

Case Study Brief: Denver Water Filter Program



HARVARD
T.H. CHAN
SCHOOL OF PUBLIC HEALTH
Prevention Research Center
on Nutrition and Physical Activity





INTRODUCTION

This case study describes Denver Water’s Filter Program (hereinafter “Filter Program”) to distribute water filter pitchers to customers with a known or suspected lead service line (LSL) while it works to remove customer-owned LSLs as part of its Lead Reduction Program. Denver Water is the public water utility for Denver, Colorado serving about one quarter of Colorado’s total population (1.5 million customers).¹ Pursuant to a program approved by the US Environmental Protection Agency (EPA), the utility plans to improve the built environment by removing all LSLs from its service area by 2035. The Filter Program was included as part of Denver Water’s LSL removal strategy because LSLs are the primary source of lead in drinking water,² and the process of LSL removal can

cause short-term spikes in lead exposure at the tap.³ Ingestion of lead is of particular concern for pregnant people, formula-fed infants, and young children. Denver Water’s Filter Program utilizes an equity-based prioritization model and strategic partnerships with community organizations to ensure that all eligible families receive water filters at no cost and families most at risk from the health harms of lead in drinking water are prioritized during the 15-year LSL removal process. The lessons learned from Denver Water’s Filter Program can be used to inform the work of other water utilities and state and local agencies working to integrate health equity principles into programs to distribute filter pitchers to address drinking water contaminants of concern.

This case study is part of a series of six descriptive case studies of state and local safe home water access policies and programs. The research team collected and reviewed available background materials for each case and conducted semi-structured interviews with key informants about relevant community context and policies, program design, program implementation, and lessons learned. All six case studies and a summary report are available at: <https://www.hsph.harvard.edu/prc/projects/safe-home-water>

The research team also developed and compared estimates of the population reach and costs for widespread implementation of each case study policy or program based upon the prevalence of families with children 0–5 experiencing low income with concerns about tap water and/or lack of access to safe home tap water.

PROGRAM RATIONALE

The Filter Program is part of Denver Water's comprehensive Lead Reduction Program. According to Denver Water, the primary source of lead in drinking water in its service area comes from the estimated 64,000–84,000 customer-owned LSLs (pipes) that bring water from public water mains in the street to home plumbing systems.⁴ In 2012, more than 10 percent of the drinking water samples analyzed by Denver Water to comply with the federal Safe Drinking Water Act's Lead and Copper Rule exceeded the federal action level for lead of 15 ppb.⁵ The elevated lead levels triggered state and federal legal requirements that the utility study lead remediation options.

In 2018, the Colorado Department of Public Health and the Environment ordered Denver Water to use the additive orthophosphate to inhibit corrosion as water travels through LSLs and home plumbing systems.⁵ Environmental organizations and water quality advocates were concerned about the impact of phosphates in wastewater from orthophosphate-treated water on the region's groundwater quality and filed a lawsuit to prevent the use of orthophosphate.⁶ Denver Water subsequently applied for special permission from the EPA to avoid orthophosphate treatment by executing a 15-year Lead Reduction Program whereby Denver Water would pay to remove all customer-owned LSLs and supply water filter pitchers to customers with a known or suspected LSL and to certain

households with copper pipe and lead solder. The Lead Reduction Program was found to be less costly and posed a lower risk to groundwater quality than orthophosphate treatment. It received EPA approval in December 2019⁵ and Denver launched the Lead Reduction Program in January 2020.



Courtesy of Denver Water

COMMUNITY PARTNERS

The Filter Program builds community capacity to raise awareness about lead in drinking water through strategic partnerships with the Colorado Special Supplemental Nutrition Program for Women, Infants and Children (WIC) and other community organizations. WIC provides supplemental foods, infant formula, referrals, and education supports to pregnant people and young children experiencing low income who are at nutritional risk. Almost two-thirds (67.6 percent) of the infants participating in WIC are exclusively fed infant formula, most often powdered formula that must be reconstituted with plain water.^{7(p8)} The collaboration between Denver Water and Colorado WIC primarily consisted of information sharing. Colorado WIC provided geographic data on WIC participation rates to Denver Water to inform a prioritization model for the Lead Reduction Program. Denver Water conducted a training for Colorado WIC program staff to ensure they were incorporating drinking water into lead reduction educational activities. Denver Water also shared data about the LSLs in its service area with WIC.

For its community outreach and education efforts, Denver Water obtained formal commitments (via paid partnerships) with the community organizations iNow and CREA Results.⁸ The organization iNOW (integration: Navigation, Outreach, Wealth-Building) focuses on refugee integration through evidence-based pathways like physical health and well-being.⁹

CREA Results is a grassroots organization of Promotores de Salud (Community Health Workers) who are fluent in Spanish and sensitive to the local Latinx culture.⁹ When designing and piloting the Filter Program, Denver Water also worked with Groundworks Denver, Mile High Youth Corps, Clean Water Action, and the Greenway Foundation to incorporate community and stakeholder input.





PROGRAM FINANCING

The total cost of the full scale Filter Program is estimated to be \$33-48 million depending on the number of filters pitchers and replacement filters distributed during the 15-year Lead Reduction Program.^{10(p260)} Denver Water plans to

fund the program through a combination of new and existing funding from water rates, bonds, new service fees, hydropower generation, and potentially loans, grants and other contributions.¹¹



KEY PROGRAM ACTIVITIES

The Filter Program is required as part of Denver Water's EPA-approved Lead Reduction Program.⁵ The program must deliver filter pitchers and replacement cartridges to all utility customers with known or possible LSLs until six months after a customer's LSL is removed or until the customer's service line is determined to be of another material. Families with a formula-fed infant under 2 years old living in a home built between 1983-87 that does not have a LSL but may have lead solder, are to be provided with free water testing and filter pitchers and replacement filters if water testing indicates elevated levels of lead.¹² Under its EPA-approved plan, Denver Water must achieve a 65 percent filter adoption rate to provide equivalent protection to orthophosphate treatment.⁵ If at any time the adoption rate falls below 75 percent, additional actions will be triggered, such as increased or modified communication,

outreach, and education efforts with particular attention to sub-groups.⁵

The Filter Program includes the following program activities:

1. Determination of priority areas to receive filters and educational materials based on LSL inventory data and a prioritization model by Denver Water and private contractors (Mott MacDonald and AECOM);
2. Mailing of filter kits and replacement cartridges to customers by a private contractor (120Water);
3. Surveys of customers to determine filter adoption rate assisted by a private contractor (Mott MacDonald); and
4. Promotion of filter use and awareness of the Filter Program by Denver Water and community partners.

Denver Water contracted with private engineering companies (Mott MacDonald and AECOM) to develop its prioritization model for its comprehensive Lead Reduction Program that includes LSL replacement and filter pitcher distribution.¹³ A private company (120Water) is under contract to distribute and track filters and replacement cartridges, provide

educational materials, and provide web-based data management services for the program. Denver Water and its paid community partners (iNOW and CREA Results) promote filter use through community events, social media posts, door-to-door outreach, a customer tracking system, how-to videos, and conducting virtual educational meetings open to the public.^{3,14}

PROGRAM DESIGN STRATEGIES TO REACH PREGNANT PEOPLE AND FAMILIES WITH YOUNG CHILDREN

The Filter Program incorporates health equity and environmental justice principles into its design with a focus on homes most likely to have an LSL and customers most at risk from the health consequences of lead in drinking water. For its filter distribution and community outreach and education activities, Denver Water utilizes a variety of strategies to reach pregnant people and families with young children living in homes with a LSL (Table 1).

Families with a formula-fed infant under two years old living in homes without a LSL built between 1983-87 can participate in the Filter Program if water testing indicates an issue with lead.¹² Denver Water identified about 15,000 properties built between 1983-1987, including many multi-unit structures, and began outreach to these properties in the third quarter of 2020.¹⁶ As of July 2021, Denver Water had sent letters describing the Filter Program to more than 38,000 households and 242 families with formula-fed infants requested a water test kit.^{15(p19)} Ten test results showed lead above three

micrograms per liter (a trigger level used to indicate a problem with lead).^{15(p19)} Of those ten, two families with a formula-fed infant enrolled in the Filter Program.^{15(p19)}



To make sure lead stays out of your water, we're starting with your pipes.

Denver Water is committed to delivering safe water to our community. So, we're replacing customers' lead pipes, one impacted property at a time. To find out if you're one of them, visit our website.

Learn more at [DenverWater.org/Lead](https://denverwater.org/Lead)

DENVER WATER
LEAD REDUCTION PROGRAM

Courtesy of Denver Water

Table 1: Program Design Elements to Meet the Needs of Pregnant People and Families with Young Children

Strategy	Description
Prioritization Model	<p>Denver Water decides how to focus its community outreach and education efforts for the Filter Program using a prioritization model that combines LSL inventory data with socio-demographic data. The socio-economic data used includes an area-based analysis of the distribution of household income, minority status, WIC participation data, child blood lead level monitoring data, and the relative prevalence of expecting families and families with young children in a given area.^{15(p63)}</p>
Tenant Outreach	<p>Denver Water provides introductory program materials and filter kits to apartment complexes for distribution to new tenants when they move in and conducts phone and email follow-up with customers with non-deliverable, returned filter kits.¹⁵</p> <p>Denver Water also conducts outreach with leasing offices to make them aware of the Filter Program.</p>
Educational Outreach	<p>To increase awareness about the Lead Reduction Program and promote Filter Program participation by families with infants and young children, Denver Water has conducted educational outreach visits at the Rocky Mountain Early Childhood Conference; the City and County of Denver’s Head Start & Office of Children’s Affairs; the Denver Early Childhood Council; the Road to Reading Summit held by Denver Public Schools; and the Children’s Environmental Health Network.^{15(p50)}</p>



PROGRAM RESULTS AND FINDINGS

Pilot Program

In summer of 2019, Denver Water conducted a pilot filter program to inform the design of the full-scale Filter Program.^{10(p3)} The pilot distributed 300 filter pitcher kits in mixed-income neighborhoods with a mix of English- and Spanish-speaking residents, and higher concentrations of “expecting families, children, and those of low socioeconomic standing.”^{10(p3)} Households received a ZeroWater pitcher filter kit and educational materials through the mail (200 households) or door-to-door delivery (100 households) and completed surveys about their filter usage. Surveys indicated that 67 percent of the participants filtered their water for drinking and cooking.^{10(p20)} The total cost of the pilot program was \$122,230.^{10(p18)}

Lessons learned from the pilot program were incorporated into the full-scale program design. To reduce costs, provide longer-lasting filter cartridges, and to limit fluoride removal from filtered water, Denver Water switched from ZeroWater filter pitchers to Brita filter pitchers and entered into a three-year contract with Brita. The utility also found that distributing filters by mail was more cost-effective than door-to-door delivery, and all filter kits are being provided through the mail for the full-scale program.

Full Filter Program

Filter Distribution

In March 2020, Denver Water began its full-scale Filter Program.¹⁶ As of July 2021, Denver Water has distributed filter pitcher kits and replacement cartridges every six months to all customers with a known LSL or a service line of unknown material in its service area.^{15(p39)} Denver Water estimates that approximately 97,735 Denver Water households are participating in the Filter Program as of July 2021.^{15(p37)} Throughout the filter program, anyone may call to request extra filters based on household size or being an in-home childcare provider. Households that request additional filters are placed onto a list of high demand filtered-water users who then automatically receive additional replacement cartridges during subsequent replacement filter mailings.^{17(p12)}

Culturally Competent Community Outreach and Education

The Filter Program uses data from its prioritization model and user surveys to identify neighborhoods, households, and communities most likely to have a LSL and most vulnerable to the health harms of lead in drinking water. This information is used to determine where to focus the program’s outreach and education resources. To reach non-English speaking and

culturally diverse households, Denver Water makes all materials available in English and Spanish and contracts with the community organizations iNOW and CREA Results. In neighborhoods prioritized for community outreach and education, iNOW provides information and support in the languages of Amharic, Arabic, French, Nepali and Somali, maintains a virtual helpdesk, distributes educational materials to community organizations and businesses, generates social media posts and online videos, and hand delivers filter pitchers and cartridges to non-English and non-Spanish speaking community members.¹⁵ CREA Results conducts similar outreach and education for Denver’s Spanish-speaking community.

Filter Adoption Rate

To evaluate the effectiveness of the Filter Program, Denver Water monitors what it calls the “filter adoption rate.” To determine the filter adoption rate, Denver Water periodically surveys homes provided with filters by the Filter Program about whether or not they use filtered water for drinking water, cooking and/or infant formula preparation. A November 2020 survey was sent to 20,000 households, and 3,987 responses were received (20 percent response rate). Of the households that responded to the survey, 93 percent reported using filtered water for drinking and 68 percent reported using filtered water for cooking.^{18,19(p19)} The total “calculated filter adoption rate” among these respondents was 80 percent.^{19(p19)} Denver Water intends to conduct educational efforts focused on the importance of using filtered water for cooking.^{18, 20}

Denver Water also uses its survey data to assess whether filter use varies by income, ethnicity, language spoken at home, tenancy (renter vs. owner-occupied) and whether there is a young child in the home. Among the respondents to the November 2020 survey, there were similar filter adoption rates by income, ethnicity, language spoken at home, tenancy (renter vs. owner-occupied), and presence of a young child in the home.²¹

Of the November 2020 survey respondents, 102 households reported that they had a formula-fed infant, and 97 percent reported using filtered water for formula preparation.^{19(p19)} The 102 households with formula-fed infants were sent a reminder card in the mail emphasizing the importance of using filtered water to prepare infant formula.^{15(p63), 22}



PROGRAM IMPLICATIONS

Denver Water's Filter Program is part of Denver Water's EPA-approved Lead Reduction Program and must meet specific filter adoption benchmarks or be subject to an enforcement action to begin orthophosphate treatment. Denver Water provides filters and replacement filters at no cost to participants and focuses its community outreach and education efforts using an equity-based prioritization model and user survey data. This approach is grounded in the overall program goals of identifying and serving households most likely to have an LSL and most vulnerable to the health harms of lead in drinking water. User surveys indicate that filter usage is similar across all groups that responded to the survey including households with lower incomes, renters, households with children and Latinx households. Key components of Denver Water's commitment to ensuring that all households can participate in the Filter Program

have been its paid community partnerships to deliver culturally competent outreach and education, and a tenant outreach strategy focused on providing customers with an LSL with water filters regardless of whether they own or rent their home.



SUGGESTED CITATION

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AUTHORS

Prepared by Cara Wilking, JD, independent legal consultant, Barnstable, Massachusetts; Emily Nink, MS, CPH, Prevention Research Center on Nutrition and Physical Activity, Department of Social and Behavioral Sciences at the Harvard T.H. Chan School of Public Health; and Angie Cradock, ScD, MPE, Prevention Research Center on Nutrition and Physical Activity, Department of Social and Behavioral Sciences at the Harvard T.H. Chan School of Public Health.

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