

**WEST OAKLAND DIESEL PARTICULATE ASSESSMENT, INTERVENTION, EVALUATION
AND OUTREACH PROJECT**

Evaluating Indoor Air Interventions To Reduce Diesel Particulate Matter In West Oakland, California

FINAL REPORT
EPA Aging Initiative

Date: August 24, 2006

Recipient: Pacific Institute for Studies in Development, Environment, and Security

Agreement Number: CH – 83225801– 0

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Report Outline

- A. Abstract (page 2)
- B. Project Activities (page 4)
- C. Project Innovations (page 8)
- D. Results, Successes, and Challenges (page 9)
- E. Target Audience for Dissemination (page 13)
- F. Conclusion (page 13)
- G. Final Budget (page 13 and Attachment A)
- H. Acknowledgements (page 13)

A. ABSTRACT

A1 Organizational Background

The Community Strategies for Sustainability and Justice (CSSJ) Program of Pacific Institute was launched in 1995 to assist communities in addressing critical human health and environmental issues. Currently, the CSSJ Program has three main initiatives, one of which includes helping West Oakland residents use new research to address the problem of diesel pollution. In this project, we have partnered with the West Oakland Environmental Indicators Project and the California Environmental Health Tracking Program (CEHTP) at the California Department of Health Services. CEHTP is currently developing a standards-based, integrated system facilitating public health actions through monitoring, reporting, linkage, and communication of data on environmental hazards/exposures and environmentally related diseases.

A2 Purpose

Particulate air pollution exacerbates heart and lung disease, leading to hospitalization, increased morbidity, and premature mortality. The key purpose of this project was to demonstrate and evaluate exposure reduction methods and disseminate findings and other helpful information to the West Oakland community, with the focus on older adults. We aimed to improve the indoor environments and health status of elderly residents in West Oakland by identifying residential areas likely to be impacted by vehicular and truck traffic, and providing them with a potential intervention technology. While outreach and education efforts would focus on the efficacy of the studied method and general indoor air quality, ultimately, we hoped such a study would demonstrate the need for reducing pollution affecting residents at the source. Overall reduction in diesel pollution provides numerous environmental and health benefits to West Oakland residents of all ages.

A3 Objectives

The primary project objective was to evaluate the efficacy of using a portable indoor air cleaner to reduce potential mobile-source emissions in the indoor environment of West Oakland senior citizens. To achieve this objective, we were to identify residential areas likely to be impacted by mobile source emissions, recruit older adults, identify potential intervention technology, implement the intervention, perform pre- and post-intervention air monitoring, and disseminate the findings and other practical information.

A4 Methods

We used CEHTP's existing data system to identify senior residences with the greatest potential for traffic-related exposures. Older adults were recruited and interviewed for eligibility. The intervention phase was conducted over three weeks, with indoor and outdoor air sampling in study participants' homes: Week 1 – air sampling; Week 2 – deployment of a portable HEPA air filter indoors in one room, and air sampling; Week 3 – continued use of the air filter, and air sampling. The air sampling equipment consisted of air pumps and quartz cassette filters collecting elemental and organic carbon particles. At the conclusion of the study, we conducted an informational meeting with study participants; developed an educational brochure on indoor air quality; conducted meetings within West Oakland senior community; and distributed the custom brochure to the West Oakland community at large.

A5 Demographics of Target Audience

West Oakland is a low-income community of approximately 22,000 people, with the median income of \$21,385 and a large proportion of residents of color (65% Black, 16% Latino, 11% White, 9% Asian, and 15% multiracial)¹. West Oakland also has a significant proportion of elderly residents, of whom 26% live in poverty and 42% are renters². Most of these elderly spend a large proportion of their time indoors and 53% live alone². Older adults are more vulnerable to the risks of indoor air pollution partly due to spending larger part of the day indoors and a generally weakened health status.

A6 How funds were used

Funds were spent on rental of air monitoring equipment; laboratory analysis; other study equipment; outreach and recruitment materials; meeting supplies; staff time for the project; and compensation (\$100 grocery vouchers) for the 10 study participants. Please see section G for the final budget.

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1. Census 2000 figures for West Oakland (Census Tracts 4015-4019, 4021-4027). Alameda County Department of Public Health. 2001. *Community Information Book: West Oakland*. Oakland, CA. p.10.
 2. "West Oakland Snapshots," 2001, Institute of Urban and Regional Development, UC Berkeley.

B. PROJECT ACTIVITIES

B1 Project Chronology

Spring – Summer 2005

Final approval by CA Committee for Protection of Human Subjects (CPHS)
Completion of traffic volume assessment of the study area
Development of subject eligibility criteria and fieldwork materials

September 2005

Eligibility screening and recruitment of subjects

October – November 2005

Completed informed consent; provided participants with compensation food vouchers
Conducted the intervention
During Week 2 of the intervention, provided participants with HEPA filters, which they were to keep after the air monitoring was completed

January – February 2006

Received laboratory report of analyzed air samples
Conducted a meeting with study participants to share the preliminary results of the study and provided participants with educational materials about improvement of indoor air quality

March – June 2006

Completion of data analysis
Dissemination of indoor air educational materials to the seniors and the general community in West Oakland
Educational presentation at a senior citizen center about indoor air quality

July 2006

Presentation to the Oakland Commission on Aging
Continued outreach to other senior citizen locations

B2 Summary of project activities

B2.1 Activity 1: Assessment

The assessment phase involved utilizing CEHTP's existing traffic-related pollutant information system, incorporating California Department of Transportation (CalTrans) traffic volume data to characterize potential senior citizen residences in West Oakland with regard to their proximity to high traffic roads. The measure of success was a traffic volume map of the project area made available by the CEHTP.

In the Assessment activity, we have completed the following tasks, among others:

- Created a detailed list of existing senior housing in the study area
- Finalized the study area and mapped senior housing locations on a traffic volume map
- Identified general areas in West Oakland that are impacted by mobile-source pollutants using CEHTP's existing traffic-related pollutant information system
- Identified locations to focus recruitment

B2.2 Activity 2: Intervention

The intervention phase involved research and selection of an appropriate portable air cleaner technology, development of pre- and post-intervention air sampling protocol, and conducting the actual field work. The pre- and post-intervention air monitoring consisted of sampling of elemental and organic carbon utilizing

NIOSH5040 method. Elemental carbon (also called “soot” or “black carbon”) is useful as a marker of diesel exhaust and as such determines the extent to which diesel particulates may be penetrating inside homes. Organic carbon is a marker of other types of combustion products, such as burning food or smoking. Final protocol included sampling the air indoors and outdoors of participating senior residences for one week prior to the air cleaner deployment; and for two weeks subsequent air cleaner deployment (Week 1 – air sampling only, indoors and outdoors; Week 2 – begin air cleaner operation indoors in one room and air sampling indoors and outdoors; Week 3 – continue air cleaner operation and air sampling). Literature review indicated that the most appropriate portable air cleaner for this study would be a mechanical air purifier, with a HEPA filter, with a Clean Air Delivery Rate (CADR) of at least 200 for environmental tobacco smoke (particle size similar to diesel exhaust). The measure of success in this activity was the completion of the intervention and air sampling in 10-20 senior residences.

In the Intervention activity, we have completed the following tasks, among others:

- Researched and selected intervention equipment (a portable HEPA air cleaner)
- Had the protocol reviewed by Indoor Air Program staff from the California Air Resources Board and Cal EPA Office of Environmental Health Hazard Assessment staff
- Obtained 11 donated HEPA air filters for use in participants’ homes (Holmes Harmony)
- Developed a “host packet” of materials for participants including: a log of activities to be filled out by participants during the study, information about the indoor air filter and air monitoring device, and a factsheet about indoor air quality
- Created a walk-through checklist for the indoor air assessment at participants' homes
- Designed sound proofing device for air sampling pumps
- Administered informed consent, completed residence walk-throughs, and completed pre- and post-intervention air monitoring of 10 seniors’ homes over a 3 week period from late October to early November

B2.3 Activity 3: Outreach

This project was intended to develop community-based expertise and capacity on environmental health issues. Outreach efforts focused first on recruiting older adults for taking part in this study; and after completion of the project, to provide them with useful and accessible information about the study, findings, and general air quality. The West Oakland Healthy Homes Collaborative is a community-initiated project to improve indoor air quality in West Oakland homes impacted by diesel air pollution and other particulate air pollution. Through the outreach coordinator, we were able to do outreach to and recruitment of potential study participants at key community venues in West Oakland such as senior centers, church groups, and apartment buildings for the elderly. After extensive outreach in the senior citizen community, we were able to screen 18 interested residents, and recruit 10 study participants. The measures of success in this activity were our ability to conduct outreach and education to recruit sufficient number of participants; ensure that no participant dropped out of the study before completion; train the participants on necessary study controls to ensure accuracy of results; and summarize the information in a manner accessible to this community. All recruited participants completed the study for the entire 3-week period, allowing us into their homes for a total of 5 visits per home.

In the Outreach activity, we have completed the following tasks, among others:

- Created an informational sheet for prospective participants about the study and possible equipment they would host
- Created eligibility screening questionnaire and database to log each participant’s information
- Established methods within project team to 1) conduct outreach, 2) screen residents for eligibility, 3) assign codes for all residents to protect identity, 4) select eligible participants based on a convenience sample, and 5) notify selected participants
- Disseminated 300 outreach and recruitment flyers and gave presentations about the project to over 130 community members
- Screened 18 interested volunteers for eligibility, and recruited 10 residents as study participants

- Trained 10 participants of the study on necessary study controls to ensure accuracy of results
- Provided all participants with a packet of information about the study, their rights and responsibilities, and general air pollution information

B2.4 Activity 4: Dissemination Strategy

The results from the assessment, intervention and evaluation phases were summarized in a manner that made the information and findings accessible to the community. There are quite a few sources of educational materials on indoor and outdoor air quality, many of which are very detailed, offering practical steps for exposure reduction. However, from talking with West Oakland community members, we found that many residents wanted a simple, clear explanation of what indoor air pollution is and simple steps they can take to improve their indoor air quality and health. Translating our study efforts and other available materials into meaningful results for the study participants and West Oakland senior community was an important consideration.

The measure of success for this activity was discovery, creation, and dissemination of information of immediate actions that help reduce or control exposures to environmental particulate matter among older adults in West Oakland. To that effect, we created an educational brochure specific to West Oakland, explaining sources of indoor air pollution and delineating low-cost simple actions to reduce these hazards; while acknowledging the ambient air quality problem in the area.

At the February 6, 2006 meeting with study participants to present preliminary results, many attendees were eager to share more information about indoor and outdoor air quality issues with other community residents as well as policymakers. To that end, residents were encouraged to join existing efforts to address these issues in a collaborative setting through the Healthy Homes Working Group of the West Oakland Toxics Reduction Collaborative, a partnership of the West Oakland Environmental Indicators Project and the US EPA.

On May 18th, 2006, the custom indoor air brochure was disseminated to seniors served at the West Oakland Senior Center, a center place in the community for elders. On July 5th, 2006, the study information and the brochure were presented to the City of Oakland Commission on Aging. The West Oakland Healthy Homes Collaborative will further disseminate the indoor air brochure and/or other air pollution educational materials through the following venues in the neighborhood: Healthy Homes working groups; Senior centers; Community group meetings and events; and other appropriate sites.

In the Dissemination activity, we have completed the following tasks, among others:

- Presented preliminary results to study participants and received feedback on the study and next steps on February 6, 2006
- Compiled a comprehensive packet of educational materials (listed below) about indoor air quality and study results for study participants (given at the February 6, 2006 meeting):
 - “Reducing Indoor Air Pollution” Factsheet (California Air Resources Board)
 - “Reducing Exposure to Particulate Pollutants” (California Air Resources Board)
 - Consumer Reports factsheet about air purifiers
 - “50 things you can do to reduce air pollution” (California Air Resources Board)
 - “The Inside Story: A Guide to Indoor Air Quality” (US EPA/CPSC)
 - Anti-Idling doorhangers and brochure (Ditching Dirty Diesel Collaborative)
 - Map of the study area
 - Results from West Oakland Indoor Air Study (PowerPoint slides)
 - How to change your Holmes air filters factsheet
 - West Oakland indoor air study monitoring equipment factsheet
- Created a brochure on indoor air quality for West Oakland senior residents and community at large
- Presented the study and air quality information at the West Oakland Senior Center (50 indoor air brochures distributed, 25 EPA/CPSC “The Inside Story on Air Pollution” booklets distributed, 35 seniors present)

- Made a presentation to the City of Oakland Mayor’s Commission on Aging on July 5, 2006 (provided an informational packet to 11 commissioners and 1 staff person consisting of our indoor air brochure, one-page summary of the study, and “Reducing Indoor Air Pollution” factsheet from California Air Resources Board). Provided additional 89 indoor air brochures to the Commissions’ staff person. The meeting was broadcast live on Oakland’s local government access television channel.
- Overall, we distributed nearly 600 copies of the indoor air brochure, both in hard copy and electronically (see Table 1)

Table 1. Final dissemination of the Indoor Air Quality Brochure, created by project staff

Date	Event	People in attendance	Brochure copies distributed	Feedback/Comments
May 18, 2006	West Oakland Senior Center Advisory Board Meeting	19	50	
June 15, 2006	West Oakland Senior Center Dance, Sewing Classes, and Lunch	50	50	Some seniors wanted to know about having a non-smoking apartment complex
June 16, 2006	USC Media and Communication Retreat on Air Quality (Sacramento)	36	45	“The brochure was a good idea”
July 5, 2006	City of Oakland Mayor’s Commission on Aging (live TV broadcast on a local channel)	12	89	Commissioners wanted the brochure translated into other languages
July 18, 2006	St. Mary’s Garden Senior Housing	40	40	Need brochure in South Asian languages
July 19, 2006	Email various organizations, individuals, and list-serves		More than 300	

C. PROJECT INNOVATIONS

West Oakland residents have long identified indoor air quality as an important environmental health issue. Through the West Oakland Environmental Indicators Project, the residents and organizations identified 17 indicators of their neighborhood to measure and track over the years. Indoor air quality and truck traffic, while not being part of the detailed indicators, were listed as critical concerns. The innovation of this project centered on addressing a significant matter facing a low-income neighborhood in close proximity to the Port of Oakland and bounded by three freeways. Previous work in West Oakland started identifying the impact of diesel pollution in the area, however, it did not provide residents with practical information they could use to protect their health and home environment. This project reflected a critical step in addressing West Oakland residents' (both senior citizen and others) interests and providing them with tangible strategies to improve their health.

Additionally, while the portable air cleaner marketing materials are ubiquitous, very little research has been done to evaluate their effectiveness. Some studies involved asthmatic or allergic subjects or targeted larger particles like dust and pollen. The portable air cleaner industry itself lacks consistent standards in the measure of product effectiveness. The novel approach of this project mainly centered on actionable results: focusing on a vulnerable population (the elderly), an ambient air quality problem (traffic/diesel exhaust), the use of little-studied technology (portable air cleaner), and the information dissemination strategy to empower community residents to take further steps to improve their health. The combination of the above steps and the development of materials enabling action made this project unique.

D. PROJECT RESULTS, SUCCESSES, AND DIFFICULTIES ENCOUNTERED

Given the low level of funding, an experimental design (e.g. case-control approach) which allows for control of numerous factors, such as the influence of internal and external sources of pollutants, was not feasible. Therefore, we have adopted a quasi-experimental approach for this pilot project. In order to maximize available budget, CEHTP staff contributed their time and we have solicited a donation of the air cleaners. Holmes company donated 11 units of their Harmony air purifier model for this project.

We have encountered a number of challenges during the outreach and intervention/air sampling phases. The dissemination activities were our primary success.

D1 Difficulties encountered

D1.1 Outreach activity challenges

After the assessment phase identifying a part of West Oakland most impacted by traffic-related pollution, the main challenge was recruitment of an adequate number of potential participants residing in the area of interest. We were not able to recruit a sufficient number of seniors to draw a random sample for study participation. After screening all interested volunteers, we had a convenience sample of eight eligible non-smoker individuals (one of who resided outside of the smaller area of interest) and two smoker households. We were not able to have a balanced proportion of single family homes vs. apartment-style residences: the sample included one apartment, one town-house and eight single-family homes. We were able to recruit the targeted number of participants (10), however only seven out of ten met all the eligibility criteria.

The following are some of the reasons for recruitment difficulty:

- Large proportion of West Oakland residents are smokers. Since one of our eligibility requirements was a non-smoking household, seniors who were smokers did not apply to participate in the study (with the exception of a few, two of whom we ultimately accepted).
- Two of the senior housing developments did not have the capacity to hold tenant meetings for the outreach coordinator to present information about the study.
- One senior housing development did not respond to telephone calls.
- Federal senior housing under Oakland Housing Authority needed approval by HUD.
- We were not advertising the \$100 food voucher as the selling point of the study per CPHS request.
- Many seniors had difficulty understanding the need for the study.
- Some West Oakland residents out of target area volunteered to participate (one of which we accepted).
- Some seniors were not willing to allow us into their homes so many times or they were not willing to host noisy equipment.
- The actual cost of air cleaners and replacement filters may be too high for this low-income community, so some seniors may have been unwilling to participate, receiving an air cleaner and then having to maintain it.
- There was a large population of South East Asian seniors residing in the area. However, due to lack of staff and resources to translate the materials, we were limited to recruiting only English-speaking seniors.
- Only one staff person was conducting the entire outreach effort.

D1.2 Intervention activity challenges

Due to the limited budget of this project and lack of safe and convenient outdoor locations among participating seniors, we were not able to deploy outdoor air monitoring equipment at all 10 households. In order to determine the decrease in traffic-related pollutants in the indoor environment, it is essential to conduct concurrent sampling indoors and outdoors of the household. We were able to place outdoor monitors at five participating homes. Due to the proximity to other participants, we assigned two of the five outdoor sampled locations to the neighbors who had only indoor air sampling; thus increasing the outdoor comparisons to seven households. Participant J was assigned outdoor air sampling values of participant A and participant B was assigned outdoor air sampling values of participant G (please see the enclosed map).

Due to some delays in the logistical set-up of the study and an early start of the rainy season in the area, we lost one outdoor air sample due to water damage. It had rained intermittently (and sometimes heavily) during all three weeks of the intervention activity.

The main challenges during the intervention activity included air sampling equipment problems and participant non-compliance with study controls. On many occasions, the air pumps failed to complete sampling for the entire seven-day sampling episode (majority shut down around days 5-6). Most participants either noted these occurrences in their logs or notified our field staff. Such shut-downs could be explained by various factors like power outages, participant non-compliance, or exceedance of pump sampling capacity. Out of 45 samples (30 indoor and 15 outdoor), only nine had sampling episodes without any interruptions. This information has been documented in the activity logs by the participants and/or in the notes collected by the study team. In one household, the air cleaner malfunctioned; however, we were able to replace it with another unit.

As is common in such studies, we had several instances of participants not following study controls as requested. For example, some have turned down the air cleaner to a lower setting; others had children upset the equipment; still others kept doors and/or windows open in the room where we were sampling. Despite the best efforts of our staff to train study participants in the necessary responsibilities of hosting air sampling equipment and study participation, such occurrences were not avoidable. Some participants recorded deviations in their activity logs; others turned in empty logs.

To calculate concentrations of pollutants, we had to estimate the total air flow through the pumps given the information available. Therefore, our data analysis focused more on ratios and relationships between indoors/outdoors and elemental carbon/organic carbon rather than actual mass and concentration of the pollutants. We would caution against generalizing these results due to the uncertainties introduced by equipment difficulties.

D2 Results

As seen in Table 2 below, Organic Carbon was the major component of Total Carbon, both indoors and outdoors. Among ten locations with indoor air monitoring, Indoor Total Carbon (TC) consisted of about 95% Organic (OC) and 5% Elemental Carbon (EC). Among five locations with outdoor air monitoring, Outdoor Total Carbon consisted of about 80% OC and 20% EC. These results are consistent with expected composition of carbon particles indoors and outdoors. We expect EC to be more abundant outdoors, primarily due to traffic exhaust; EC emissions indoors are expected to be much less significant.

We found outdoor ratio of OC to EC to be approximately 4 and EC to TC ratio of approximately 0.2. This represents an expected characteristic of gasoline vehicles, rather than diesel³. Since West Oakland community is surrounded by three freeways with heavy truck traffic, we expected to find higher amount of EC outdoors. However, given only five locations with outdoor air samplers in our study, we can not generalize these findings to the entire West Oakland neighborhood.

Overall amount of EC indoors was very low, with average estimated EC concentration indoors of approximately $0.4 \mu\text{g}/\text{m}^3$ (Table 2). Other studies found average indoor EC concentrations to range from 0.4 to $5.5 \mu\text{g}$ per meter cubed⁴. This constitutes good news for West Oakland residents, indicating that, at least among the households participating in this project, penetration of EC from outdoors inside is relatively low.

In the absence of indoor sources, the ratio of indoor to outdoor concentrations should be less than or equal to one. For OC, we would expect the average indoor concentrations to be higher than outdoor due the indoor household activities, such as cooking. Table 2 shows that among participating households, we found higher OC amounts indoors than outdoors. However, the converse was true for EC.

Indoor/outdoor ratios were, in general, lower in Weeks 2 and 3 compared to Week 1. Outdoor levels being similar, this indicates a decline in indoor concentrations. Outdoors, we found a relatively constant weekly amount of both OC and EC; however, the indoor amount of EC declined in Weeks 2 and 3 by approximately 50%. This was an average decline, as in some households we did not see a decline in EC (or OC) with the use of an air cleaner in Weeks 2 and 3. In some households, there was an increase (in a couple of instances, we could explain these increases from the activity logs filled out by participants – for example, one household had their house weatherstripped during Week 3). In three households, we saw a definite decline of EC amount indoors in Weeks 2 and 3 compared to Week 1.

Steps such as adjusting EC and OC indoor measurements by the room size and outdoor measurements by the prevalent wind conditions and precipitation could improve the evaluation of the air cleaner effectiveness; however, given the equipment failures and other uncertainties in EC and OC concentration calculations, we did not perform those analyses.

Overall, there is some indication that the use of an air cleaner helped reduce amount of Elemental Carbon (proxy for diesel exhaust) in the indoor environment. We would caution against generalizing these results further, however, due to significant equipment problems in the field that led to uncertainty in calculating the levels of OC and EC indoors.

Table 2. Average mass (μg) and average concentration ($\mu\text{g}/\text{m}^3$) of Total Carbon, Organic Carbon, and Elemental Carbon, by week of air sampling. There was no air cleaner use in Week 1; air cleaner operated continuously during Weeks 2 and 3.

Measure	Total Carbon			Organic Carbon			Elemental Carbon		
	Week 1	Week 2	Week 3	Week 1	Week 2	Week 3	Week 1	Week 2	Week 3
INDOOR									
average mass	341.44	167.00	285.56	322.22	161.56	278.56	19.22	6.11	7.56
average concentration	17.32	9.01	14.39	16.26	8.75	14.00	0.98	0.31	0.36
OUTDOOR									
average mass	302.43	264.14	252.57	243.29	213.29	208.57	58.86	51.14	43.86
average concentration	16.29	12.86	12.69	13.10	10.47	10.30	3.33	2.53	2.20
INDOOR/OUTDOOR RATIO									
average mass	1.67	0.52	1.58	2.12	0.62	1.90	0.41	0.10	0.21
average concentration	1.30	0.61	1.62	1.61	0.72	1.95	0.32	0.11	0.20
INDOOR RATIO BY WEEK									
average mass	–	–	–	–	0.55	0.76	–	0.50	0.59
average concentration	–	–	–	–	0.60	0.76	–	0.48	0.53
OUTDOOR RATIO BY WEEK									
average mass	–	–	–	–	1.50	1.53	–	1.16	1.02
average concentration	–	–	–	–	1.06	1.03	–	0.92	0.72

3. http://www.epa.gov/apti/course419b/instructor/im_chapter_1.pdf

4. Na, K., and D. Cocker. 2005. Organic and elemental carbon concentrations in fine particulate matter in residences, schoolrooms, and outdoor air in Mira Loma, California. *Atmospheric Environment*. 39:3325-3333.

D3 Successes

Despite the challenges we encountered, this project enjoyed a number of successes. First and foremost, we were very successful in reaching West Oakland seniors and educating them about how to maintain good indoor air quality. While the elderly or low-income population may have difficulty accessing educational materials requiring the Internet, we succeeded in disseminating our materials to the specific target areas in the community, such as senior centers, community centers, and other popular venues for seniors. Our presentations to key senior centers also allowed residents to ask questions and made it easily accessible for them to get one-on-one information about how to improve their indoor air. We have also been successful in bringing the issue of indoor air pollution to an equal level of exposure that outdoor air pollution receives, and discussing the inter-relatedness of the two. While most agencies focus on one or the other, we recognized that both types of air pollution are a concern for environmental justice communities like West Oakland. Our main success was in providing this community with practical information for low-cost immediate risk reduction, such as weatherstripping their homes, not smoking inside, prudent use of cleaning products, installation of good quality air filters in the central heating/air conditioning systems, etc. Presenting information about this study to the City of Oakland Mayor's Commission on Aging further advanced the exposure of this information to our target audience.

In talking with seniors in West Oakland, we found that some already use portable air cleaners in their homes. Bringing awareness to the seniors about the types of air cleaners and potential harmful effects of ionizing models through conversations and our brochure, was very important. As we stated above, the key purpose of this project was to evaluate traffic-related pollution exposure reduction methods and disseminate findings and other helpful information to the West Oakland senior citizen community. We achieved success in each of these steps.

E. TARGET AUDIENCE FOR DISSEMINATION

The target audience of our study and dissemination of practical, action-able information included the senior citizen residents of West Oakland. A secondary audience was the West Oakland community at large that could benefit from the same guidance. As mentioned in the previous sections, information about how to improve indoor air quality was disseminated to key locations in West Oakland targeted for seniors. We primarily concentrated on distributing the indoor air brochure and other informational materials to seniors since most spend a majority of their time indoors, and are more susceptible to the health effects of indoor air pollution. However, the educational materials will further be distributed at locations accessible to a variety of community residents, such as the West Oakland Library branch, because the information is also useful to families with children, and those with existing respiratory problems such as asthma. Similar to the elderly, both children and asthma sufferers are at more risk from indoor air pollution. Given the high rate of child asthma hospitalizations in West Oakland, we will also disseminate brochures and information to the West Oakland Asthma Clinic.

F. CONCLUSION

In this project, we aimed at improving the indoor air environment and health status of West Oakland seniors by evaluating the use of portable air purifiers for reducing indoor amount of traffic-related pollution. While we have encountered a number of challenges and can not say conclusively that the air cleaners helped improve indoor air quality, several study participants indicated that they felt better with the use of the air cleaner. They also appreciated their active involvement in this project and the ability to make comments and suggest improvements for the future. Majority indicated that they were interested in pursuing action to make their indoor environment healthier. Through the creation and distribution of an easily-accessible brochure on the indoor air quality for West Oaklanders, we were able to make an impact on the community at large. It is important to continue funding studies such as this, to address local needs and concerns of residents impacted by various sources of pollution and providing them with guidance on practical, low-cost strategies to make their environment healthier.

G. BUDGET

We have enclosed the final budget and statement of expenditures in Attachment A.. California Department of Health Services CEHTP staff contributed time to this project. Holmes corporation donated 11 air purifiers for the use in this study. Savings were directed at increasing participant incentives.

H. ACKNOWLEDGEMENTS

We would like to acknowledge the Holmes company for the donation of Harmony air purifiers. We are also grateful to Stephen Wall, Toni Stein, and Tom Kirchstetter for their valuable input.

Attachment A

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Evaluating Indoor Air Interventions To Reduce Diesel Particulate Matter In West Oakland, California

FINAL REPORT
EPA Aging Initiative
Agreement Number: CH – 83225801– 0

Pacific Institute **USEPA Aging Invite Budget Detail**

Position/Title	Expenditures
Program Director	\$1,125
Program Coordinator	\$4,974
Fringe Benefits	33% of base salary
	\$3,807
includes payroll taxes, vacation, sick leave, health insurance, and retirement benefits	
Equipment	
Air monitoring equipment rental	\$2,385
Purchase of battery eliminators for air monitoring filter pumps	\$1,320
Stipends for Participants	
Stipends for Study Participants	\$1,000
Materials and Meeting Costs	
Photocopying and meeting supplies	\$444
Contractual	
Subgrants to Partner Organizations	
West Oakland Healthy Homes Collaborative	\$3,250
Total Indirect Costs	\$6,696
Total Project Costs	\$25,000