The Bay Area Air Quality Management District's Home Air Filtration Program:

Lessons Learned and Tips for Replication

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MANAGEMENT & PREVENTION

California's wildfire season has been growing in length and severity, regularly exposing millions to harmful particulate matter and hazardous air pollutants. The negative health impacts of wildfire smoke are well established and include: asthma exacerbations, coughing, wheezing, acute and chronic bronchitis, reduced lung function, eye irritation, heart attacks, arrhythmias, heart failure, pulmonary embolisms, and strokes. While everyone in a given geographic region may be exposed to smoke during a wildfire, those most vulnerable to the health impacts of wildfire smoke include: children, pregnant women, people with asthma or another lung disease, and people with heart disease. Additionally, it can be more difficult for low-income residents to reduce their exposure to wildfire smoke if they work outside, live in substandard rental housing that allows smoke to infiltrate inside their homes, or are unhoused.

During wildfire smoke events, residents are encouraged to stay indoors when possible, with doors and windows closed. Using an air cleaner, also known as an air purifier, certified by the California Air Resources Board, can greatly reduce indoor particulate levels to reduce impacts from smoke. Many low-income Californians cannot afford air cleaners which contributes to the disparate impact of wildfire smoke and health conditions, like asthma, on low-income communities.

Starting in 2021, a partnership between the Bay Area Air Quality Management District (BAAQMD), Regional Asthma Management & Prevention (RAMP), a project of the Public Health Institute, and seven asthma home visiting programs aimed to address this disparity by providing free air cleaners to low-income residents with poorly controlled asthma across the Bay Area. With the hope that this project can be scaled and replicated, this case study describes the project, lessons learned, and tips for replication, focusing on the following categories:

- Partnerships
- Air cleaner selection
- Orders and deliveries
- Education
- Data collection

The case study also provides information about the recipients of the air cleaners and overall reflections on the impact of the project.

"We have observed over this past year that our clients have been very appreciative that we provide air purifiers to them. The partnership between the Bay Area Air Quality Management District, RAMP, and our program has allowed us to offer air purifiers to all of our clients. Clients tell us that they see a significant reduction of allergy symptoms from using the air purifiers…They have mentioned their desire to purchase air purifiers themselves, but that they just have not been able to afford one and are thus very grateful we can provide this service."

—Asthma home visitor

Partnerships

In the summer of 2021, the Bay Area Air Quality Management District (BAAQMD) approached Regional Asthma Management & Prevention (RAMP), a project of the Public Health Institute, about their interest in providing air cleaners to low-income residents with asthma. RAMP recommended that the air cleaners be provided as part of a comprehensive asthma home visiting approach by partnering with Bay Area organizations involved with the Asthma Mitigation Project (AMP).

AMP is a grant program administered by the Center at Sierra Health Foundation with funds from the California Department of Health Care Services. From 2020-2023, 28 community-based organizations, local health departments, and community clinics across the state received funding to provide home-based culturally and linguistically relevant asthma self-management education. The asthma home visitors, most of whom are Community Health Workers, also conduct an in-home environmental asthma trigger assessment and then provide supplies and services to help reduce those triggers. The AMP program serves Medi-Cal beneficiaries, as well as undocumented adults who are not otherwise qualified for Medi-Cal, who have poorly controlled asthma.

Seven of the organizations participating in AMP are in the Bay Area and agreed to provide air cleaners purchased by BAAQMD to their AMP clients, along with education about how to use and maintain the air cleaners to reduce exposure to wildfire smoke and other asthma triggers. The seven programs are:

- Alameda County Department of Public Health – Asthma Start Program
- Breathe California
- Contra Costa County Health Services
- LifeLong Medical Care
- Roots Community Health Center
- San Mateo County Family Health Services
- Santa Rosa Community Health Centers

Initially, eligibility was limited to AMP clients. In November 2022, eligibility criteria were expanded to allow the AMP programs to provide an air cleaner to any low-income client in the Bay Area with asthma or another respiratory condition and more funds were added to the partnership.

Through this partnership, BAAQMD is able to reach the most vulnerable populations to ensure they not only have access to air cleaners – a critical tool for mitigating wildfire smoke impacts – but also that they receive guidance and education about how to optimally place, use, and maintain the units through wildfire seasons.

Lessons and Tips for Partnerships

Establish Memoranda of Understanding (MOUs) with all participating partners before launching the project and involve partners in project planning and rollout: Early in the partnership, BAAQMD and RAMP established an MOU to articulate the roles and responsibilities of each organization. Later in the partnership, BAAQMD recognized the need to also establish MOUs with each of the seven participating organizations and did so in late 2022. One AMP program director recommended that future projects include "Longer preparation time to involve distribution partners in planning and rollout." This includes plans for media and/or community outreach. In this project, BAAQMD's media outreach promoted the air filter program broadly before consulting on messaging with community agency partners. This oversight led to problems when large numbers of community members reached out to AMP programs only to then learn that they did not meet the eligibility criteria to receive air cleaners. It also overwhelmed the email inboxes of BAAQMD staff. Working with partners in advance of the project's launch is one way to help ensure a smooth rollout. Another consideration in establishing MOUs is whether any financial resources can be provided to the partners; when feasible, it is helpful to support the staff time required to coordinate orders and deliveries and to collect data from clients who receive the air cleaners.

Consider an intermediary organization to streamline communication, ordering and data collection: RAMP staff already had collaborative working relationships with the seven AMP programs and, through this project, served as the single point of communication for AMP programs when they wanted to request more air cleaners or had questions. RAMP compiled demographic data on the clients who received air cleaners as well as the data related to air cleaner order requests from participating programs to share with BAAQMD. One AMP program director shared, "Having a contact person who is a liaison like RAMP has been super helpful." The programs appreciated having a trusted partner in a liaison role and it reduced some administrative burden on BAAQMD staff. The intermediary role requires staff time and is primarily an administrative function. This role could potentially be fulfilled by an air district or other agency if resources are not available to support an intermediary.

"We have received great feedback from our asthma home visiting clients. They have expressed how much this has impacted their asthma flare ups."
—Asthma home visitor

Air cleaner selection

Before launching the project, the Compliance & Enforcement Division within BAAQMD issued a Request for Qualifications in order to select vendors and specific air cleaners, all of which were required to be certified by the California Air Resources Board (CARB) as meeting regulatory standards. BAAQMD staff established a scoring rubric and involved a representative from RAMP and from one of the AMP programs to participate in the review process. Vendors were given points based on cost of each unit, the Clean Air Delivery Rate (CADR) for tobacco smoke (cubic feet per minute), the cost of a replacement HEPA filter, the noise level, and portability. Vendors were also given points for being local and/or a green business, certified by a government agency or independent private rating organization. Based on the review process, two vendors were selected. Each vendor offered two air cleaners, one for smaller spaces and one for larger spaces. While those vendor agreements were in place, AMP programs could request quantities of any or all of the four options for distribution to their clients. The programs were able to provide one air cleaner to each client. Clients were given information about how to purchase replacement HEPA filters but were not provided with any replacement filters.

In 2022, the Community Engagement Division within BAAQMD launched a second phase of the project and, as part of that process, issued another Request for Qualifications and selected four air cleaners and replacement filters. The final selection included an air cleaner that was previously offered during the first phase of the project and three new, different options. This selection process did not involve external partners and the points were given based on: cost of each unit and replacement filter, Clean Air Delivery Rate (CADR) for tobacco smoke, noise level of unit, life expectancy of filters, unit size, local business, green business, as well as weight, and maneuverability. For this second phase of the project, clients were given one air cleaner and one replacement HEPA filter.

For both phases of the project, BAAQMD compiled information about each air cleaner including, Clean Air Delivery Rate (CADR) for tobacco smoke (cubic feet per minute), room size (square feet), unit dimensions, unit weight, box dimensions, annual energy use (kWh/year), and replacement filter information. The asthma programs were able to use this information to guide their selection.

Lessons and tips

Select vendors and air cleaners through a competitive process with clear, health protective criteria and scoring rubrics: This process not only allowed the agency to comply with any requirements related to vendor selection, but also allowed the inclusion of factors that may be important to clients (e.g., noise level, portability, and cost of the replacement filter). In addition to ensuring that all air cleaners are CARB-certified, RAMP recommends an additional health-protective criteria of ensuring that all selected air cleaners are mechanical air cleaners, which only use physical filtration through HEPA filters, rather than electronic air cleaners (which include ionizers, electrostatic precipitators, PCOs, hydroxyl generators, devices with UV light components, and other electronic air cleaning technologies), as they may release non-ozone emissions with potential adverse health impacts that are still being studied.

Involve partners in the process of establishing criteria and selecting vendors: Involving external partners in the selection process can help ensure that the selected air cleaners meet the needs of participating organizations and their clients.

Provide multiple air cleaners from which partners can select to meet the needs of their organizations and clients: The AMP programs considered an array of criteria when ordering air cleaners, so the information that the BAAQMD provided about each option was very helpful. As one program director said, "The air cleaners are bulky and difficult to store." For that program, box dimensions were helpful to know. Another program director shared, "It's important to have a variety of purifiers in terms of size/weight. Some families are sharing rooms with others so portability is important."

Provide at least one replacement filter. The addition of a replacement filter for the second phase of this project was very well received. The cost of replacement filters could be a barrier for clients to properly maintain their air cleaners, so providing a replacement filter upfront is helpful in reducing that barrier.

Orders and deliveries

Early in the project, several AMP programs expressed concern about their ability to store large quantities of air cleaners. Most AMP programs enroll clients on a rolling basis and provide the air cleaners during a home visit in which the Community Health Workers (CHW) also provide education on reducing asthma triggers. As such, they did not want to receive all of the air cleaners from BAAQMD upfront, but rather requested that they be allowed to place multiple orders for small quantities over the course of the partnership. BAAQMD agreed to this request and worked with the vendors to make it possible. Each month, RAMP invites AMP programs to submit requests for more air cleaners. RAMP then compiles the information and shares it with BAAQMD staff who work directly with the vendors to fulfill the orders and ship the air cleaners directly to each program.

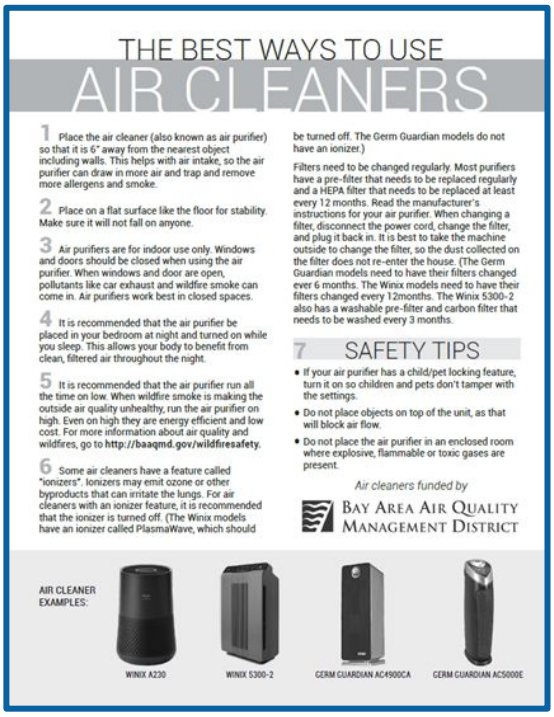
Lessons and Tips for Orders and Deliveries

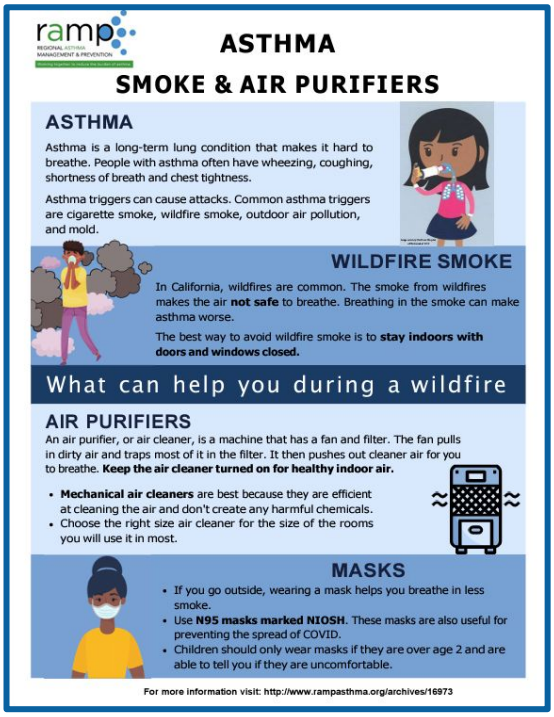
Work with programs that will be distributing the air cleaners to establish processes for orders and deliveries: For the AMP programs, it was important to be able to place multiple orders for small quantities on an as needed basis. The fact that BAAQMD worked with programs and vendors to make that possible was a key to success. One AMP program director said that her advice on program continuation or expansion is: "Keep allowing smaller, more frequent ordering/shipping." If the project model were different—for example, if distribution partners wanted to provide air cleaners to all eligible clients at a single event—a different ordering process would likely be preferable. Working with partners to understand their needs upfront can help shape the ordering process. Another tip for the ordering process is to work with partner agencies and clients to set up appropriate expectations for the time it takes from order to delivery. BAAQMD has a series of steps and approval processes for working with vendors, order requests, purchase orders, checking on deliveries, and invoicing that can take up to 2-3 weeks. It is important to either work with a funded agency that can do the ordering in a faster and more streamlined process, or at least set expectations on the timelines so that community agencies can plan ahead and prepare for these unavoidable delays.

Education

Since the air cleaners are provided by CHWs as part of their asthma home visiting program, the CHWs also provide education about how to use and maintain the air cleaners. BAAQMD created a fact sheet called "The Best Ways to Use an Air Purifier" that provides instructions on how to properly use and maintain air cleaners, which was reviewed by RAMP and one of the AMP programs, and had it translated into Spanish, Chinese, Tagalog, Arabic, and Vietnamese based on input provided by the AMP program directors. When new air cleaners were selected in 2022, BAAQMD updated the fact sheet with information about the four air cleaners provided. A thumbnail of the updated fact sheet is below.

Additionally, RAMP and one of the AMP partners, the Alameda County Department of Public Health, developed videos in English and Spanish about how to use and maintain air cleaners. One AMP staff person said, "If clients do not know how the air purifier works, we help set it up." Another said that a successful component of this program is "providing the air purifier with information."





In addition to educating clients about how to use and maintain the air cleaners, the CHWs also provide education about how to improve indoor air quality and reduce environmental asthma triggers more broadly. For example, they educate clients about activities that create indoor pollution, such as frying foods, sweeping, smoking, or lighting candles or incense. Some of the air cleaners have indicator lights that change color when the indoor air quality worsens or improves. Some of the asthma home visitors shared that this is a useful tool to support them in their education. One noted: "Clients have expressed surprise to see the indoor air quality indicator changes during house cleaning, vacuuming, and cooking."

RAMP also created another educational fact sheet on wildfire smoke, asthma, and prevention methods for reducing asthma triggers, such as using home air cleaners and masks when the air quality is unhealthy (thumbnail above). This fact sheet is also available in Spanish, Chinese, Tagalog, Arabic, and Vietnamese and was distributed to community partner agencies to share with their clients and put on RAMP's website.

Lessons and Tips for Education

Provide educational materials in different formats and language: BAAQMD worked with the AMP partners to develop the educational materials and to understand what languages should be prioritized for translation. This was well received by program staff, one of whom noted "Having instructions in multiple languages was helpful." Recognizing that people learn in different ways, the asthma home visitors also requested videos on how to use and maintain air cleaners. RAMP was able to use funds from a different grant to develop videos in partnership with the Alameda County Department of Public Health. Given limited resources, the videos were only produced in English and Spanish. Working with partners to understand the needs of their clients and identifying or creating educational materials was an important component of this project. The education not only ensures that clients understand how to use and maintain the air cleaners, but also leads to overall indoor air quality improvements and a reduction in asthma triggers.

When feasible, provide the air cleaners as part of a comprehensive asthma management intervention: As described earlier, the air cleaners were provided as part of a comprehensive asthma home visiting program, through which CHWs provided asthma self-management education, an environmental asthma trigger assessment, and other trigger remediation supplies, like HEPA vacuums, asthma-friendlier cleaning products, or dehumidifiers. The comprehensive approach supports greater improvements in both asthma outcomes and indoor air quality. That said, this approach may not always be feasible. There may be times when the urgency to get air cleaners to community members becomes the highest priority. In those cases, we recommend at least providing written educational materials and links to the videos on how to use and maintain the air cleaners.

Data collection

Data collection is important for projects like this so that the Air District can determine whether the program is indeed reaching the intended recipients, which in this case is low-income community members with asthma. AMP programs were asked to record the following information for each air cleaner distributed: date unit was delivered to individual; city and zip code of individual receiving unit; age group, self-reported race/ethnicity, and primary language of individual receiving unit. RAMP created a spreadsheet for each AMP program to record the information and collected data from each program on a quarterly basis. RAMP shared the compiled quarterly data with BAAQMD staff and analyzed the data from the previous five quarters in March 2023.

Lessons and Tips for Data Collection

Establish data collection expectations and protocols upfront in partnership with distribution partners: The BAAQMD staff worked collaboratively with AMP partners to understand what type of data collection was allowable (e.g. home visiting programs could not provide any patient identifying information) and feasible for the CHWs conducting the asthma home visits. The District ultimately struck an effective balance in collecting enough data for accountability purposes yet ensuring that the data collection process was not too onerous on partners. The data expectations were finalized upfront and never changed over the course of the project, which was very helpful for project partners.

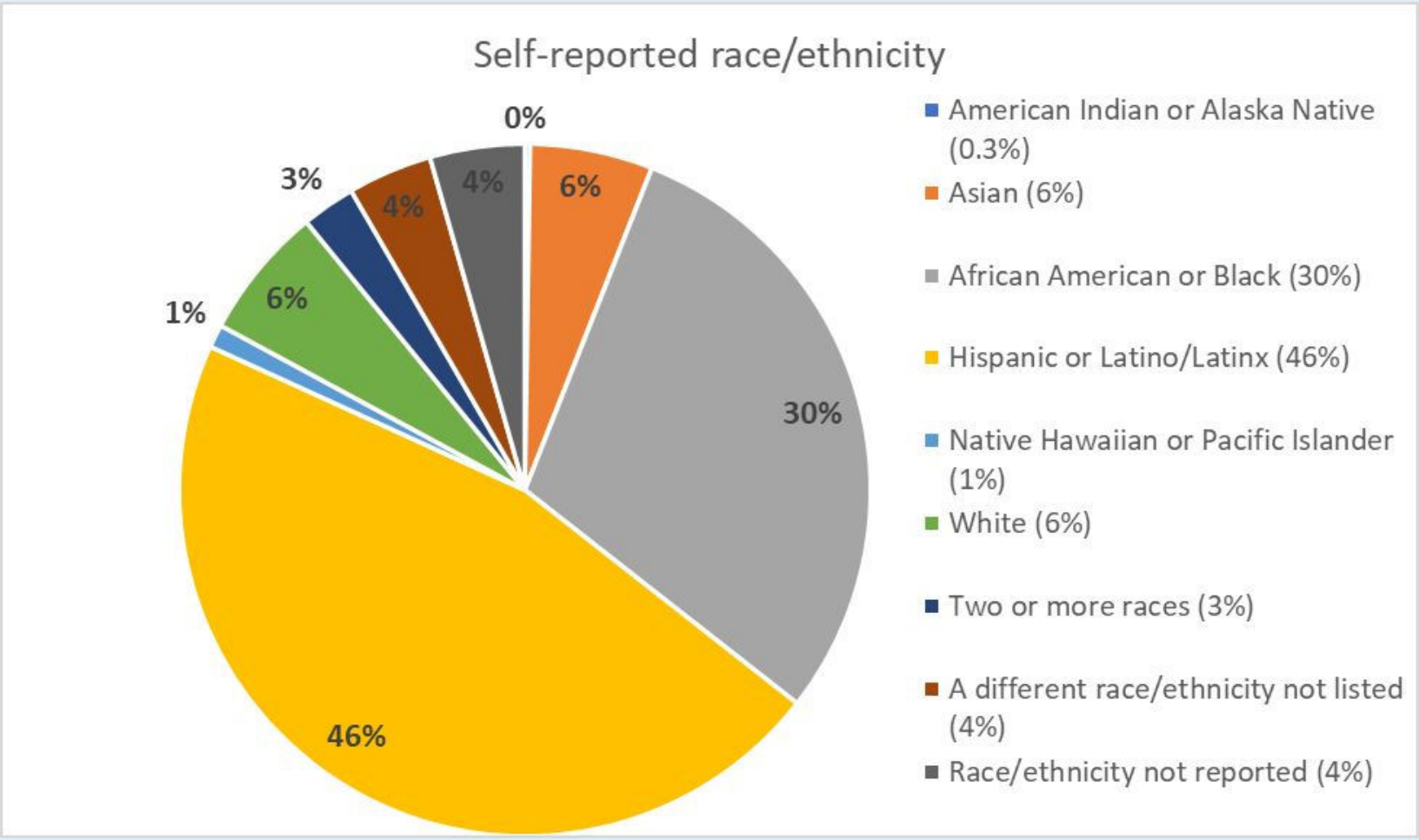
Consider whether financial support could be provided to support the data collection task: Because the AMP programs were already collecting data on age, race/ethnicity, and primary language for their AMP grants, it was determined that the data collection would be feasible. However, even the task of recording the data in a separate place and submitting it on a regular basis takes time. One AMP program shared that they decided not to extend the air cleaner distribution to clients outside of AMP partly because they simply did not have the staff resources for the data collection requirements.

Data on Air Cleaner Recipients

In June 2023, RAMP staff compiled data from across all previous quarters. A total of 835 air cleaners had been distributed to AMP partners at that time.

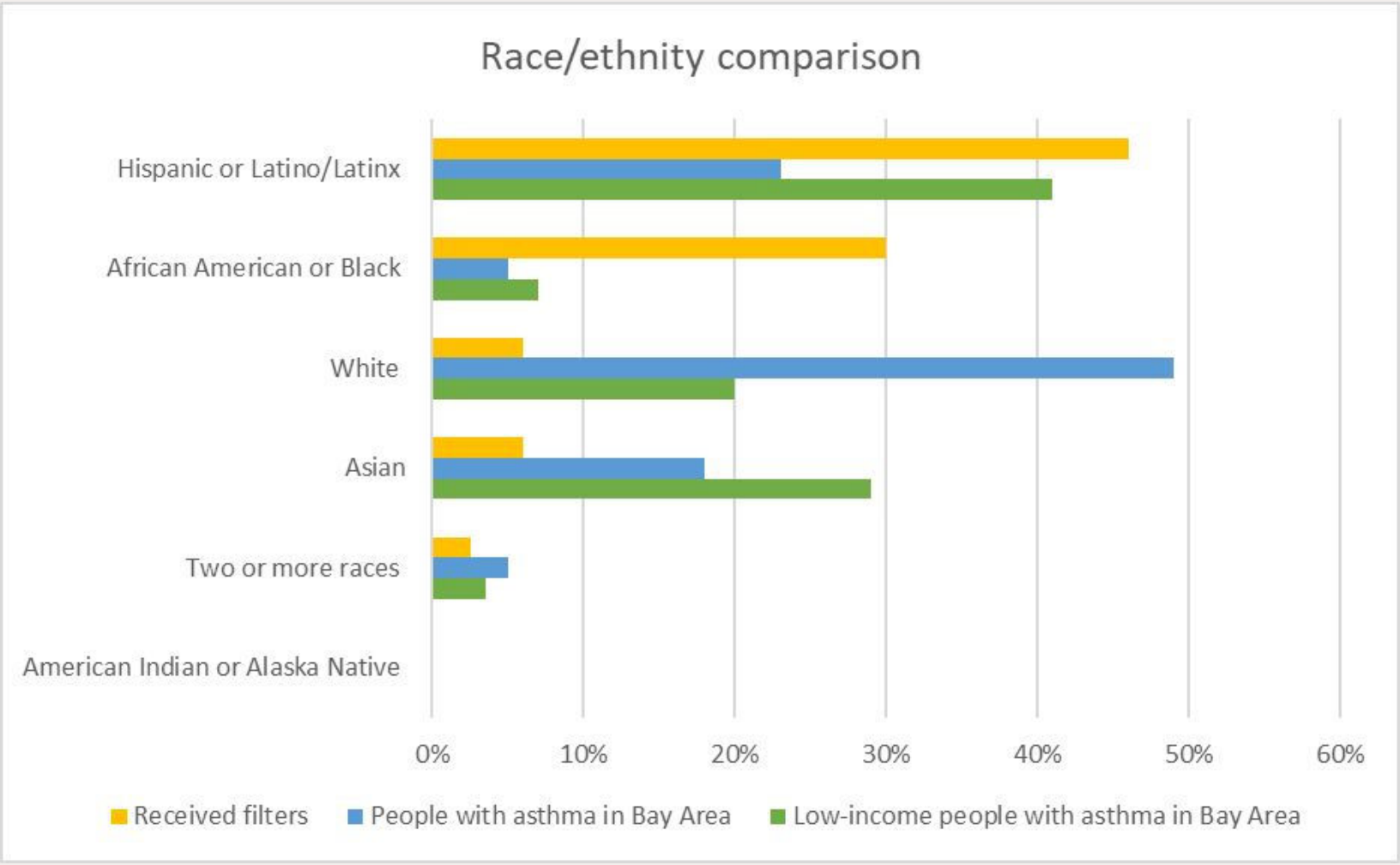
The charts show data on the air cleaner recipients by race/ethnicity, age, and primarily language. Recognizing that the Air District's need to understand whether partnerships of this nature help them reach their equity goals, each chart is followed by another chart comparing the air cleaner recipients to people in the Bay Area with asthma according to the 2021 California Health Interview Survey conducted by UCLA. Race/ethnicity is also compared to people in the Bay Area with asthma who are low-income, using incomes below 138% of the Federal Poverty Level, which is the cutoff for Medi-Cal eligibility. These data were also acquired through the California Health Interview Survey.

The programs collected data on self-reported race/ethnicity. The largest percentage of people (46%) self-identified as Hispanic or Latino/Latinx followed by African American or Black (30%).



"The ability to provide this resource to patients (that have limited financial means) has had a significant impact on improving patient health outcomes surrounding asthma." – Asthma home visitor

The next chart compares the race/ethnicity of air cleaner recipients to the race/ethnicity of 1) people with asthma in the Bay Area and 2) low-income people with asthma in the Bay Area. A conclusion that can be drawn from the comparison chart is that the AMP programs successfully reached and provided air cleaners to low-income African-American and Latino people with asthma. However, the percentages of White and Asian clients that received air cleaners were lower than the percentages of White and Asian people with asthma in the Bay Area. In some cases, the race/ethnicity of the air cleaner recipients was shaped by the fact that some AMP organizations serve specific geographic areas or prioritize services to specific racial/ethnic groups. For example, Roots Community Health Center's asthma program is an African-centered model of prevention and treatment with an emphasis on service to African-American families in East Oakland.

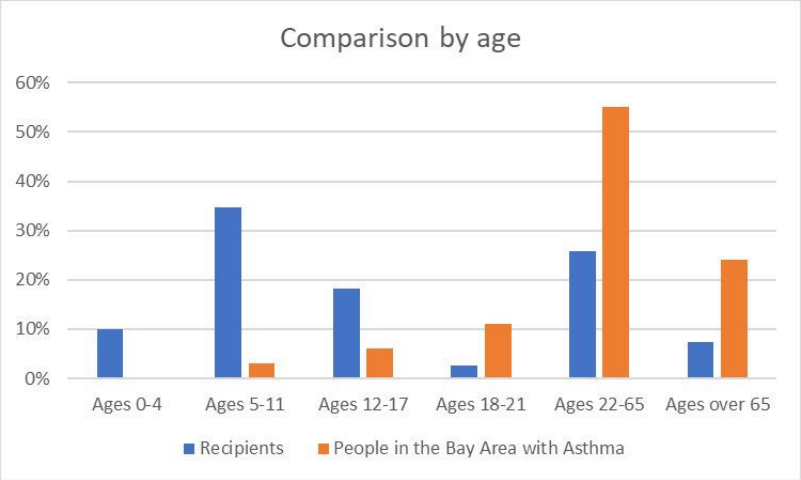


"Clients have been so grateful! I have a lot of families who have kids with allergies and asthma and they are triggered by things like pollen and dust who say it has made a huge difference."

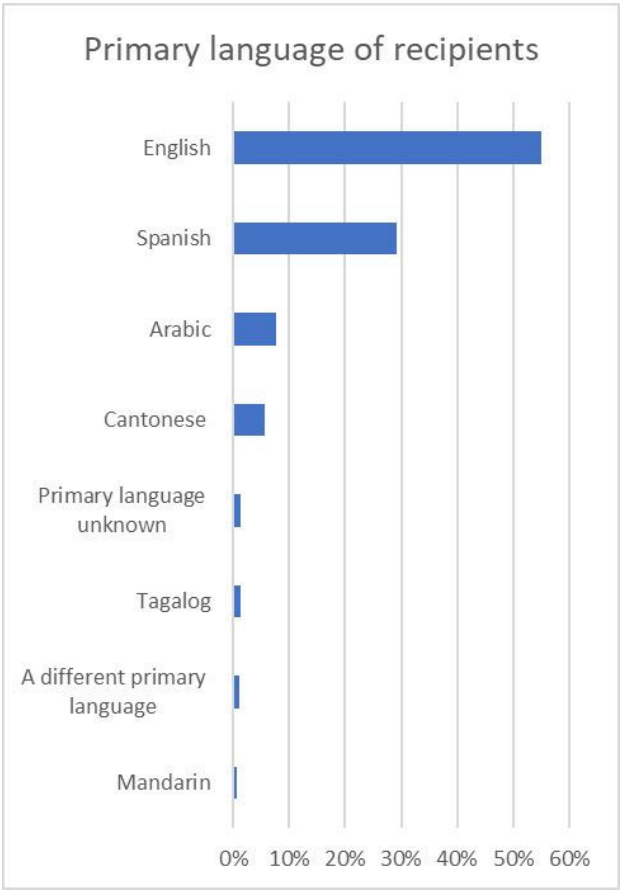
—Asthma home visitor

The air cleaners were distributed to all age groups with the largest number between 5-11 years of age. The next chart shows how the age of recipients compares to the age of people with asthma in the Bay Area. (Note: when looking at the numbers of people with asthma in the Bay area by age group and limiting to people under 138% of the Federal Poverty Level, the numbers were too small to be statistically stable and are thus not reported here.)

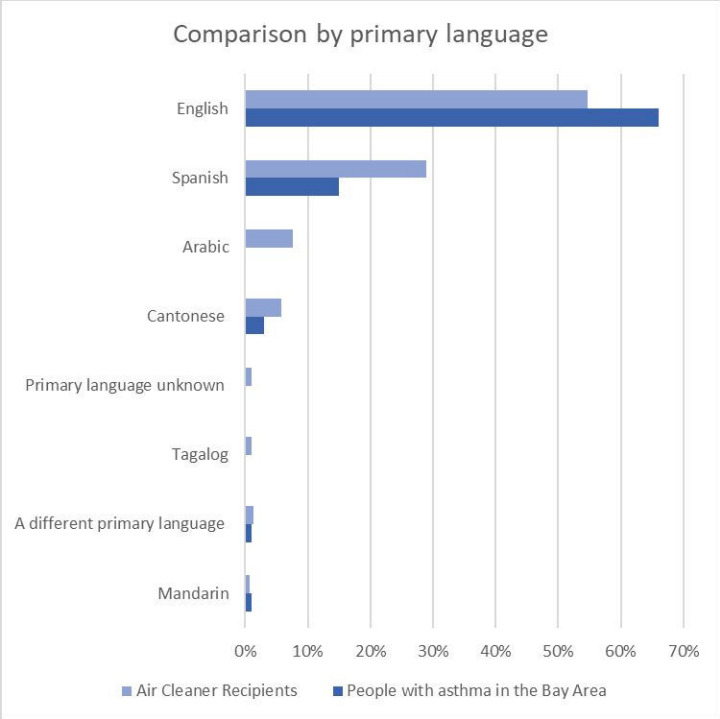
A conclusion that can be drawn from the comparison chart is that the AMP programs successfully reached and provided air cleaners to children with asthma but reached a lower percentage of adults with asthma than actually live in the Bay Area. Some of the participating AMP programs only serve particular age groups. For example, Alameda County Department of Public Health – Asthma Start Program only serves children.



The majority of air cleaner recipients (55%) speak English as their primary language. Twenty-nine percent speak Spanish, followed by Arabic (8%), Cantonese (6%), Tagalog (1%), and Mandarin (1%). Some air cleaner recipients reported speaking Farsi, Vietnamese, or Korean, but the percentages were below 1%. When reporting data, the AMP programs reported that for 1% of the recipients, they did not record the primary language and 1% spoke a different language than the options provided.



Below compares the primary language of air cleaner recipients to the primary language of people in the Bay Area with asthma. A conclusion that can be drawn from the comparison chart is that the AMP programs were successful in reaching individuals and families who speak languages other than English as their primary language.



Overall, the AMP programs were able to provide air cleaners to diverse low-income community members in the Bay Area. They were very successful in reaching Latino and African-American residents, families with children, and individuals whose primary language is something other than English.

"The air is breathable in my house"

—Program participant with asthma

In terms of geographic reach, the Air District's jurisdiction includes the counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and parts of Solano and Sonoma counties. The red outline on the map above shows the jurisdiction area. The stars on the map indicate the location of the AMP programs participating in this partnership. There were no AMP programs serving Marin, Napa, or Solano counties. And some of the AMP programs serve just particular cities or neighborhoods rather than the entire county.

It is important to note that the number of air cleaners distributed varied across the programs due to variation in the size of the programs and numbers of clients served. The programs that distributed the largest numbers of air cleaners reported successful outreach and enrollment protocols for their AMP activities. They described having multi-pronged outreach that involved health plans, colleagues in their own organizations, partnerships with clinical providers, and connections with community-based organizations. One program with lower numbers described challenges in partnering with a health plan and delays in setting up referral pathways. Another program noted that while they were successful in enrolling AMP clients, they did not offer air cleaners to their clients outside of the AMP program since many of them are unhoused.

The counties with the most air cleaner recipients were Alameda County (299 recipients) and Contra Costa County (314 recipients). Alameda County has two AMP programs-- the Alameda County Department of Public Health's Asthma Start program and Roots Community Health. Contra Costa County also has two AMP programs—Contra Costa Health Services and LifeLong Medical, which has clinics in Alameda County as well, but focused on Contra Costa County for this particular project. Additionally, Breathe California serves clients in both Alameda County and Contra Costa County, along with San Francisco, San Mateo, and Santa Clara Counties.

In sum, the AMP programs reached many community members across the Bay Area (835 as of June 2023), but there were gaps and unequal geographic distribution. When designing a program and forming partnerships, the lead agency must consider an array of factors. A significant advantage of partnering with asthma home visiting programs is that the air cleaners are provided by trusted asthma educators who demonstrate how to use and maintain the air cleaners and provide them as part of a comprehensive approach to asthma management. These programs were also extremely effective at reaching low-income African-American and Latino communities who are often disproportionately impacted by asthma and air pollution. Other program models may have different advantages. For example, partnering with local health departments or other organizations that serve broad geographic areas may help agencies reach people across their entire jurisdiction. Additionally, there may be faster ways to distribute larger numbers of air cleaners to community residents than was done through the AMP partnerships, which could be useful during wildfire smoke events and/or with a larger project budget.

Lessons and tips

PARTNERSHIPS

Establish Memoranda of Understanding (MOUs) with all participating partners before launching the project and involve partners in project planning and rollout

Consider an intermediary organization to streamline communication, ordering and data collection

AIR CLEANER SELECTION

Select vendors and air cleaners through a competitive process with clear, health protective criteria and scoring rubrics

Involve partners in the process of establishing criteria and selecting vendors

Provide multiple air cleaners from which partners can select to meet the needs of their organizations and clients

ORDERS AND DELIVERIES

Work with programs that will be distributing the air cleaners to establish processes for orders and deliveries

DATA COLLECTION

Establish data collection expectations and protocols upfront in partnership with distribution partners

EDUCATION

Provide educational materials in different formats and languages

When feasible, provide the air cleaners as part of a comprehensive asthma management intervention

Overall impact

The Bay Area Air Quality Management District's Home Air Filtration Program has provided tremendous value to low-income residents with asthma and the programs that serve them. Air cleaners reduce environmental asthma triggers and improve indoor air quality, improving the lives of people with asthma. They are especially important as California experiences more frequent and more intense wildfire smoke events. The staff of the partnering asthma organizations not only provided air cleaners but also education, meaning clients are more likely to use and maintain them properly. This is further reinforced by the written materials provided in the clients' primary language. Additionally, receiving free air cleaners means the asthma home visiting programs can direct their limited budget toward addressing other asthma triggers, which increases their overall impact on clients.

We encourage the Bay Area Air Quality Management District to sustain and expand their program and for other air districts and government agencies to replicate this program. In addition to the lessons and tips provided in this case study, project partners would be happy to share the educational materials (both written and video), data tracking sheets, and other tools to support successful scaling of this important project.

> **"Air feels fresh and clean."**
>
> **—Program participant with asthma**