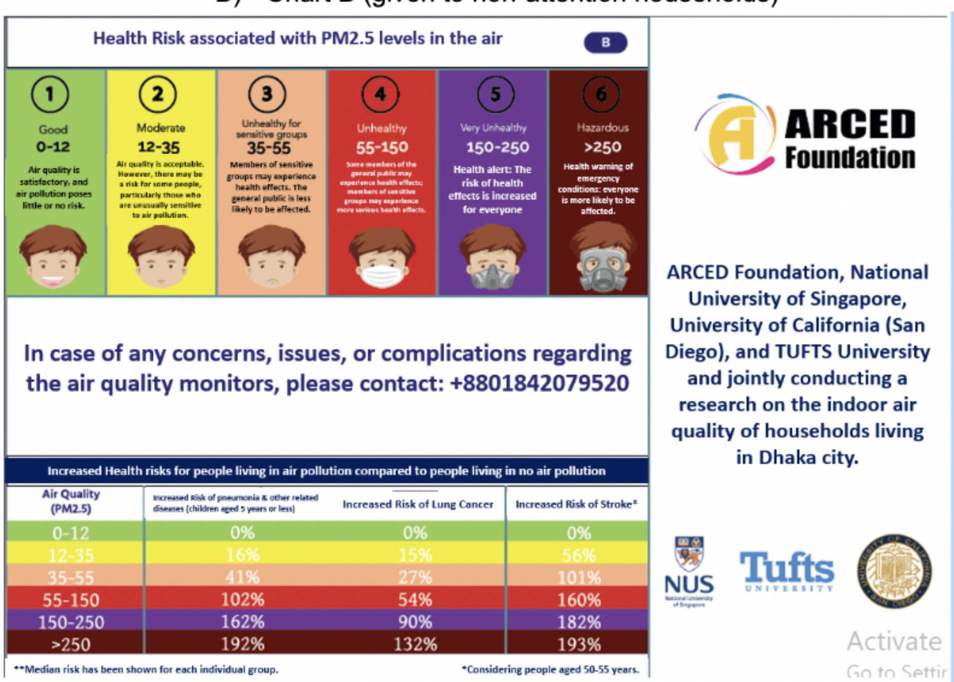
A) Chart A (given to attention treatment households)



Air Quality (PM2.5)	Increased Risk of pneumonia & other related diseases (children aged 5 years or less)	Increased Risk of Lung Cancer	Increased Risk of Stroke*
0-12	0%	0%	0%
12-35	16%	15%	56%
35-55	41%	27%	101%
55-150	102%	54%	160%
150-250	162%	90%	182%
>250	192%	132%	193%

**Median risk has been shown for each individual group. *Considering people aged 50-55 years.

B) Chart B (given to non-attention households)



Air Quality (PM2.5)	Increased Risk of pneumonia & other related diseases (children aged 5 years or less)	Increased Risk of Lung Cancer	Increased Risk of Stroke*
0-12	0%	0%	0%
12-35	16%	15%	56%
35-55	41%	27%	101%
55-150	102%	54%	160%
150-250	162%	90%	182%
>250	192%	132%	193%

**Median risk has been shown for each individual group. *Considering people aged 50-55 years.

Notes: Images of the English translation of the information charts provided to households together with the air quality monitor.

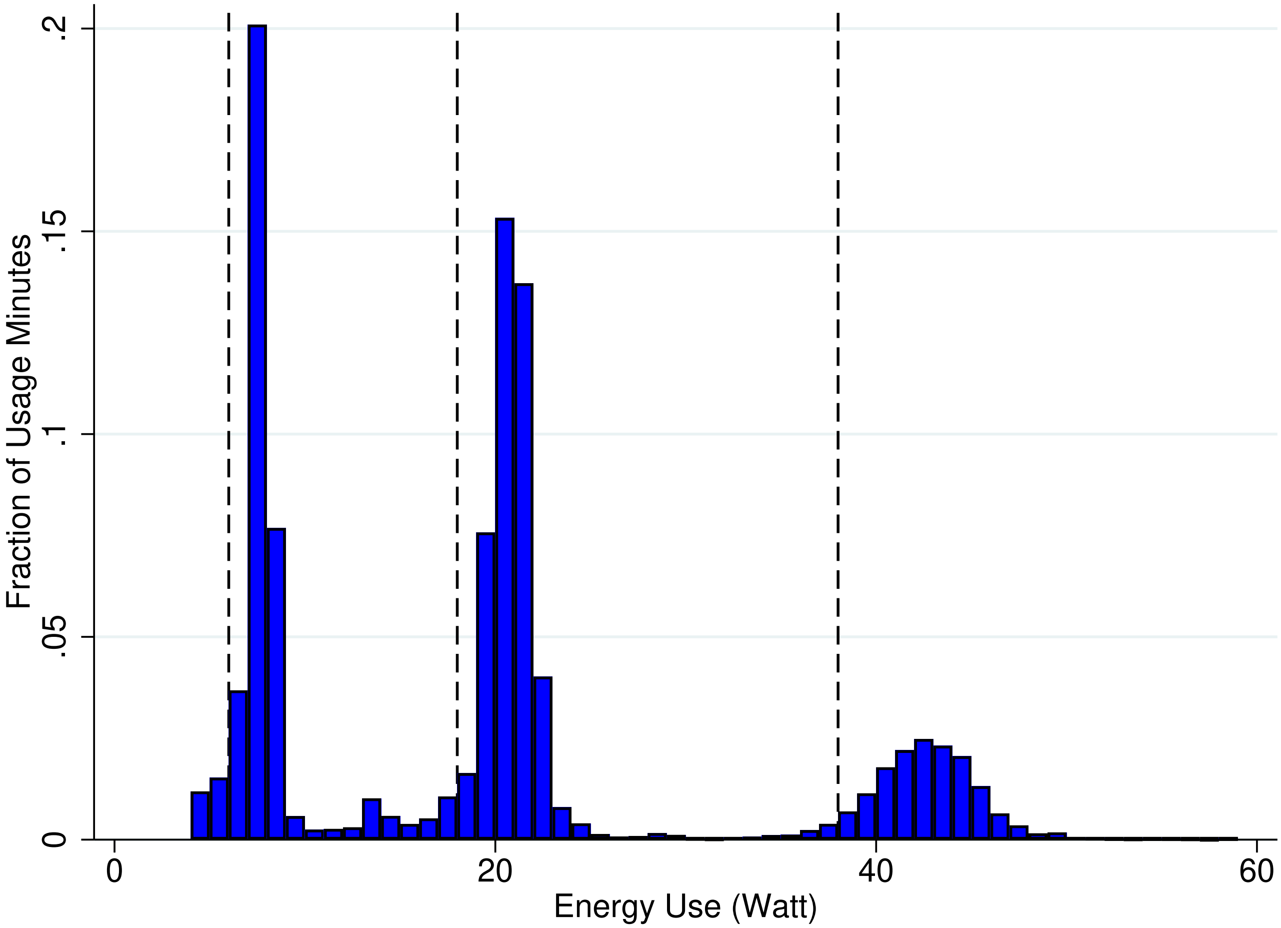
Figure A.4: SQAir Purifer

Notes: Image of the air purifier provided to the households in the air purifier treatment group. For more details, see: https://smartairfilters.com/en/product/sqair-air-purifier/

Figure A.5: Smart Socket

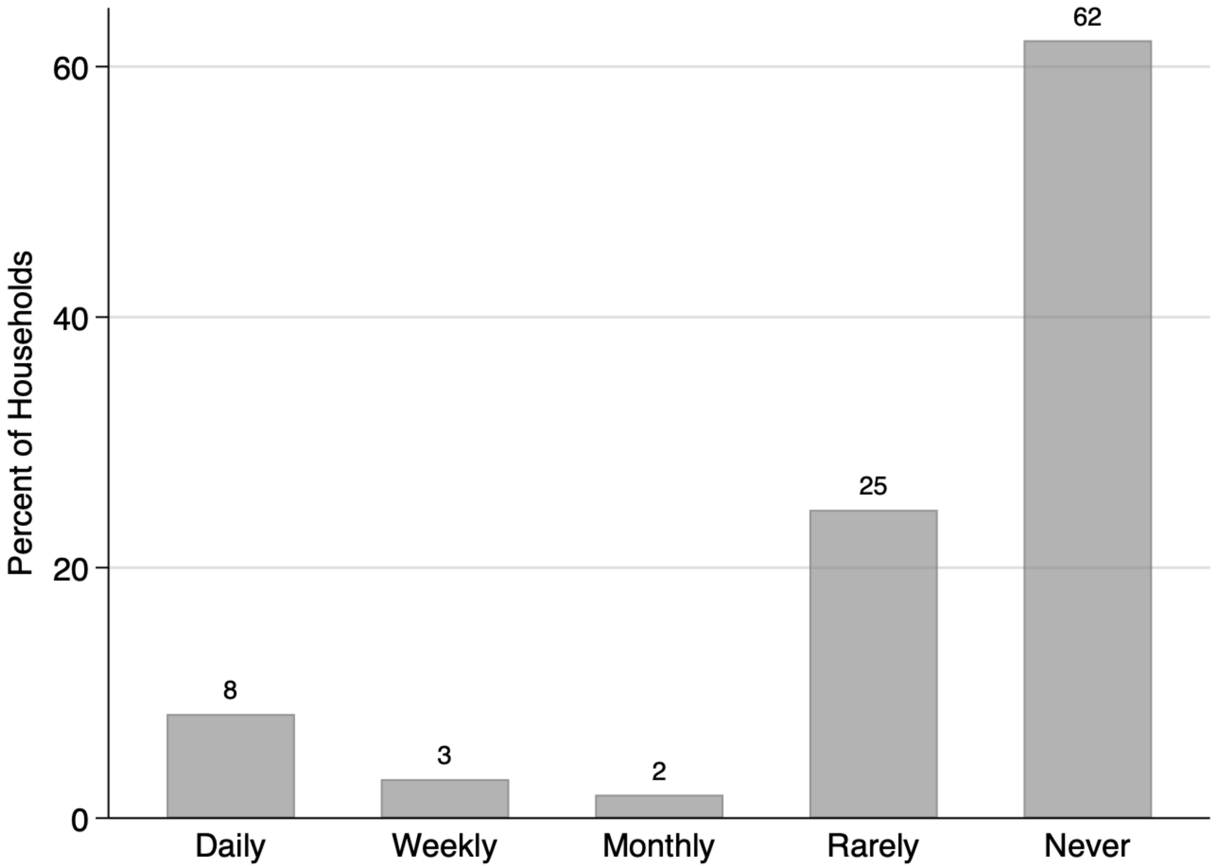
Notes: Image of the smart socket used to measure when the air purifier was used. Each purifiers' electricity chord was glued into a smart socket. The smart socket transmits minute-by-minute usage data to the research team via Wi-Fi.

Figure A.6: Wattage Used by Air Purifiers (Experiment 1, Smart Socket Data)



Notes: The figure shows how much electricity each air purifier uses in watts. Each observation is a minute by household smart socket reading between the Phase 2 survey and 1 April 2024. We have only included observations where the air purifier is in use. The three vertical dashed lines represent the manufacturer's description of how much electricity the air purifier uses on the low, medium, and high settings.

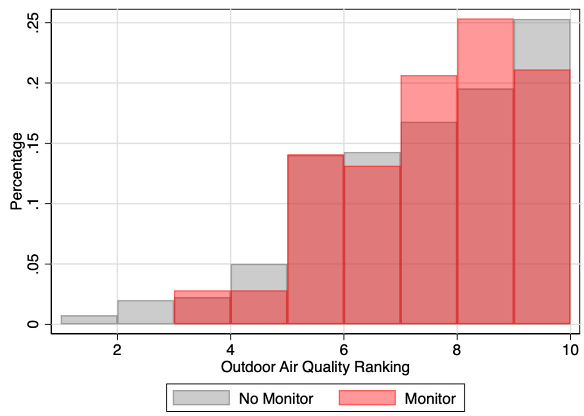
Figure A.7: Distribution of How Often Households Reported Checking Outdoor Air Pollution (Experiment 1, Phase 1 Survey)



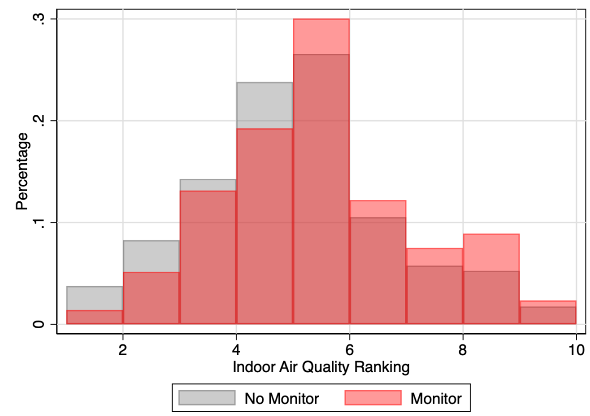
Notes: This histogram shows the distribution of responses in the Phase 1 survey to the the question "How often do you check or monitor outdoor air pollution levels?"

Figure A.8: Effect of Monitor on Perceptions and WTP for Purifier (Experiment 1, Phase 2 Survey)

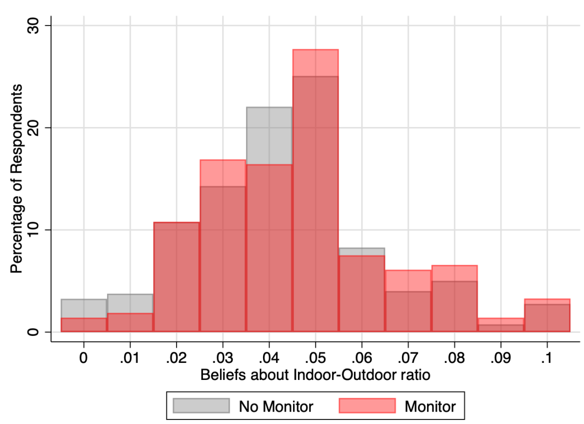
(a) Shift in Outdoor Air Pollution Perceptions



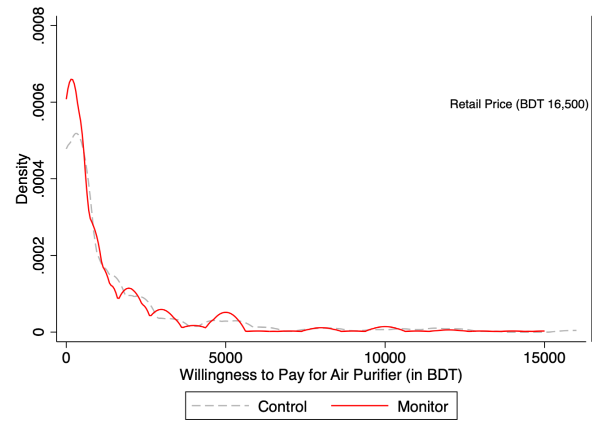
(b) Shift in Indoor Air Pollution Perceptions



(c) Shift in Perceptions of Indoor-Outdoor Ratio

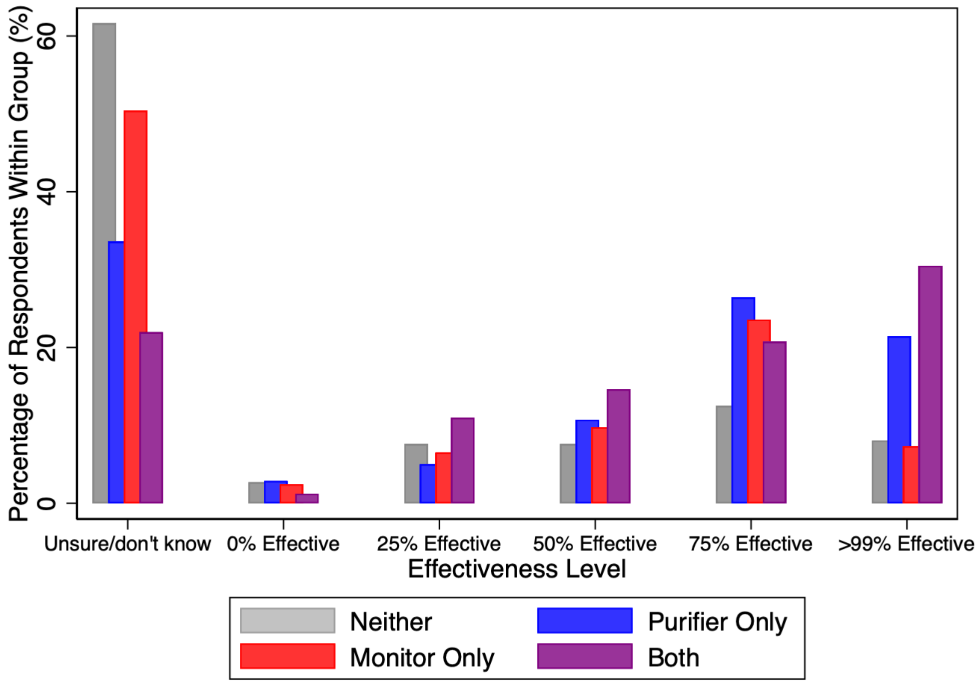


(d) No shift in WTP for purifier in Phase 2



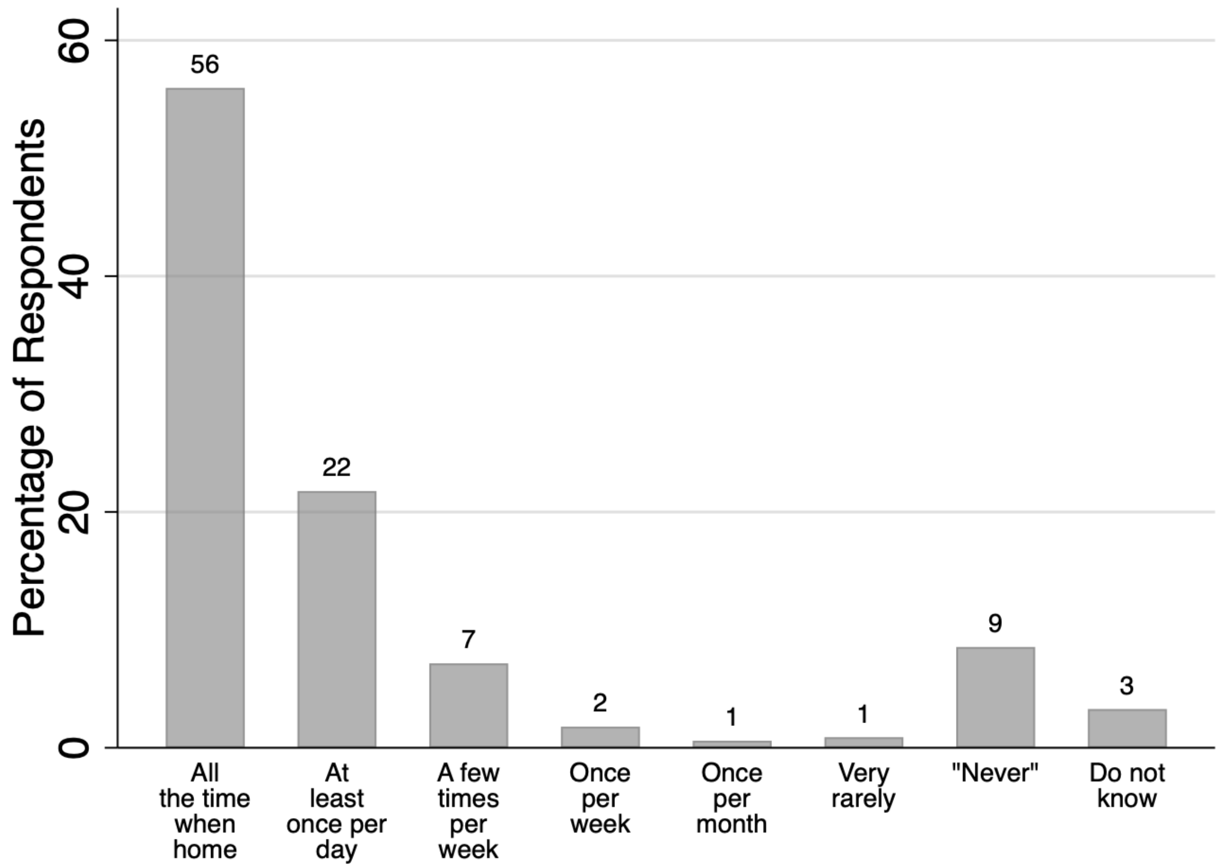
Notes: This figure describes the shifts in household beliefs during phase 2 survey of Experiment 1 with monitor treatment. Panel (a) shows the shift in beliefs about the severity of outdoor air pollution with monitor treatment. Panel (b) shows the shift in beliefs about the severity of indoor air pollution with monitor treatment. Panel (c) shows the shift in beliefs about the ratio of indoor to outdoor air pollution with monitor treatment. Panel (d) shows the density of a revealed preference measure for willingness to pay for air purifiers during phase 2 for households in the control group and monitor treatment group.

Figure A.9: Distribution of Air Purifier Effectiveness Perceptions by Monitor and Purifier Treatment (Experiment 1, Phase 3 Survey)



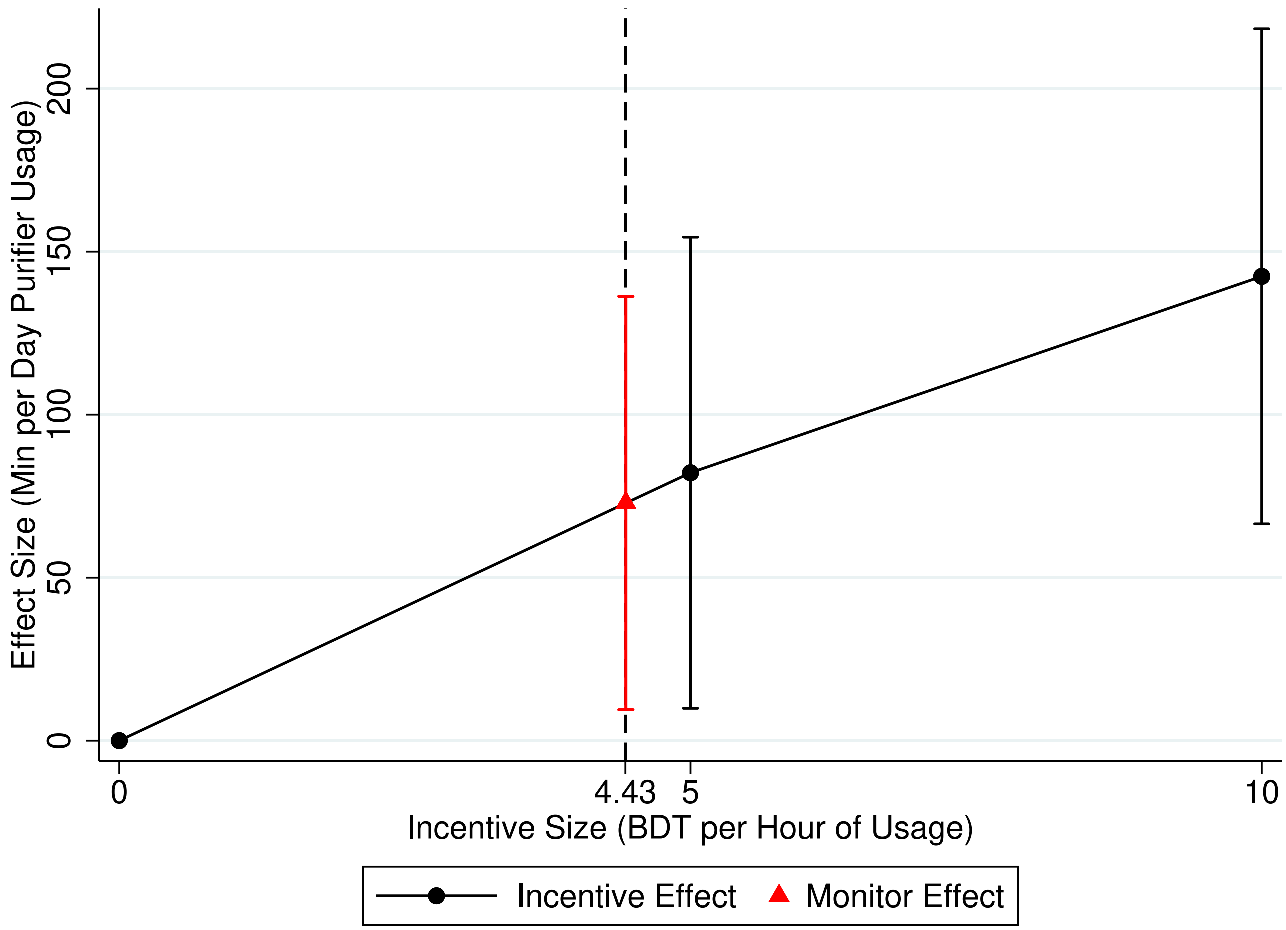
This figure shows the differences in beliefs during the Phase 3 survey of Experiment 1 about effectiveness of air purifiers for the following groups: neither monitor nor purifier, monitor only, purifier only, and both monitor and purifier. The outcome is the response to a question asking how effective the household thinks regular air purifiers that can be bought in shops in Dhaka are at removing air pollution from the room in which they are being run. This variable ranges from 0 being completely ineffective to 1 being (almost) completely effective. Unsure/don't know: is a binary variable equal to 1 if the household selected any option other than "Don't know/unsure". 0% effective, 25% effective, 50% effective, 75% effective and >99$ effective are binary variables equal to 1 if the household said the purifier was 0%, 25%, 50%, 75% and >99% effective respectively. Observations are at the household level.

Figure A.10: Predicted Air Purifier Usage by Households (Experiment 1, Phase 1 Survey)



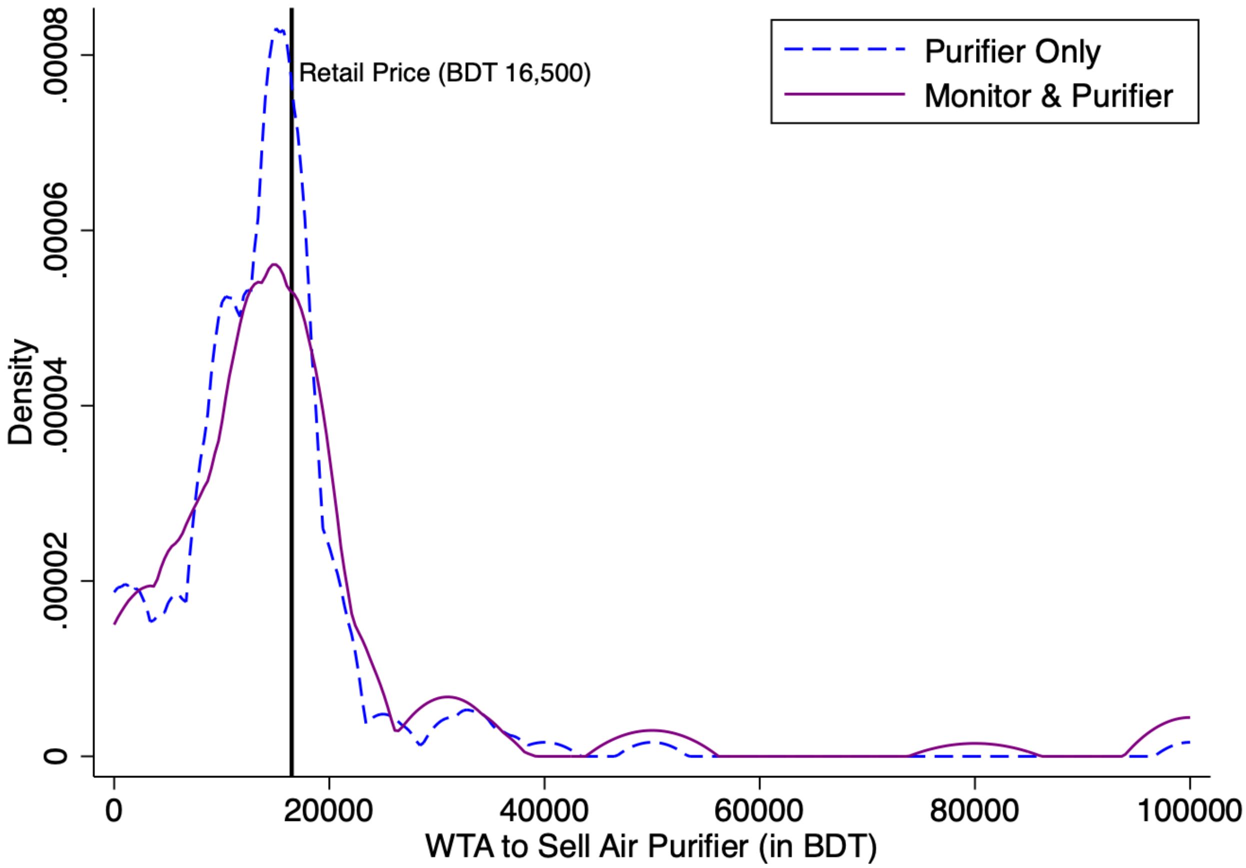
Notes: This figure shows the distribution of responses during the Phase 1 survey of Experiment 1 to the question: "If you owned an air purifier, how often would you use it during the winter months?"

Figure A.11: Comparison of the Effect of Monitors and the Effect of Incentives on Purifier Usage (Experiment 1, Smart Socket Data)



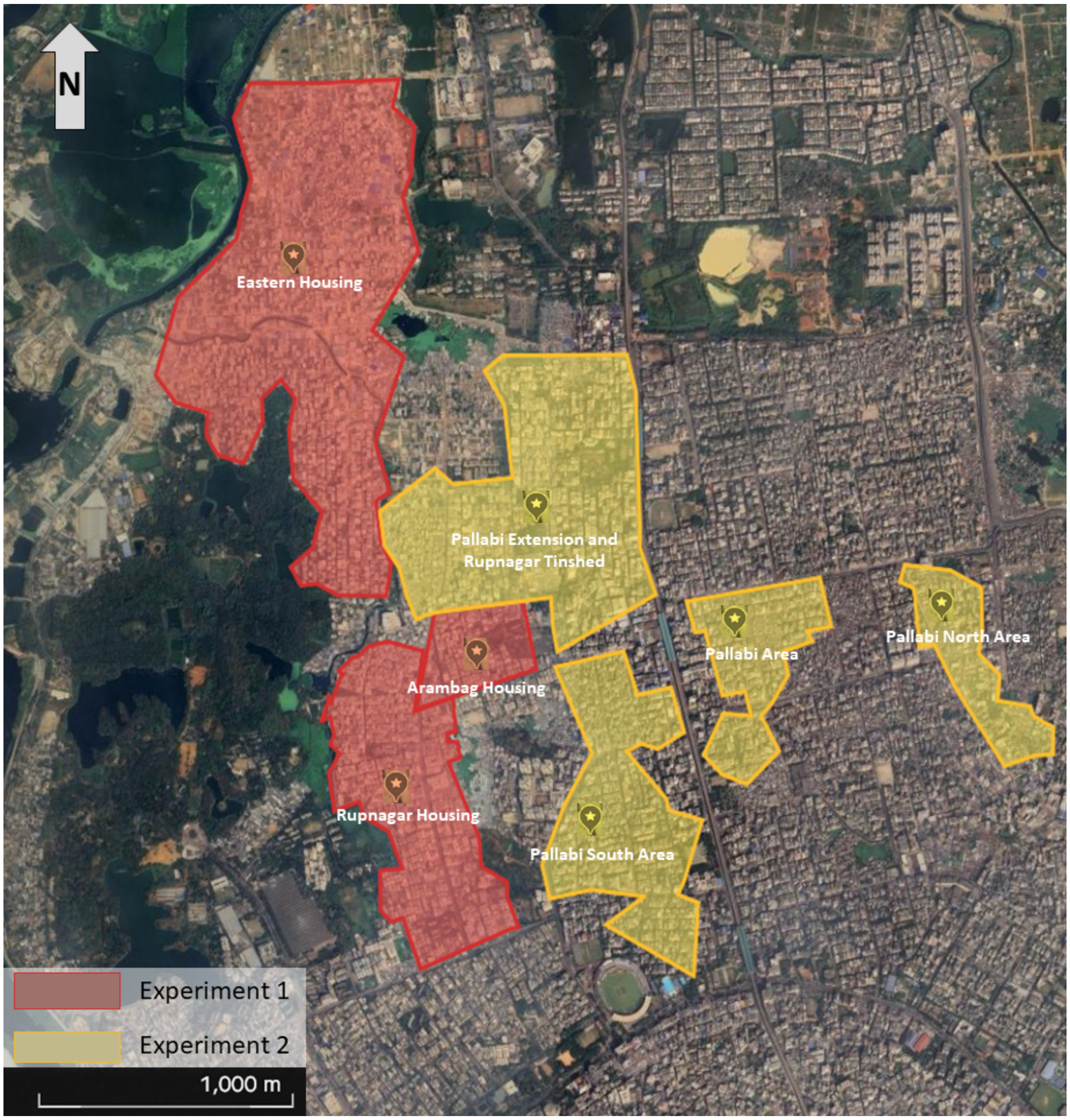
Notes: This figure compares the effect of the monitor treatment with the effect of the incentives to use the air purifier. We have placed the monitor treatment effect at BDT 4.4 on the x-axis as the monitor effect is equivalent to the linear interpolation of the incentive effect at BDT 4.4. Estimates are based on data from April 1 to April 30, 2024, the period of the incentive payments. 95% confidence intervals are based on standard errors clustered at the household level.

Figure A.12: Distribution of WTA in Phase 3 by Monitor + Purifier vs. Purifier Group



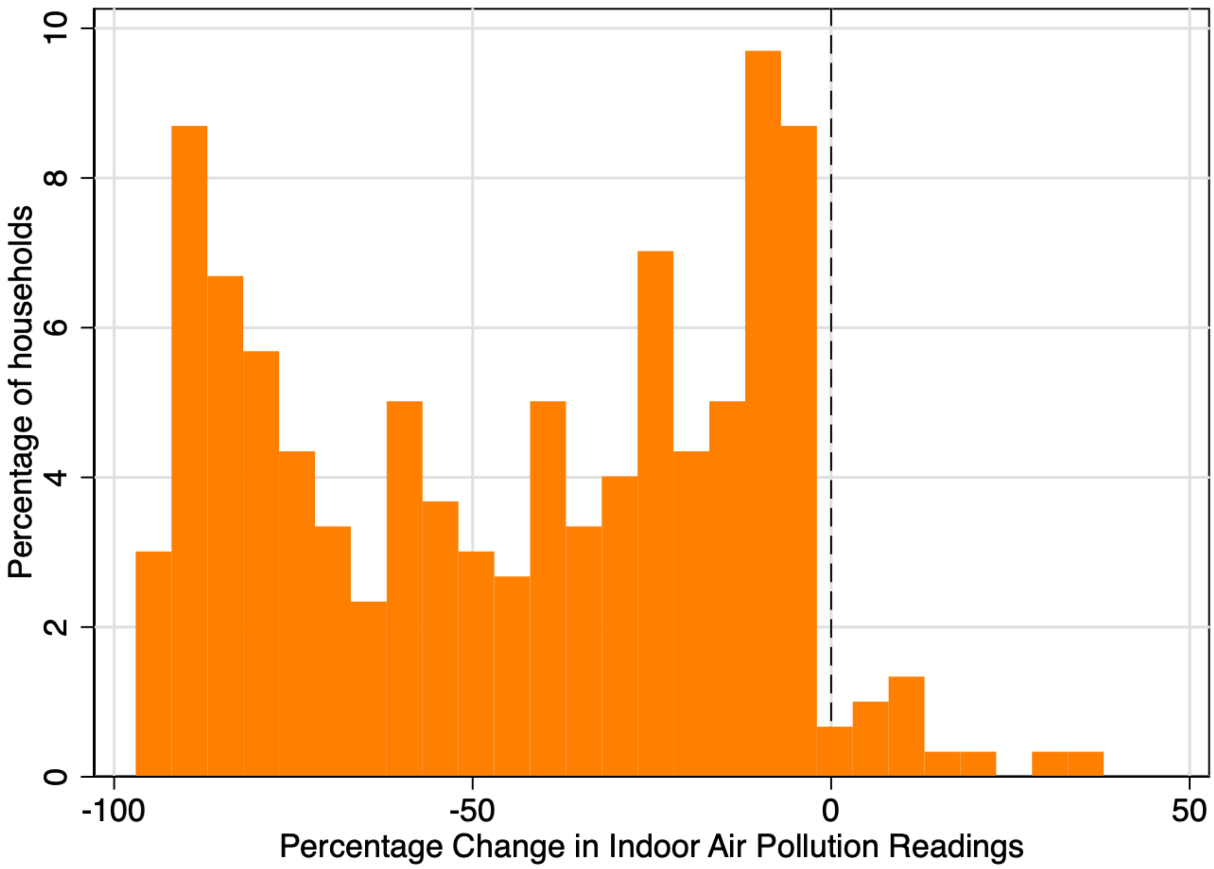
Notes: This figure describes the density of a revealed preference measure for willingness to accept to sell an air purifier during phase 3 survey of Experiment 1 for households in the purifier group by whether or not they also received a monitor. The solid black vertical line denotes the retail price of air purifiers.

Figure A.13: Experiment 2: Map of Study Area



Notes: This is a map of the four housing associations in which Experiment 2 was conducted. All of the housing associations are located in the Mirpur area of Dhaka, Bangladesh.

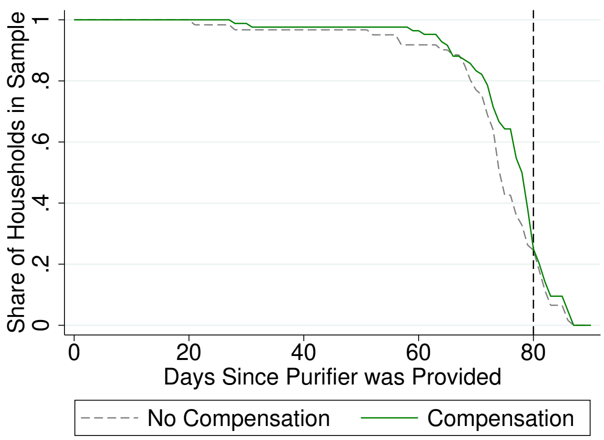
Figure A.14: Experiment 2: Change in Air Pollution During Demonstration for the Both (Together) Group



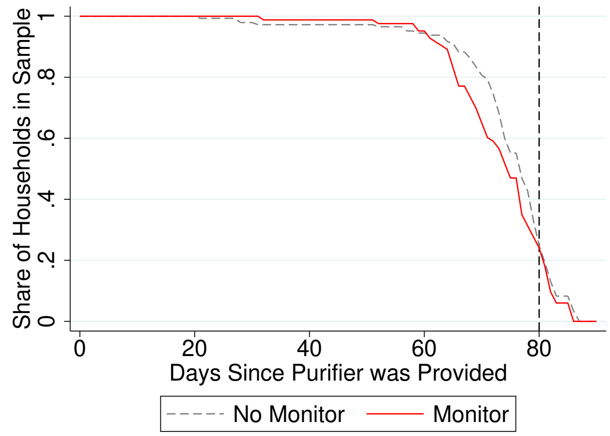
Notes: The figure shows the distribution of percentage changes in IAP during the demonstration for both (together) treatment arm in Experiment 2. The second recordings in this group were initiated only after December 7, 2024 and therefore the graph is based on 299 observations (as opposed to 400 observations).

Figure A.15: Share of Households Represented in Analysis of Air Purifier Use Over Time

(a) Compensation vs. No compensation (Figure 6b)



(b) Monitor vs. No Monitor (Figure 7b)



Notes: The figure shows the share of households that have not yet reached 1 April 2024 (when the are dropped from the sample), at each relative time since the Phase 2 survey. The vertical dashed line indicates where the data in Figures 6b and 7b end.

D Tables

Table A.1: Effect of Treatments on Attrition: Phase 1 to Phase 2 (Experiment 1)

	(1) Phase 2 Attrition
Monitor	-0.024
	(0.030)
Monitor x Attention	0.021
	(0.035)
Observations	1,008
Control mean	0.196

Notes: This table shows the effects of the monitor and attention treatment on attrition from phase 1 survey to phase 2 survey during Experiment 1. The outcome variable is attrition during phase 2 survey, measured by the households who participated in phase 1 survey but not phase 2 survey. This variable is 1 if the household is in the phase 1 survey but not in the phase 2 survey. Observations are at the household level. Significance levels are denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

Table A.2: Balance Among Unattrited Households in Phase 2: Monitor Treatment

	(1) No-Monitor Group		(2) Monitor Group		(2)-(1) Pairwise t-test	
Variable	N	Mean/(SE)	N	Mean/(SE)	N	Mean difference
College Graduate	399	0.474 (0.025)	419	0.480 (0.024)	818	0.006
Age	399	37.554 (0.696)	419	38.969 (0.700)	818	1.415
Beliefs about Risk of Lung Cancer and Stroke from Air Pollution	380	1.648 (0.024)	401	1.627 (0.023)	781	-0.021
Beliefs about Risk of ARI for Children from Air Pollution	390	1.740 (0.029)	410	1.723 (0.029)	800	-0.017
Beliefs about Severity of OAP	399	7.376 (0.102)	419	7.566 (0.101)	818	0.190
Beliefs about Severity of IAP	399	4.789 (0.105)	419	4.692 (0.105)	818	-0.097
Beliefs about IAP Relative to OAP	395	3.557 (0.062)	418	3.507 (0.061)	813	-0.050
F-test of joint significance (P-value)						0.392
F-test, number of observations						773

Notes: This table provides balance test on Phase 1 survey data for households unattrited by Phase 2 survey in Experiment 1 for the monitor and non-monitor groups. For each variable, we report the difference and the statistical significance of the t-test. We also report the joint F-test with p-value. Statistical significance thresholds are reported conventionally using $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.3: Balance Among Unattrited Households in Phase 2: Attention Treatment

	(1)		(2)		(2)-(1)	
	No-Attention Group		Attention Group		Pairwise t-test	
Variable	N	Mean/(SE)	N	Mean/(SE)	N	Mean difference
College Graduate	213	0.479 (0.034)	206	0.481 (0.035)	419	0.002
Age	213	37.568 (0.943)	206	40.417 (1.031)	419	2.849**
Beliefs about Risk of Lung Cancer and Stroke from Air Pollution	204	1.651 (0.032)	197	1.602 (0.032)	401	-0.050
Beliefs about Risk of ARI for Children from Air Pollution	209	1.756 (0.042)	201	1.689 (0.039)	410	-0.066
Beliefs about Severity of OAP	213	7.460 (0.138)	206	7.675 (0.147)	419	0.215
Beliefs about Severity of IAP	213	4.629 (0.143)	206	4.757 (0.154)	419	0.128
Beliefs about IAP Relative to OAP	213	3.512 (0.084)	205	3.502 (0.090)	418	-0.009
F-test of joint significance (P-value)						0.352
F-test, number of observations						400

Notes: This table provides balance test on Phase 1 survey data for households unattrited by Phase 2 survey of Experiment 1 for the attention and non-attention groups (monitor households only). For each variable, we report the joint F-test with p-values. Statistical significance thresholds are reported conventionally using $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.4: Effect of Purifier Treatment on Attrition: Phase 2 to Phase 3

	(1)
	Phase 3 Attrition
Purifier	-0.056**
	(0.022)
Pur X Monthly-Incentive	-0.022
	(0.024)
Pur X Daily-Incentive	-0.045**
	(0.018)
Observations	818
Control Mean	0.102

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the effects of the purifier treatment as well as the purifier treatment interacted with monthly and daily electricity incentives on attrition between phase 2 and phase 3 survey during Experiment 1. The outcome variable is attrition during phase 3 survey. This variable is 1 if the household participated in phase 2 survey but not phase 3 survey. Observations are at the household level, and this sample was restricted to be inclusive of only households that were sampled in the Phase 2 survey (818). For reference, out of 1,008 households, 818 households were sampled in the Phase 2 survey, and then 758 were sampled in the Phase 3 survey. In other words, 190 households attritioned at between Phase 1 and Phase 2, and 60 households attritioned between Phase 2 and Phase 3. Significance levels are denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

Table A.5: Balance Among Unattrited Households in Phase 3: Purifier Treatment

	(1)		(2)		(2)-(1)	
	No Purifier		Purifier		Pairwise t-test	
Variable	N	Mean/(SE)	N	Mean/(SE)	N	Mean difference
Monthly Income	460	61813.478 (2490.459)	298	58235.872 (2676.912)	758	-3577.606
Education	460	14.228 (0.273)	298	14.587 (0.325)	758	0.359
Age	460	43.593 (0.628)	298	44.466 (0.780)	758	0.873
WTP	459	1399.041 (111.519)	296	1362.365 (148.880)	755	-36.677
HH Size	460	4.183 (0.068)	298	4.111 (0.073)	758	-0.072
Beliefs about Risk of Lung Cancer and Stroke from Air Pollution	440	1.924 (0.035)	290	1.943 (0.043)	730	0.020
Beliefs about Risk of ARI for Children from Air Pollution	449	2.169 (0.043)	291	2.251 (0.056)	740	0.081
Donate to Clean Air NGO (0/1)	460	0.246 (0.020)	298	0.268 (0.026)	758	0.023
Clean Air Priority (Z-score)	460	-0.002 (0.046)	298	0.034 (0.061)	758	0.035
Beliefs about IAP Relative to OAP	460	0.446 (0.010)	298	0.448 (0.012)	758	0.002
Beliefs about Severity of IAP	460	4.713 (0.084)	298	4.691 (0.103)	758	-0.022
Beliefs about Severity of OAP	460	7.041 (0.088)	298	7.171 (0.117)	758	0.130
F-test of joint significance (P-value)						0.897
F-test, number of observations						725

Notes: This table provides balance test on Phase 2 survey data for households unattrited by Phase 3 survey of Experiment 1 for the purifier and non-purifier groups. For each variable, we report the difference and the statistical significance of the t-test. We also report the joint F-test with p-value. Statistical significance thresholds are reported conventionally using $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.6: Balance Among Unattrited Households in Phase 3: Purifier Treatment By Incentive

	(1) No Incentive		(2) Daily Incentive		(3) Monthly Incentive		F-test for balance across all groups	
Variable	N	Mean/(SE)	N	Mean/(SE)	N	Mean/(SE)	N	F-stat/P-value
Monthly Income	136	59252.941	82	57164.634	80	57604.875	298	0.062
		(4329.853)		(4414.568)		(5036.363)		0.940
Education	136	14.787	82	14.488	80	14.350	298	0.169
		(0.507)		(0.584)		(0.611)		0.844
Age	136	44.831	82	46.232	80	42.038	298	2.071
		(1.113)		(1.564)		(1.495)		0.128
WTP	135	1720.296	81	1025.432	80	1099.500	296	2.464*
		(263.884)		(192.588)		(252.649)		0.087
HH Size	136	4.191	82	4.159	80	3.925	298	1.207
		(0.109)		(0.138)		(0.139)		0.300
Beliefs about Risk of Lung Cancer and Stroke from Air Pollution	131	2.016	81	1.961	78	1.803	290	2.070
		(0.071)		(0.089)		(0.057)		0.128
Beliefs about Risk of ARI for Children from Air Pollution	132	2.220	81	2.404	78	2.143	291	1.628
		(0.082)		(0.122)		(0.088)		0.198
Donate to Clean Air NGO (0/1)	136	0.221	82	0.305	80	0.312	298	1.465
		(0.036)		(0.051)		(0.052)		0.233
Clean Air Priority (Z-score)	136	-0.011	82	0.061	80	0.082	298	0.230
		(0.096)		(0.112)		(0.111)		0.794
Beliefs about IAP Relative to OAP	136	0.452	82	0.455	80	0.435	298	0.213
		(0.019)		(0.022)		(0.024)		0.808
Beliefs about Severity of IAP	136	4.581	82	4.890	80	4.675	298	0.777
		(0.155)		(0.189)		(0.202)		0.461
Beliefs about Severity of OAP	136	7.096	82	7.439	80	7.025	298	1.025
		(0.179)		(0.184)		(0.250)		0.360

Notes: This table provides balance test on Phase 2 survey data for households unattrited by Phase 3 survey of Experiment 1 within the purifier group by type of incentive (none, daily, monthly). For each variable, we report the difference and the statistical significance of the t-test. We also report the joint F-test with p-value. Statistical significance thresholds are reported conventionally using $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.7: Effect of Purifier Treatment on Attrition in Monitor Households: Phase 2 to Phase 3

	(1)
	Phase 3 Attrition
Purifier	-0.044
	(0.029)
Pur X Monthly-Incentive	-0.042*
	(0.024)
Pur X Daily-Incentive	-0.042*
	(0.024)
Observations	419
Control Mean	0.089

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the effects of the purifier and incentive treatments on attrition between phase 2 and phase 3 survey during Experiment 1 for the subset of households who received a monitor after Phase 1 survey. The outcome variable is attrition during phase 3 survey. This variable is 1 if the household participated in phase 2 survey but not phase 3 survey. Observations are at the household level, and this sample was restricted to be inclusive of only households that were sampled in the Phase 2 survey and received an air purifier. For reference, out of 1,008 households, 818 households were sampled in the Phase 2 survey, and then 758 were sampled in the Phase 3 survey. In other words, 190 households attritioned at between Phase 1 and Phase 2, and 60 households attritioned between Phase 2 and Phase 3. Significance levels are denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

Table A.8: Balance Among Unattrited Households in Phase 3: Purifier Treatment

	(1) No Purifier		(2) Purifier		(2)-(1) Pairwise t-test	
Variable	N	Mean/(SE)	N	Mean/(SE)	N	Mean difference
Monthly Income	236	63087.288 (3589.395)	158	61337.911 (3874.768)	394	-1749.377
Education	236	14.708 (0.376)	158	14.829 (0.421)	394	0.121
Age	236	44.627 (0.879)	158	43.829 (1.055)	394	-0.798
WTP	236	1392.182 (157.451)	158	1176.899 (165.799)	394	-215.283
HH Size	236	4.068 (0.089)	158	4.095 (0.103)	394	0.027
Beliefs about Risk of Lung Cancer and Stroke from Air Pollution	225	2.000 (0.055)	156	1.965 (0.065)	381	-0.035
Beliefs about Risk of ARI for Children from Air Pollution	228	2.208 (0.063)	156	2.301 (0.082)	384	0.093
Donate to Clean Air NGO (0/1)	236	0.271 (0.029)	158	0.253 (0.035)	394	-0.018
Clean Air Priority (Z-score)	236	0.029 (0.068)	158	0.079 (0.084)	394	0.050
Beliefs about IAP Relative to OAP	236	0.470 (0.014)	158	0.449 (0.017)	394	-0.022
Beliefs about Severity of IAP	236	5.000 (0.116)	158	4.747 (0.145)	394	-0.253
Beliefs about Severity of OAP	236	7.161 (0.116)	158	7.120 (0.153)	394	-0.041
F-test of joint significance (P-value)						0.776
F-test, number of observations						379

Notes: This table provides balance test on Phase 2 survey data for monitor households unattrited by Phase 3 survey of Experiment 1 for purifier and non-purifier households. For each variable, we report the difference and the statistical significance of the t-test. We also report the joint F-test with p-value. Statistical significance thresholds are reported conventionally using $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.9: Effect of Monitor Treatment on Attrition in Purifier Households: Phase 2 to Phase 3

	(1)
	Phase 3 Attrition
Monitor	0.001
	(0.025)
Monitor x Attention	-0.010
	(0.027)
Observations	308
Control Mean	0.034

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: This table shows the effects of the monitor and attention treatment on attrition between phase 2 and phase 3 survey during Experiment 1 for the subset of households who received an air purifier after Phase 2 survey. The outcome variable is attrition during phase 3 survey. This variable is 1 if the household participated in phase 2 survey but not phase 3 survey. Observations are at the household level, and this sample was restricted to be inclusive of only households that were sampled in the Phase 2 survey and received an air purifier. For reference, out of 1,008 households, 818 households were sampled in the Phase 2 survey, and then 758 were sampled in the Phase 3 survey. In other words, 190 households attritioned at between Phase 1 and Phase 2, and 60 households attritioned between Phase 2 and Phase 3. Significance levels are denoted by $* * *p < 0.01$, $* * p < 0.05$, and $*p < 0.1$.

Table A.10: Balance Among Unattrited Purifier Households in Phase 3: Monitor Treatment

	(1)		(2)		(2)-(1)	
	No-Monitor Group		Monitor Group		Pairwise t-test	
Variable	N	Mean/(SE)	N	Mean/(SE)	N	Mean difference
Monthly Income	140	54735.000 (3645.044)	158	61337.911 (3874.768)	298	6602.911
Education	140	14.314 (0.504)	158	14.829 (0.421)	298	0.515
Age	140	45.186 (1.158)	158	43.829 (1.055)	298	-1.357
WTP	138	1574.710 (256.299)	158	1176.899 (165.799)	296	-397.811
HH Size	140	4.129 (0.103)	158	4.095 (0.103)	298	-0.034
Beliefs about Risk of Lung Cancer and Stroke from Air Pollution	134	1.918 (0.056)	156	1.965 (0.065)	290	0.047
Beliefs about Risk of ARI for Children from Air Pollution	135	2.193 (0.073)	156	2.301 (0.082)	291	0.109
Donate to Clean Air NGO (0/1)	140	0.286 (0.038)	158	0.253 (0.035)	298	-0.033
Clean Air Priority (Z-score)	140	-0.017 (0.090)	158	0.079 (0.084)	298	0.096
Beliefs about IAP Relative to OAP	140	0.448 (0.019)	158	0.449 (0.017)	298	0.001
Beliefs about Severity of IAP	140	4.629 (0.146)	158	4.747 (0.145)	298	0.118
Beliefs about Severity of OAP	140	7.229 (0.180)	158	7.120 (0.153)	298	-0.108
F-test of joint significance (P-value)						0.568
F-test, number of observations						288

Notes: This table provides balance test on Phase 2 survey data for purifier households unattrited by Phase 3 survey of Experiment 1 for monitor and non-monitor households. For each variable, we report the difference and the statistical significance of the t-test. We also report the joint F-test with p-value. Statistical significance thresholds are reported conventionally using $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.11: Effect of Treatments on Withdrawals from Study

	(1) Purifier Status: Withdrawn	(2) Purifier Status: Withdrawn	(3) Monitor Status: Withdrawn
Monitor	0.0113		
	(0.0113)		
Monitor x Attention	0.00101		
	(0.0166)		
Purifier x Any Compensation		-0.0143	-0.0134
		(0.0101)	(0.0133)
Purifier x Daily Compensation		-0.0000318	0.0000184
		(0.0000554)	(0.0000299)
Purifier			0.00909
			(0.0140)
Time FE	Yes	Yes	Yes
Observations	22,677	22,677	31,082
Control mean	0.000	0.014	0.004

Notes: This table reports the effects of the monitor treatment, purifier treatments, and their interaction, on participants withdrawing from the study. We define withdrawal from the study as a participant contacting us to return the equipment or to communicate that they no longer want to be part of the study. Each observation is a day by household. The outcome variable is an indicator of whether the household had withdrawn on that day. Column (1) shows the effect of the monitor and attention treatments on withdrawing from the purifier treatment, among households assigned to the purifier treatment. Column (2) shows the effect of the electricity compensation treatments on withdrawing from the purifier treatment, among households assigned to the purifier treatment. Column (3) shows the effect of the purifier and electricity compensation treatments on withdrawal from the monitor treatment, among households assigned to the monitor treatment. Standard errors are clustered at the household level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.12: Effects of Monitor on Beliefs of Health Risk

	(1) Beliefs about Risk of Lung Cancer and Stroke from Air Pollution	(2) Beliefs about Risk of ARI for Children from Air Pollution
Monitor	0.136**	0.113
	(0.0684)	(0.0842)
Observations	789	799
Control mean	1.89	2.16

Notes: This table shows the effect of providing monitors on people's beliefs regarding the harmfulness of current air pollution on increasing the risk of (1) lung cancer and stroke in adults and (2) acute respiratory issues for children measured during phase 2 survey of Experiment 1. Each observation is at the household level. For column 1 the outcome variable is the perceived risk of lung cancer and stroke, categorized into various levels of increased risk ranging from "No effect" to "More than quadrupling". The outcome variable in columns 2 has the same categorization but relating to the perceived risk of acute respiratory issues for children. We use heteroskedasticity robust standard errors. $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.13: Effect of Monitor and Attention Incentives on Household Perception of Indoor and Outdoor Air Quality and Willingness to Pay for Air Purifiers (Experiment 1, Phase 2 Survey)

	(1) Beliefs about Severity of IAP	(2) Beliefs about Severity of OAP	(3) Beliefs about IAP Relative to OAP
Monitor	0.447***	0.161	0.0305*
	(0.151)	(0.161)	(0.0176)
Monitor X Attention	-0.161	-0.0705	-0.00558
	(0.176)	(0.181)	(0.0207)
Observations	818	818	818
Control mean	4.54	7.05	0.43

Notes: This table shows the effect of air quality monitor and incentives for attention to air quality monitor on households' perception of indoor and outdoor air pollution. All outcome variables are measured during Phase 2 survey of Experiment 1. Observations are at the household level. Column 1: "Beliefs about Severity of OAP" is households' response to: "How would you rate the current outdoor air quality in your area? [On a scale of 1-10, with 1 being "not polluted at all" and 10 being "extremely polluted.]" Column 2: "Beliefs about Severity of IAP" is households' response to: "How would you rate the current indoor air quality in your area? [On a scale of 1-10, with 1 being "not polluted at all" and 10 being "extremely polluted.]" Column 3: "Beliefs about IAP v. OAP" is households' response to: "How polluted do you believe the air in your home is compared to the air outdoors?" Column 4: Revealed preference willingness to pay for an air purifier elicited using a modified-BDM mechanism. WTP values are winsorized at the 99% level. Significance levels are denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

Table A.14: Effect of Monitor on Self-Reported Air Purifier Usage

	(1) Days used 30+ minutes	(2) HH Used All the Time
Monitor	0.521	0.143**
	(0.326)	(0.065)
Observations	292	292
Control mean	5.104	.244

Notes: This table shows the effect of monitors on self-reported air purifier use during phase 3 survey of Experiment 1. Column 1: during the phase 3 survey households who had previously received an air purifier were asked "In the past 7 days, how many days did you use the air purifier for 30 minutes or more? (numerical answer between 0 and 7)?" Column 2: During Phase 3 survey, households who received the air purifier were asked how often they used the air purifier. The response options were the same as Column 1. We follow the same procedure of creating a binary variable. Significance levels are denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

Table A.15: Effect of Monitor and Attention Treatment on Air Purifier Use

	(1) Usage per Day (Minutes)	(2) Usage per Day (Minutes)
Monitor	64.02***	74.58***
	(15.49)	(23.80)
Monitor x Attention		-21.48
		(29.41)
Time FE	Yes	Yes
Observations	22,536	22,536
Clusters	304	304
Control mean	31.11	31.11

Notes: This table shows the effects of the monitor and attention treatments on purifier use. Observations are at the day-by-household level. Data is from smart sockets in households with air purifiers, from the Phase 2 survey until 1 April 2024. Standard errors are clustered at the household level. $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.16: Effects of Use Incentives and Air Monitor on Air Purifier Use

	(1) Minutes per Day	(2) Minutes per Day
Any Incentive	113.0***	82.18**
	(29.75)	(36.87)
Monitor	72.40**	72.89**
	(32.39)	(32.36)
BDT 10 Incentive		60.23
		(46.91)
Time FE	Yes	Yes
Observations	9,120	9,120
Clusters	304	304
Control mean	15.5	15.5

Notes: This table shows the effect of providing incentives for using the purifier and the effect of owning a monitor on purifier usage. The incentives were either BDT 5 per hour of use, or BDT 10 per hour of use. Each observation is at the day-by-household level among households with air purifiers. The outcome variable is the number of minutes that the air purifier was used on that day. Data is from 1 April 2024 until 30 April 2024, the period during which the incentives were provided. Standard errors are clustered at the household level. $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.17: Effects of Monitors, Purifiers and Monitors + Purifiers on WTP (Phase 3, Experiment 1)

	(1) WTP (In BDT)
Monitor	-119.8
	(249.8)
Purifier	104.8
	(269.6)
Phase 3	107.6
	(178.1)
Purifier x Monitor	-320.6
	(394.0)
Monitor X Phase 3	-34.94
	(310.6)
Purifier X Phase 3	80.85
	(347.2)
Monitor X Purifier X Phase 3	632.7
	(522.2)
Survey FE	Y
Observations	1,566
Clusters	817
Control mean	1,408.65
Sample	Phase 2+3

Notes: This table shows the effect of monitor treatment, purifier treatment and the combination of the two on willingness to pay for purifiers using BDM elicitations in phase 2 and phase 3 survey. The regression includes survey fixed effects and an indicator variable for subset of households who also received the attention treatment. Standard errors are clustered at the household level. $***p < 0.01$; $**p < 0.05$; $*p < 0.1$.

Table A.18: Experiment 2: Balance Table

Variable	(1) Control Mean/(SE)	(2) Purifier Only Mean/(SE)	(3) Monitor Only Mean/(SE)	(4) Both (Separately) Mean/(SE)	(5) Both (Together) Mean/(SE)	(6) Credit Only Mean/(SE)	F-test for balance across all groups F-stat/P-value
Male (0/1)	0.873	0.882	0.875	0.885	0.875	0.897	0.316
	(0.017)	(0.016)	(0.017)	(0.016)	(0.017)	(0.015)	0.904
Age (Years)	47.960	48.127	47.040	46.627	46.528	47.458	0.863
	(0.741)	(0.764)	(0.693)	(0.688)	(0.750)	(0.748)	0.505
Highest Education Level	13.473	13.287	13.643	13.670	13.040	13.180	0.582
	(0.290)	(0.299)	(0.290)	(0.268)	(0.293)	(0.402)	0.714
HH Members ()	4.430	4.505	4.370	4.272	4.370	4.367	0.888
	(0.089)	(0.088)	(0.078)	(0.083)	(0.081)	(0.084)	0.488
Beliefs: Severity of OAP (1-10)	6.650	6.372	6.560	6.348	6.615	6.520	1.037
	(0.120)	(0.120)	(0.114)	(0.118)	(0.120)	(0.119)	0.394
Beliefs: Severity of IAP (1-10)	4.322	4.447	4.482	4.185	4.348	4.287	1.010
	(0.115)	(0.110)	(0.106)	(0.105)	(0.114)	(0.116)	0.410
Beliefs: IAP v. OAP (1-10)	4.482	4.450	4.543	4.143	4.702	4.420	2.233**
	(0.122)	(0.118)	(0.116)	(0.119)	(0.123)	(0.125)	0.049
Indoor PM2.5 (50 ug/m3)	2.608	2.690	2.776	2.853	2.755	2.775	1.314
	(0.084)	(0.087)	(0.086)	(0.090)	(0.086)	(0.086)	0.255
Has Opinion: Lung Cancer Risk	0.907	0.885	0.905	0.887	0.887	0.877	0.580
	(0.015)	(0.016)	(0.015)	(0.016)	(0.016)	(0.016)	0.715
Has Opinion: ARI Risk	0.930	0.912	0.915	0.925	0.907	0.912	0.339
	(0.013)	(0.014)	(0.014)	(0.013)	(0.015)	(0.014)	0.889
Has Opinion: Purifier Effectiveness	0.420	0.438	0.403	0.443	0.357	0.385	1.714
	(0.025)	(0.025)	(0.025)	(0.025)	(0.024)	(0.024)	0.128
WTP (Practice Round)	12.873	11.578	11.912	12.610	13.488	13.482	1.613
	(0.640)	(0.580)	(0.585)	(0.621)	(0.624)	(0.676)	0.153
Do you own an air conditioner?	0.335	0.370	0.390	0.352	0.365	0.328	0.952
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.023)	0.446
Number of observations	400	400	400	400	400	400	2400

Notes: This table provides balance test on the baseline variables in Experiment 2. Balance variables were collected before households received any of the treatment conditions which were Control, Purifier Only, Monitor Only, Both (Separately), Both (Together) and Credit Only. For each variable, we report the joint F-test with p-values. Statistical significance thresholds are reported conventionally using $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.19: Treatment Effects - ARI and Lung Risk (Experiment 2)

	(1) Opinion on ARI Risk (0/1)	(2) Perceived ARI Risk Increase (0/1)	(3) Opinion on Lung Risk (0/1)	(4) Perceived Lung Risk Increase (0/1)
Purifier Only	-0.0225	-0.0125	-0.0250	-0.00500
	(0.0173)	(0.0322)	(0.0197)	(0.0322)
Monitor Only	-0.0200	0.0600*	-0.0100	0.0725**
	(0.0171)	(0.0309)	(0.0189)	(0.0307)
Both (Separately)	-0.0175	0.0525*	-0.0100	0.0375
	(0.0170)	(0.0310)	(0.0189)	(0.0314)
Both (Together)	-0.0150	0.0475	-0.00500	0.0325
	(0.0168)	(0.0312)	(0.0186)	(0.0315)
Credit Only	-0.0350*	5.64e-17	-0.0200	-0.0175
	(0.0180)	(0.0320)	(0.0195)	(0.0324)
Observations	2400	2400	2400	2400
Control Mean	0.95	0.71	0.93	0.71

Notes: This table shows the effect on treatments in experiemnt 2 on perceived risks of acute respiratory infections (ARI) and lung cancer risk from exposure to air pollution. Purifier only: household is shown the purifier and that it works. Monitor only: household is shown that the monitor works and allowed to see the reading. Both (separately): first the household is shown the monitor works and the reading on the monitor. The monitor is then put away the household is shown the purifier and that it works. Both (together): the household is first shown the monitor and it's reading. Then while the monitor is still on and visible, the purifier is turned on for five minutes and the household is allowed to see the changes in the reading. Credit only: the household is offered a zero-interest option for financing the purifier purchase. Each of the five treatment arms are measured against a control group. . The outcome is the response to a question asking how much do households believe exposure to air pollution increases their risk of lung cancer. This variable ranges from no increase in risk to an increase in risk by 400%. Column 1 and 3 reports the effects on a binary variable equal to 1 if the household selected any option other than "Don't know/unsure". Columns 2 and 4 are binary variables equal to 1 if the household said the risk increased. Observations are at the household level. Significance levels are denoted by $***p < 0.01$, $**p < 0.05$, and $*p < 0.1$.

Table A.20: Effect of Purifier on Monitor Usage

	(1) Usage per Day (Minutes)
Purifier	107.1**
	(54.36)
Time FE	Yes
Observations	31,082
Clusters	419
Control mean	825

Notes: This table shows the effect of having an air purifier on the minutes of air monitor usage per day. Each observation is at the day-by-household level among households with air monitors. We control for if the household received the attention treatment. Data is from between the Phase 2 survey and 1 April, 2024. Standard errors are clustered at the household level. $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.21: Effect of Purifier Treatment on Air Pollution (Experiment 1)

Panel A:	PM2.5 ($\mu g/m^3$)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Purifier	-5.52	-6.00	2.41	1.75	-3.38	-13.91**	-13.58**
	(4.51)	(6.12)	(5.22)	(3.75)	(6.67)	(6.35)	(6.66)
Baseline PM2.5	0.48***	0.55***	0.38***	0.29***	0.40***	0.61***	0.67***
	(0.06)	(0.11)	(0.10)	(0.05)	(0.09)	(0.09)	(0.10)
Panel B:	ln(PM2.5)						
Purifier	-0.120	-0.121	-0.074	-0.072	-0.117	-0.180**	-0.156**
	(0.074)	(0.079)	(0.080)	(0.076)	(0.083)	(0.077)	(0.079)
ln(Baseline PM2.5)	0.912***	0.932***	0.851***	0.807***	0.888***	0.993***	0.996***
	(0.184)	(0.208)	(0.210)	(0.186)	(0.173)	(0.177)	(0.203)
Hours	All	0-4	4-8	8-12	12-16	16-20	20-24
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	473,170	77,351	77,418	78,234	79,967	80,391	79,809
Clusters	376	370	372	371	374	373	371
Control mean	111	132	98	79	99	120	135

Notes: This table shows the effect of providing air purifiers on average air pollution during Experiment 1. Each observation is at the hour-by-household level among households with air monitors who remained in the survey until the Phase 2 survey (when the purifiers were provided). Note that all days are included, regardless of whether the purifier was turned on or not. The outcome variable in Panel A is the average air pollution in that hour. In Panel B, the outcome variable is the log of the average air pollution. Column (1) shows results for all hours of the day. Columns (2)-(7) show results for specific times of the day, divided into 4-hour periods. Data is from the date of the Phase 2 survey until 1 April 2024. Standard errors are clustered at the household level. $***p < 0.01; **p < 0.05; *p < 0.1$.

Table A.22: Effect of Monitor and Purifier on Health Outcomes

	(1) Systolic BP	(2) Diastolic BP	(3) Lung Capacity (FVC)	(4) FEV1/ FVC Ratio	(5) Blood Oxygen Level	(6) Healthcare Provider Visits	(7) Treatment Cost	(8) Sick Days	(9) Health Index (ICW)
Monitor	-0.19	-0.44	-0.03	-1.65	-0.02	0.23	318.04	0.26	-0.09
	(1.59)	(1.02)	(0.08)	(1.51)	(0.07)	(0.65)	(218.29)	(0.18)	(0.09)
Purifier	1.22	-0.10	-0.10	-0.58	0.11**	-0.81	495.57**	-0.04	0.06
	(1.76)	(1.00)	(0.08)	(1.36)	(0.05)	(0.57)	(236.09)	(0.18)	(0.09)
Purifier x Monitor	-0.97	-0.52	0.12	1.79	-0.08	-0.26	-163.89	-0.21	0.10
	(2.59)	(1.55)	(0.13)	(2.28)	(0.10)	(0.91)	(411.84)	(0.29)	(0.14)
Observations	1,073	1,073	1,046	1,046	1,073	1,842	1,842	1,842	1,842
Clusters	747	747	740	740	747	756	756	756	756
Control Mean	120.98	81.62	2.53	90.52	98.77	2.34	997.92	0.62	-0.00

Notes: This table reports the effects of the monitor and purifier treatments, as well as their interaction, on various health outcomes. We control for if the household also receives the attention incentive and the interaction between the purifier and the attention incentive. Each observation is a household member sleeping in the bedroom of the household head at the time of the phase 2 survey. The data is from the Phase 3 survey of Experiment 1. Forced Vital Capacity (FVC), is the total amount air exhaled after a deep breath and a low FVC is an indicator of restrictive lung disease. The FEV1/FVC ratio is the ratio of the Forced Expiratory Volume in 1 second and the FVC, a low ratio is an indicator of Chronic Obstructive Pulmonary Disease (COPD) or asthma. The health index is an inverse-covariance weighted index of all listed components where variables have been flipped so that a higher value represents a better outcome. Standard errors clustered at the household level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.23: Effect of Monitor and Purifier on Specific Symptoms

	(1) Cough	(2) Asthma	(3) Other lung or breathing problem	(4) Blood pressure or heart problem	(5) Pain (Back, Abdomen, Migraine, etc.)	(6) Eye or skin problem	(7) Diarrhea or Constipation	(8) Fever, Nausea, Dizzyness, or Vomiting	(9) Symptom free
Monitor	0.052	-0.000	0.000	0.001	-0.015	-0.002	0.012	0.010	-0.014
	(0.037)	(0.006)	(0.013)	(0.013)	(0.021)	(0.014)	(0.010)	(0.039)	(0.042)
Purifier	-0.002	0.002	-0.008	-0.005	0.020	-0.004	-0.005	-0.025	-0.004
	(0.034)	(0.006)	(0.009)	(0.013)	(0.024)	(0.011)	(0.007)	(0.036)	(0.041)
Purifier x Monitor	-0.022	0.002	0.003	-0.013	0.028	0.006	0.014	0.012	-0.051
	(0.059)	(0.011)	(0.017)	(0.018)	(0.038)	(0.019)	(0.017)	(0.061)	(0.069)
Observations	1,849	1,849	1,849	1,849	1,849	1,849	1,849	1,849	1,849
Clusters	757	757	757	757	757	757	757	757	757
Control Mean	0.207	0.007	0.020	0.032	0.095	0.025	0.014	0.263	0.529

This table reports the effects of the monitor and purifier treatments, as well as their interaction, on if a household member experienced a specific symptom in the past 30 days. We control for if the household also receives the attention incentive and the interaction between the purifier and the attention incentive. Each observation is a household member sleeping in the bedroom of the household head at the time of the phase 2 survey. The data is from the Phase 3 survey of Experiment 1. Standard errors clustered at the household level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.24: Effect of Monitor and Purifier on Labor Supply and Labor Income

	(1) Days worked past 7 days	(2) Income past month
Monitor	-0.07	1920.58
	(0.26)	(7332.22)
Purifier	-0.14	2800.37
	(0.26)	(5223.58)
Purifier x Monitor	-0.19	789.91
	(0.46)	(10204.47)
Observations	830	829
Clusters	721	720
Control Mean	5.07	43,251.10

Notes: This table reports the effects of the monitor and purifier treatments, as well as their interaction, on various labor supply and labor income. We control for if the household also receives the attention incentive and the interaction between the purifier and the attention incentive. Each observation is a household member sleeping in the bedroom of the household head and who held a job at the time of the phase 2 survey. The data is from the Phase 3 survey of Experiment 1. The dependent variables are the number of days worked in the past 7 days and labor income in the past month. Standard errors clustered at the household level. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.25: Effect of Monitor and Purifier on Mental Heath and Sleep

	(1) Sleep Index	(2) Mental Health Index
Monitor	-0.13	0.19
	(0.12)	(0.14)
Purifier	-0.01	0.00
	(0.11)	(0.11)
Purifier x Monitor	0.12	-0.26
	(0.18)	(0.20)
Observations	1,852	1,852
Clusters	758	758
Control Mean	-0.00	-0.00

Notes: This table reports the effects of the monitor and purifier treatments, as well as their interaction, on mental health and sleep. We control for if the household also receives the attention incentive and the interaction between the purifier and the attention incentive. Each observation is a household member sleeping in the bedroom of the household head at the time of the phase 2 survey. The data is from the Phase 3 survey of Experiment 1. The dependent variables are the sum of 10 questions about sleep (Column 1) and 10 questions about mental health (Column 2). The underlying variables have been flipped so that a higher value represents a better outcome. The sums have been normalized to have a mean of zero and standard deviation of one in the control group. Standard errors clustered at the household level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.