



SOUTH TEXAS

Safe Water Project



About Methodist Healthcare Ministries of South Texas, Inc.

Methodist Healthcare Ministries broadens the definition of health care by providing low-cost clinical care for the uninsured and by supporting community-led efforts that improve living conditions that cause people to be sick in the first place. We use our earnings as co-owners of Methodist Healthcare to ensure that people who are economically disadvantaged and uninsured can live their healthiest lives. We do this by advocating for, investing in and providing access to quality clinical care and addressing factors that affect health—including economic mobility, supportive relationships, food security, broadband access, and safe neighborhoods. Ultimately, we fulfill our mission of “Serving Humanity to Honor God” by advancing health equity so that more resilient individuals and families living in the 74 counties we serve can thrive.

Texas A&M University School of Public Health is proud to collaborate with Methodist Healthcare Ministries of South Texas (MHM) to build healthier, more resilient communities. MHM’s unwavering commitment to “Serving Humanity to Honor God” and its leadership in improving the wellness of the least served—anchored in integrity, compassion, teamwork, and spirituality—has been instrumental in driving our project’s success. Our interdisciplinary approach addresses critical environmental health challenges such as water security. We extend our sincere gratitude to our partners and the communities we serve, whose collective efforts continue to create sustainable, culturally sensitive solutions that positively impact underprivileged residents.



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SOUTH TEXAS SAFE WATER PROJECT

The South Texas Safe Water Project, a partnership between Methodist Healthcare Ministries of South Texas, Inc. (MHM) and Texas A&M University School of Public Health, addressed critical environmental and public health issues in colonia communities along the US-Mexico border.

Over a span of 2.5 years, the project focused on:

-  Assessing water quality and exposure to water contaminants
-  Implementing health interventions
-  Fostering sustainable community engagement to tackle persistent health disparities in these underserved areas

KEY FINDINGS

WATER QUALITY: Uranium, nickel, and arsenic were detected in 100% of potable water samples, posing severe health risks, including cancer and developmental delays. Despite fines imposed on water providers for EPA violations, many continued non-compliance, indicating the need for stronger enforcement mechanisms and consistent monitoring.

BIOMONITORING AND INTERVENTION: Arsenic was detected in all participants’ urine and toenail samples, indicating acute and long-term exposure. One-third also had detoxification-related vitamin deficiencies, suggesting increased vulnerability to environmental exposure. After implementing water filters, urinary arsenic levels significantly declined, demonstrating the effectiveness of primary interventions and guiding future strategies.

HEALTH IMPACTS: A comprehensive health assessment using the Short Form 12-Item (version 2) Health Survey revealed significant declines in general physical health scores among residents, underscoring the broader health impacts of chronic environmental exposures. Health risks were particularly acute for children and pregnant women, highlighting the urgency of targeted public health interventions.

COMMUNITY ENGAGEMENT: The project was driven by a Community-Based Participatory Research (CBPR) model, emphasizing collaboration with local stakeholders. Three Community Advisory Boards (CABs), involving Promotoras, nonprofit leaders, and residents, were pivotal in shaping research priorities and disseminating findings. This approach resulted in strong community trust and high participation rates, including a 96.2% survey completion rate and over 80% biomarker sample collection.

POLICY RECOMMENDATIONS:

The policy recommendations are rooted in extensive feedback from community meetings, advisory boards, and collaborative workshops:

- I** **STRENGTHEN REGULATORY OVERSIGHT:** Increase enforcement actions and penalties for water suppliers who repeatedly violate contamination standards. Establish a monitoring system that requires transparent, bilingual reporting to ensure residents are informed of water quality issues.
- II** **IMPLEMENT COMPREHENSIVE EDUCATION CAMPAIGNS:** Develop culturally relevant and linguistically appropriate educational materials for residents, including short videos, community workshops, and informational pamphlets distributed through trusted sources like churches, schools, and community centers. Enhance the role of Promotoras in delivering these resources and building community trust.
- III** **INVEST IN INFRASTRUCTURE AND EMERGENCY PREPAREDNESS:** Allocate funding for long-term water infrastructure improvements, including upgrades to filtration systems and plumbing in the colonias. Establish emergency response plans tailored to unincorporated areas, involving local leaders, fire departments, and health organizations to ensure rapid response in the event of contamination or natural disasters.
- IV** **EMPOWER LOCAL ORGANIZATIONS AND ADVOCACY GROUPS:** Strengthen the capacity of community-based organizations to lead local advocacy efforts. Create a consortium to facilitate collaboration among nonprofits, local government, and academic institutions, focusing on sustainable solutions and policy reform.
- V** **ENHANCE ACCESSIBILITY OF PUBLIC HEALTH DATA:** Standardize water quality data collection and reporting at the state level, making it easily accessible to residents in a simplified format. Advocate for a centralized clearinghouse for environmental health data to improve transparency and facilitate informed decision-making by local communities and policymakers.

CONCLUSION

The South Texas Safe Water Project demonstrates the effectiveness of community-engaged research in addressing environmental health disparities. By integrating *scientific analysis*, targeted *health interventions*, and strong *community partnerships*, the project offers a replicable framework for improving health and environmental outcomes in similar underserved regions. **Through continued advocacy, policy change, and community empowerment, this initiative lays a strong foundation for lasting improvements in the health and well-being of disadvantaged populations across South Texas and beyond.**

PROJECT LEADERSHIP & TEAM

METHODIST HEALTHCARE MINISTRIES



Jaime Wesolowski
President & Chief Executive Officer



Xochy Hurtado
Chief Operating Officer



Christine Yanas
Vice President of Policy & Advocacy



Sebastien Laroche
Director of Policy & Advocacy

"THROUGH OUR EFFORTS TO BROADEN THE DEFINITION OF HEALTH CARE, we know that health is more than what happens at a doctor's office. Rather, it's highly influenced by the conditions in the environment where people live—and **clean water is one of those critical building blocks** that helps people live their healthiest lives."

—JAIME WESOLOWSKI
(PRESIDENT &
CHIEF EXECUTIVE OFFICER)



PROJECT LEADERSHIP & TEAM

TEXAS A&M SCHOOL OF PUBLIC HEALTH



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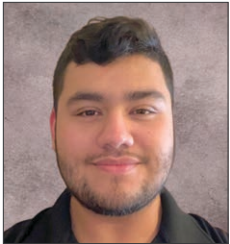
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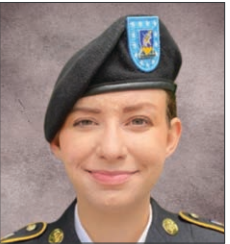
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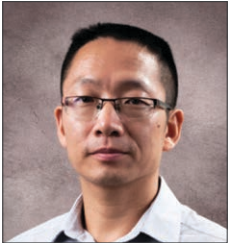
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BACKGROUND AND RATIONALE FOR SOUTH TEXAS SAFE WATER PROJECT

The South Texas Safe Water Project, a collaborative initiative between Methodist Healthcare Ministries of South Texas (MHM) and the Texas A&M University School of Public Health (TAMU SPH), was launched to address critical public health and environmental challenges facing in South Texas colonias, some of the most underserved communities in the United States.

Colonias are unincorporated settlements primarily located along the U.S.-Mexico border, characterized by inadequate infrastructure, limited access to basic services, and significant health disparities. Residents in these areas often lack reliable access to potable water, proper sanitation, and adequate healthcare, resulting in heightened vulnerability to environmental health risks.



One of the key issues identified in these communities is the persistent challenge of water quality. Many colonias rely on small water systems, private wells, or older infrastructure in homes and pipelines, all of which are often inadequately maintained and may not meet state or federal drinking water standards. Water contamination, especially with heavy metals like

lead, cadmium, and arsenic, poses a significant risk to residents. The project was particularly focused on assessing the prevalence of arsenic contamination, given its documented presence in groundwater sources along the border region. Chronic exposure to arsenic, even at low levels, is associated with severe health consequences, including cancer, cardiovascular disease, and neurological impairments. This exposure is compounded by socio-economic factors and limited access to healthcare, making it a pressing public health concern.



The rationale for this two-year project was rooted in the need to establish a comprehensive understanding of environmental hazards and their impact on community health. Existing data on water quality in colonias are often

fragmented, outdated, or insufficient to inform effective policy interventions. By undertaking a thorough assessment of water quality, including sampling and analysis for key contaminants, the project aimed to provide reliable data that could inform future public health initiatives and policy recommendations.

Moreover, the project recognized the critical role of community engagement and local knowledge. By involving community members directly in the data collection and assessment process, the project aimed to empower residents, build local capacity, and foster a sense of ownership over the findings. This approach



was designed not only to enhance the quality of the data collected but also to ensure that the results were contextually relevant and could be translated into actionable policy changes that directly address the needs and priorities of the community. The partnership between MHM and TAMU SPH addressed water quality issues, including arsenic, using environmental sampling, health assessments, and community engagement to inform policy action.

“Our water runs brown, stains our clothes, and makes us sick—how can we not fear what’s supposed to keep us alive?”

—ALAMO PARTICIPANT

[DEFINING COLÓNIAS]

Colonias are unincorporated, rural, and semi-rural communities primarily located along the Texas-Mexico border. They are often characterized by substandard housing, lack of infrastructure, and limited access to essential services.

There are over **2,000 colonias** in Texas, with **more than 500,000 residents**, mostly of Hispanic descent.

HIGH POVERTY AND UNEMPLOYMENT RATES:

Residents of colonias experience extreme poverty, with the average household income being less than \$834 per month. **Unemployment rates in these areas range from 20% to 60%**, significantly higher than the state average of 7%.

LACK OF BASIC INFRASTRUCTURE:

Many colonias lack essential services, including potable water, sewage systems, paved roads, and adequate drainage. **Approximately 34% of residents do not have access to clean drinking water**, and over 50% lack proper wastewater disposal systems, which poses severe health risks.

EDUCATIONAL CHALLENGES:

A significant proportion of colonia residents have limited educational attainment, with **70% having less than a high school education**. This limitation severely impacts their economic opportunities and overall quality of life.

Despite these challenges there is a resilient spirit within these communities, and a deep desire and need to better contextualize the environmental conditions and in particular – water quality issues.

PROJECT GOALS AND OBJECTIVES

The primary goal of this project is to drive measurable improvements in environmental and public health outcomes in two colonias in Hidalgo County. By integrating thorough environmental assessments, community health evaluations, and active local engagement, the project aims to identify and address critical health risks. The ultimate objective is to inform both policy and programmatic solutions that can be implemented locally and scaled regionally. The long-term goals include building community capacity, improving public health infrastructure, and laying the groundwork for sustainable environmental health initiatives.

The following objectives are strategically designed to support these goals:

-  **IDENTIFY AND ENGAGE TWO COLONIAS IN HIDALGO COUNTY:** Select and collaborate with two communities to build trust, establish rapport, and ensure their active participation throughout the project.
-  **EVALUATE DRINKING WATER QUALITY FOR HEAVY METAL CONTAMINATION:** Perform a detailed analysis of drinking water sources to detect heavy metals, especially arsenic, which pose significant health risks, and provide data-driven recommendations for remediation and water safety improvements.
-  **COLLECT BIOMARKER DATA FOR EXPOSURE ASSESSMENT:** Gather biological samples (e.g., urine, blood, toenails) to assess short, medium, and long-term exposures to arsenic and evaluate vitamin levels, helping to understand both the immediate and cumulative health impacts on the community.
-  **CONDUCT A COMPREHENSIVE COMMUNITY HEALTH SURVEY:** Implement a detailed health assessment survey to collect data on health outcomes, water usage patterns, and residents’ perceptions of environmental risks, providing a comprehensive view of health challenges faced by the community.
-  **DEVELOP A CITIZEN SCIENCE PROGRAM FOR LOCAL HIGH SCHOOL STUDENTS:** Create an educational initiative that engages high school students in hands-on training and environmental research, aiming to enhance their scientific literacy and prepare them for higher education opportunities in public health and environmental sciences.
-  **HOST A POLICY WORKSHOP WITH KEY STAKEHOLDERS:** Facilitate a workshop that brings together local community members, state representatives, and leaders in public health and policy to develop actionable, evidence-based policy recommendations focused on addressing local environmental and health challenges.

“SOMETIMES THE WATER HAS A YELLOWISH COLOR AND SMELLS BAD. I don't brush my teeth with tap water because my husband tells me it **smells bad**. When I flush the toilet, I can see the **yellowish color** and that's how I must take a shower.”

—ALAMO PARTICIPANT







CITIZEN SCIENCE PROGRAM WITH
HIGH SCHOOL-AGED STUDENTS

The Citizen Science Program engaged 14 high school-aged students in a comprehensive curriculum focused on environmental health, particularly water quality issues relevant to colonia communities.

The program aimed to build scientific literacy, equip students with practical skills for real-world application, and foster a sense of belonging within the scientific community.

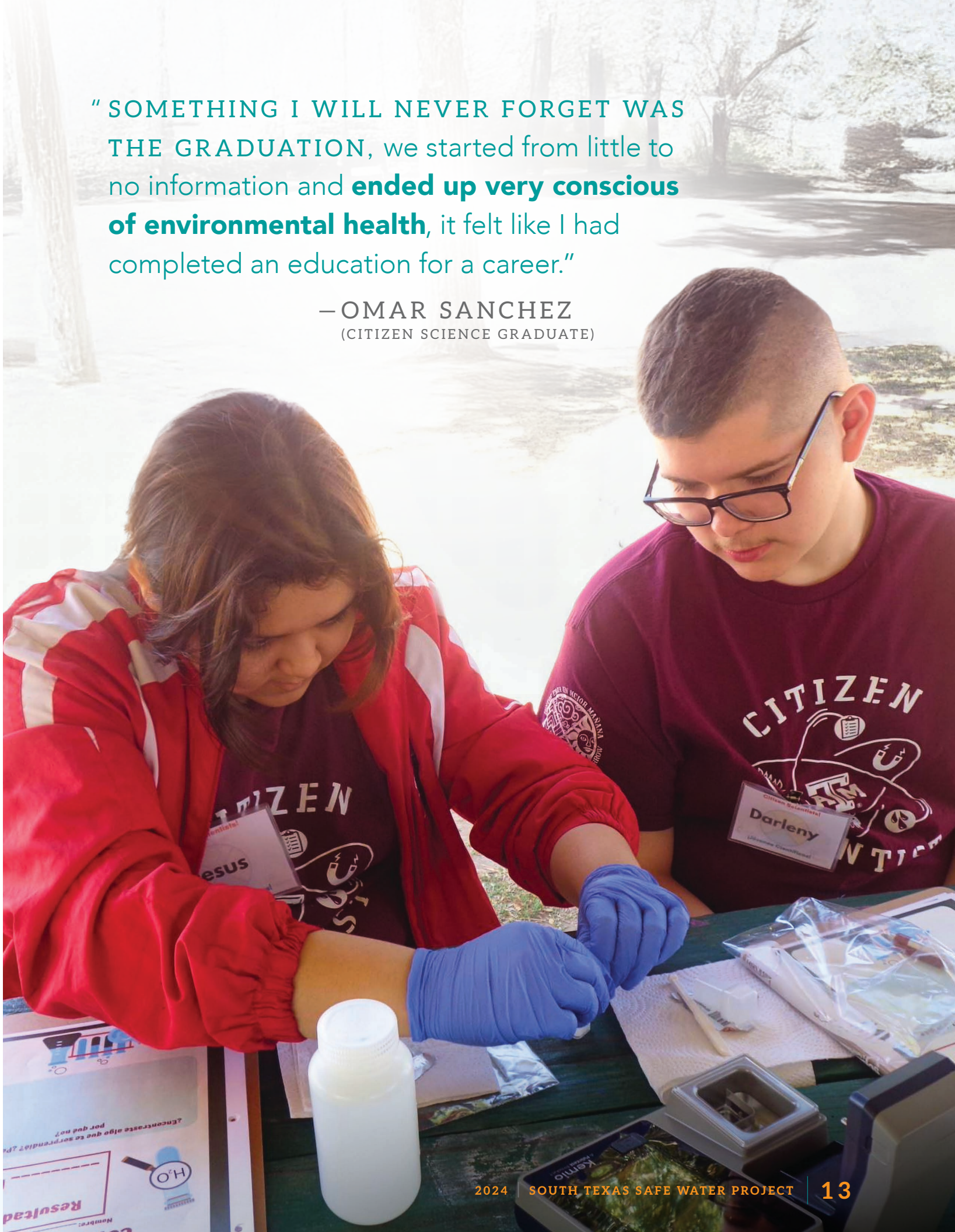
The curriculum covered several core topics, including:

-  **PUBLIC HEALTH AND ENVIRONMENTAL HEALTH BASICS:** Students were introduced to the principles of public health and the importance of citizen science in addressing local environmental challenges.
-  **WATER QUALITY EDUCATION:** The program emphasized the significance of water quality, exploring common contaminants like lead and arsenic, their sources, and potential health impacts on disadvantaged populations.
-  **HANDS-ON SAMPLING TECHNIQUES AND DATA ANALYSIS:** Students received training in water sampling and used tools such as the Kemio Heavy Metals device for contaminant testing. They participated in activities demonstrating how pollutants enter groundwater, linking these lessons to local health risks.
-  **COMMUNITY ADVOCACY AND ENVIRONMENTAL JUSTICE:** The curriculum included discussions on the role of youth in environmental advocacy, empowering students to use their new skills to contribute to community health initiatives.

The program culminated in a graduation ceremony at the Texas A&M University McAllen campus, where students were awarded Citizen Science Certificates. This event provided a platform for students to showcase their work and celebrate their achievements, reinforcing their sense of inclusion in the scientific community.

“ SOMETHING I WILL NEVER FORGET WAS THE GRADUATION, we started from little to no information and **ended up very conscious of environmental health**, it felt like I had completed an education for a career.”

— OMAR SANCHEZ
(CITIZEN SCIENCE GRADUATE)



COMMUNITY ENGAGEMENT APPROACH

The engagement strategy for the project was built on the principles of Community-Based Participatory Research (CBPR), prioritizing shared ownership, collaboration, and respect for local expertise.

This philosophy emphasized creating a reciprocal relationship with the community, valuing their knowledge, and involving them directly in shaping the research process. By integrating the trusted voices of Promotoras, Community Advisory Boards (CABs), and several local nonprofit organizations, the approach ensured culturally relevant engagement and deepened the connection between the research team and the residents.

ROLE OF COMMUNITY ADVISORY BOARDS (CABS):

The project’s foundation was strengthened by three active Community Advisory Boards:

- I** Progreso Community Health Advisory Council (PCHAC)
- II** Hand in Hand in San Carlos (HHSC)
- III** Advisory Committee for Health and Community (CASCO)

These CABs were comprised of diverse local stakeholders, including Promotoras, nonprofit leaders, business owners, faith-based representatives, and community residents. Their participation was integral in identifying environmental health priorities, such as the risks related to water contamination, and in tailoring the outreach strategies to meet the specific needs of their communities. CAB members played a crucial role throughout the project, contributing insights during the planning stages, assisting with data interpretation, and guiding the dissemination of findings back to the community.



The involvement of CABs was critical in translating research outcomes into actionable data. Their local expertise helped contextualize the findings, making the data more relevant and directly applicable for policy and programmatic recommendations. CABs facilitated discussions on potential interventions, shaping a more practical approach to address identified health disparities.

PROMOTORA-DRIVEN ENGAGEMENT

Promotoras, or Community Health Workers, were central to the engagement model, acting as cultural brokers who effectively connected the research team with community members.

Promotoras were trained in scientific literacy, environmental health, and data collection techniques, including water sampling and biomarker collection (urine, blood, and toenail samples). Their cultural competence and trusted status within the community allowed them to engage residents in a meaningful way, overcoming barriers related to language, trust, and historical skepticism towards outside researchers.

Promotoras went beyond data collection; they played a key role in educating residents on the health risks associated with environmental contaminants. Through home visits, workshops, and small group discussions, they provided bilingual, culturally tailored information that helped residents understand the implications of the study’s findings. This approach not only empowered community members to take informed action but also ensured that the research data collected was comprehensive, reliable, and reflective of the community’s true conditions.



PARTNERSHIP WITH NONPROFIT ORGANIZATIONS:

Collaborations with local nonprofit organizations were a cornerstone of the engagement strategy, providing essential support and enhancing the project’s reach:

ARISE ADELANTE: Played a key role in educational outreach, supporting logistics for workshops, health fairs, and community events. Their deep-rooted connections helped facilitate engagement with broader community networks.

PROYECTO AZTECA: Supported community mobilization efforts, especially during key outreach events. Their involvement was instrumental in increasing participation and providing additional services, such as health screenings and resource distribution, during environmental education sessions.

LUPE (LA UNIÓN DEL PUEBLO ENTERO): Engaged hard-to-reach populations. LUPE’s extensive grassroots network was crucial for organizing community meetings and gathering feedback on research priorities.

ALAMO ADVANCEMENT CENTER: Provided resources for educational programming and helped coordinate family engagement activities, focusing on health services and college readiness.

PROGRESO COMMUNITY RESOURCE CENTER: Offered space for community meetings and workshops, enhancing accessibility and creating a familiar environment for residents to engage with the research team.

SAN JUAN ADVANCEMENT CENTER: Assisted in distributing educational materials and facilitating community discussions, extending the project’s reach to a wider audience.

These partnerships allowed the project to harness the strengths of local organizations, ensuring that the engagement strategy was culturally sensitive and effectively addressed the needs of the community.



PHILOSOPHY OF ENGAGEMENT

The philosophy behind the engagement approach was one of co-learning, mutual respect, and shared decision-making. The project intentionally moved away from a top-down research model, opting instead for a collaborative framework that recognized the community as equal partners.

This approach valued the lived experiences and local expertise of residents, integrating their perspectives into every phase of the project. The goal was not only to collect data but also to build capacity within the community, providing tools and knowledge that would enable residents to advocate for their own health and environmental justice.

Education and empowerment were key tenets of this philosophy. By involving residents in participatory data analysis sessions, transparent report-back meetings, and workshops, the project aimed to ensure that the community was actively engaged and equipped to use the information generated. This inclusive process helped dismantle traditional power dynamics and fostered a stronger, more equitable research partnership.

We actively participated in and or hosted over 30 community events to support and strengthen our community, while fostering and maintaining relationships with community members, stakeholders, and collaborators. Some of these events included:

- BACK-TO-SCHOOL FAIRS
- COMMUNITY HEALTH FAIRS
- COMMUNITY FORUMS
- COMMUNITY MEETINGS



GIVING BACK:

We are deeply committed to empowering and uplifting the communities we serve. Through active engagement, we address their needs and concerns while continuously giving back. **To date, our presence and support have inspired others to contribute, enabling initiatives such as:**

- School Supplies
- Water Filters
- Food Baskets
- Participant Stipends
- Community Garden Support
- Essential Household Items
- Supporting Higher Education
- Supporting Community Events

IMPACT ON RESEARCH OUTCOMES AND DATA COLLECTION

The community engagement approach significantly enhanced the quality and relevance of the research outcomes. By involving CABs, Promotoras, and nonprofit partners throughout the project, the team was able to gather more accurate, context-specific data that directly reflected the community’s needs and concerns.

This collaborative model yielded several important impacts on the research process:

IMPROVED DATA QUALITY: The engagement of trusted local voices and the integration of culturally relevant methods led to more comprehensive and reliable data collection. The insights from CABs and Promotoras helped refine data collection tools, making them better suited to capture the lived realities of the residents.

ACTIONABLE DATA FOR POLICY RECOMMENDATIONS: The focus on community-driven insights allowed the project to generate data that was directly applicable for policy advocacy. The findings informed specific recommendations related to water quality standards, public health interventions, and infrastructure improvements. The involvement of local nonprofits and CABs ensured that these recommendations were realistic, practical, and grounded in the actual needs of the community.

ENHANCED PROGRAMMATIC ADAPTABILITY: The ongoing feedback from community partners enabled the research team to adapt the study’s methods and focus areas in real-time, responding to emerging issues identified by residents. This flexibility allowed for a more dynamic approach to data collection and analysis, ensuring that the project could address critical health and environmental concerns as they arose.

STRENGTHENED TRUST AND LONG-TERM COLLABORATION: The collaborative engagement strategy fostered a sense of shared ownership and trust between the researchers and the community. This trust not only improved participation rates but also laid the groundwork for sustained partnerships, positioning the project to continue influencing local advocacy and policy efforts beyond its formal conclusion.

ADVISORY COMMITTEE FOR HEALTH AND COMMUNITY (CASCO)



DATA ANALYSIS TECHNIQUES

METALLOMIC PROFILING IN TOENAILS

Metallomic profiling in toenail samples was conducted using inductively coupled plasma mass spectrometry (ICP-MS). This method enabled the detection and quantification of a wide range of heavy metals, including arsenic. Toenail samples were meticulously cleaned to remove external contaminants and underwent acid digestion prior to analysis, ensuring accurate measurements of heavy metal concentrations reflective of long-term exposure.



URINARY ARSENIC ANALYSIS AND INTERVENTION

Spot urine samples were collected from each participant and analyzed using high-performance liquid chromatography (HPLC) coupled with ICP-MS. This approach enabled the measurement of total arsenic and differentiation between organic and inorganic arsenic species, facilitating the quantification of toxic inorganic arsenic exposure. Participants were provided with ZeroWater filters to use in their households for 1–2 weeks. Following this intervention period, participants provided a second urine sample. Urinary arsenic concentrations before and after the intervention were compared to assess changes in exposure levels due to the use of the filtration system.

NUTRITIONAL STATUS AND ARSENIC METABOLISM

Nutritional status related to arsenic metabolism was evaluated by measuring blood levels of vitamins critical to this process, including B9 (folate), B12, and vitamin D. Blood samples were collected using an at-home finger-prick kit to create dried blood spots. These samples were subsequently processed and analyzed to determine the concentrations of these vitamins, providing information on the participants’ nutritional status and its potential impact on arsenic metabolism.

DATA COLLECTION METHODS

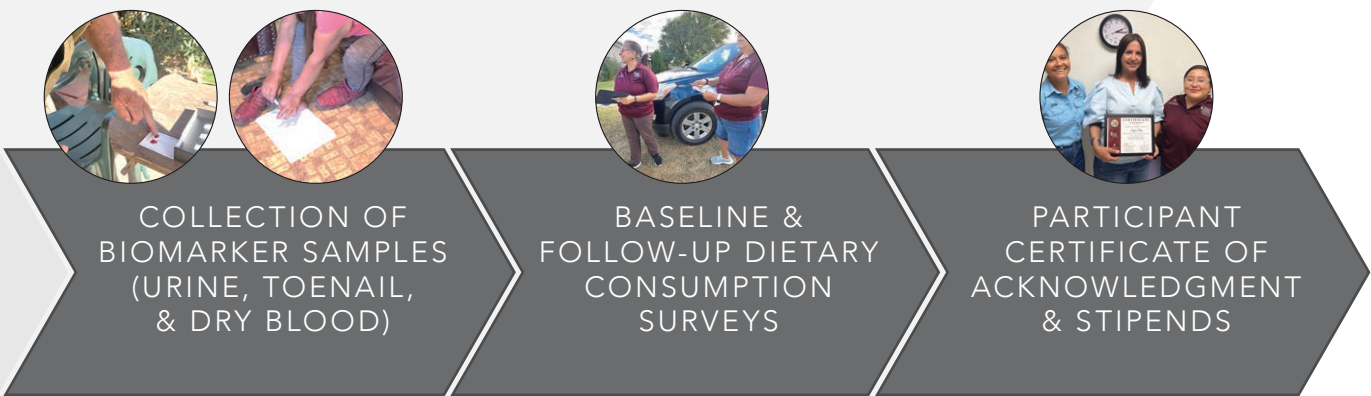
PHASE 1

COMMUNITY-BASED PARTICIPATORY RESEARCH



PHASE 2

COMMUNITY-BASED PARTICIPATORY RESEARCH



PARTICIPANT ENGAGEMENT & RETENTION

PROGRESO

(117 community members approached)

SURVEY & WATER TESTING	100 Participants <i>(85% of group)</i>
BASILINE URINE SAMPLE	81 Participants <i>(81% of group)</i>
DRY BLOOD SPOT SAMPLE	80 Participants <i>(80% of group)</i>
TOENAIL SAMPLE	77 Participants <i>(77% of group)</i>
FOLLOW-UP URINE SAMPLE	75 Participants <i>(75% of group)</i>

ALAMO

(118 community members approached)

SURVEY & WATER TESTING	103 Participants <i>(87% of group)</i>
BASILINE URINE SAMPLE	93 Participants <i>(90% of group)</i>
DRY BLOOD SPOT SAMPLE	89 Participants <i>(86% of group)</i>
TOENAIL SAMPLE	88 Participants <i>(85% of group)</i>
FOLLOW-UP URINE SAMPLE	84 Participants <i>(82% of group)</i>

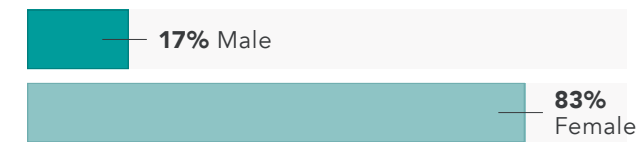
ALAMO RESEARCH RESULTS

(PERCENTAGES BASED ON 100 PARTICIPANTS)

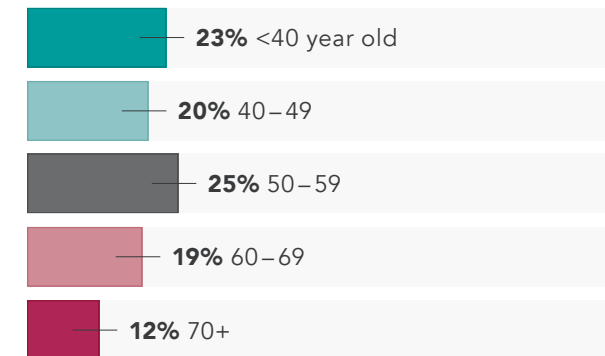


CHARACTERISTICS OF PARTICIPANTS

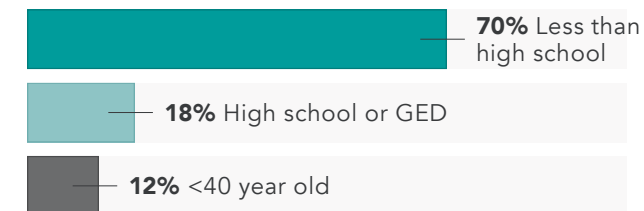
GENDER



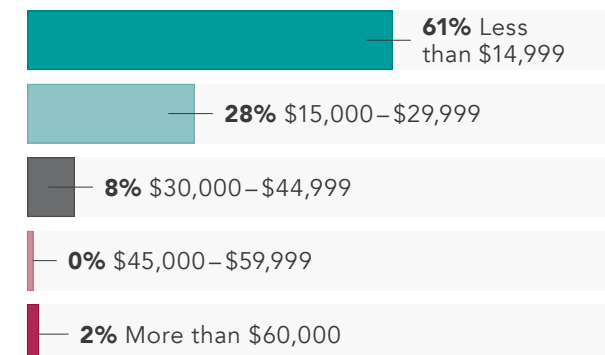
AGE



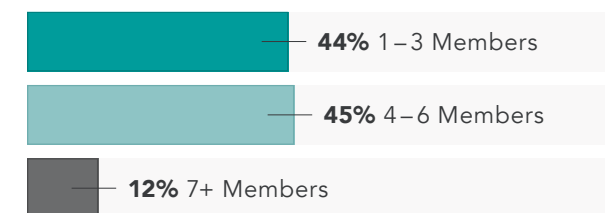
EDUCATION



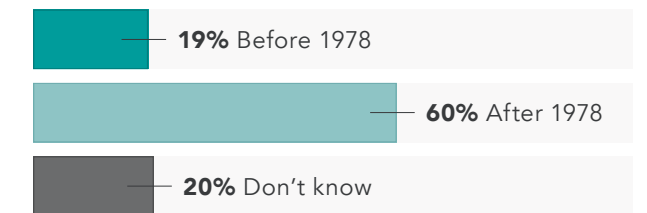
INCOME



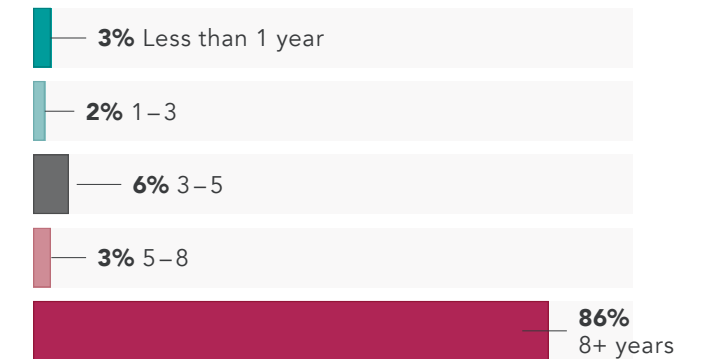
NUMBER OF FAMILY MEMBERS



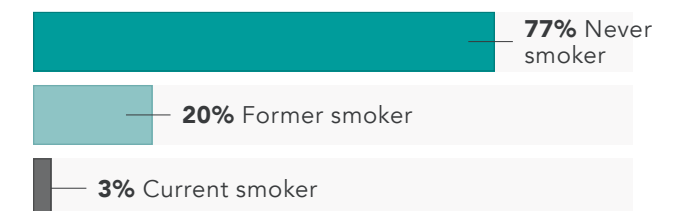
YEAR HOUSE WAS BUILT



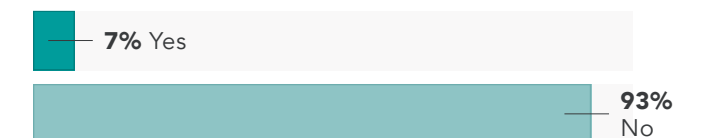
DURATION OF RESIDENCE



SMOKING

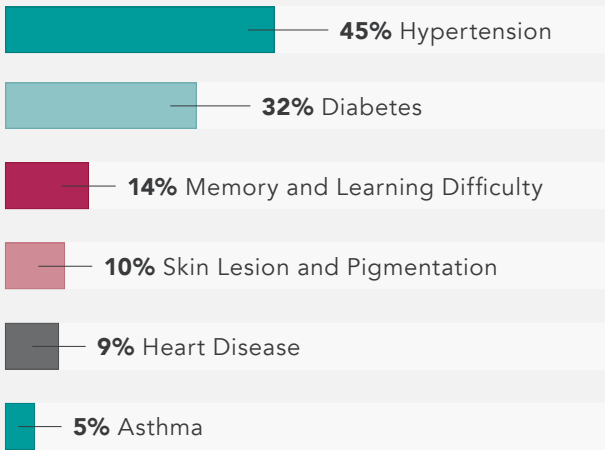


ALCOHOL DRINKING

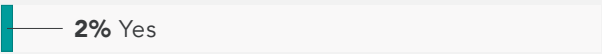


HEALTH STATUS

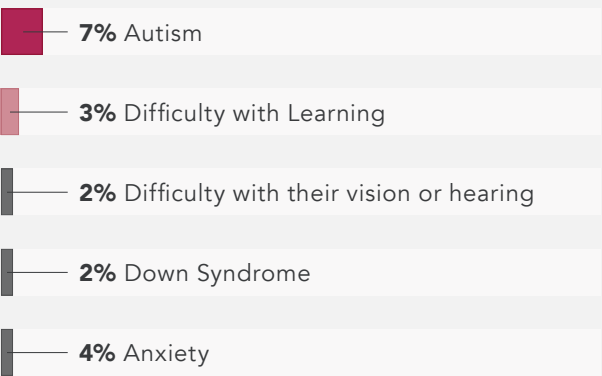
CURRENT CHRONIC DISEASE IN ADULTS



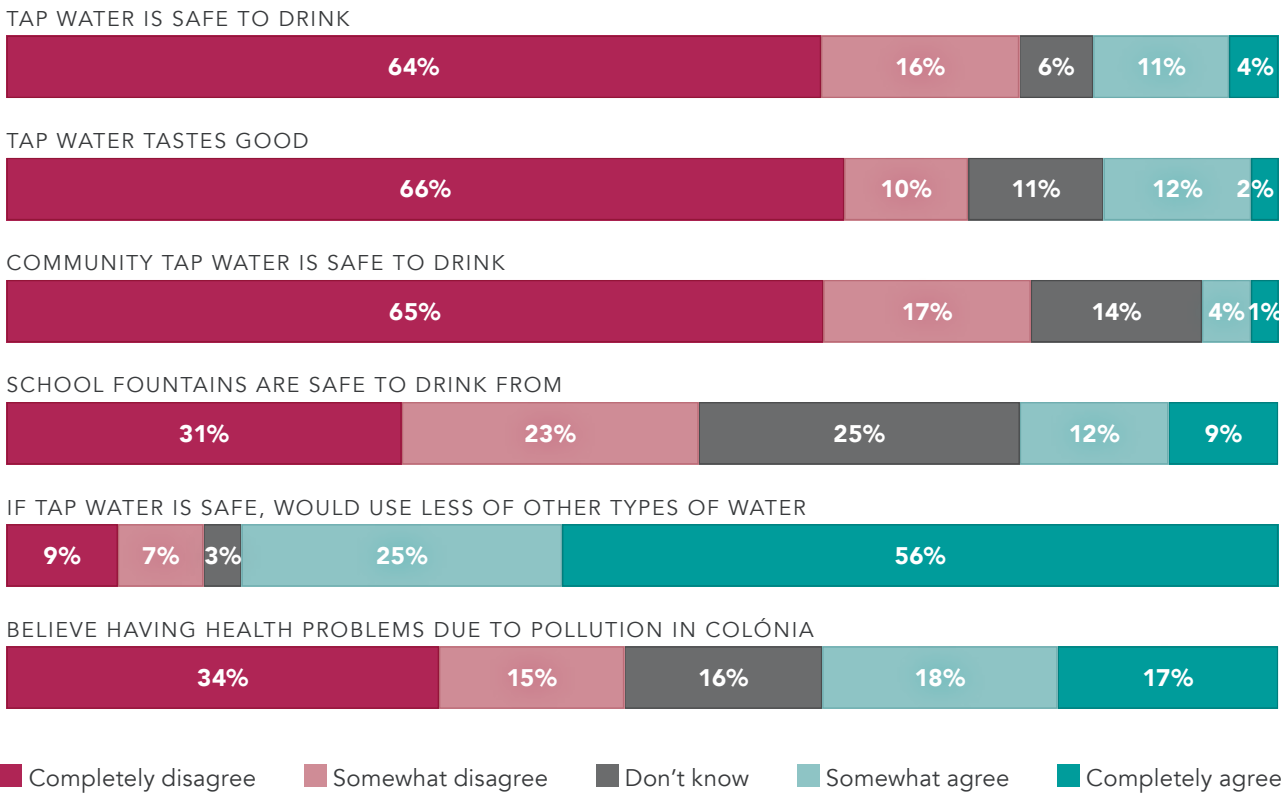
EVER HAD CANCER IN ADULTS



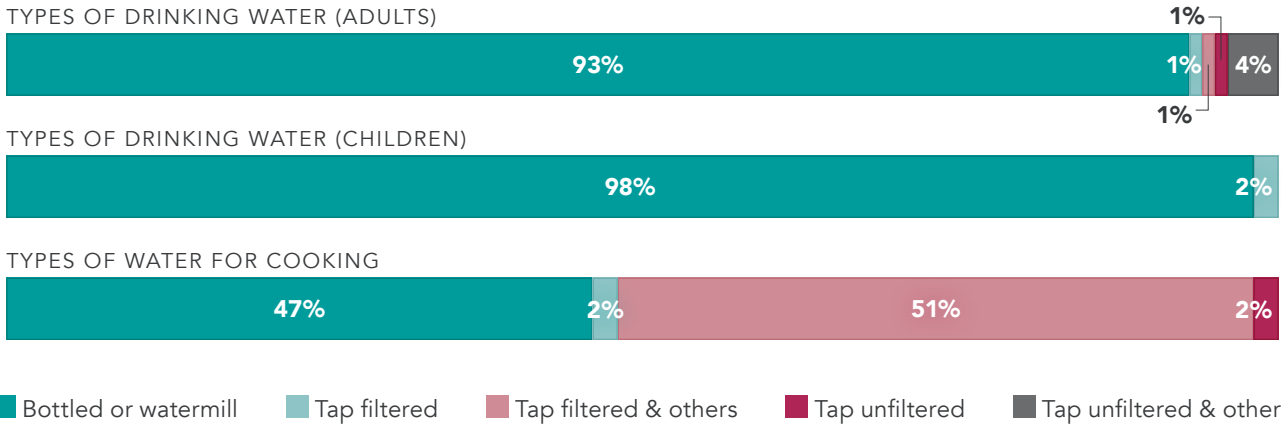
DISABILITY OR IMPAIRMENT IN CHILDREN



PERCEPTION OF DRINKING WATER QUALITY



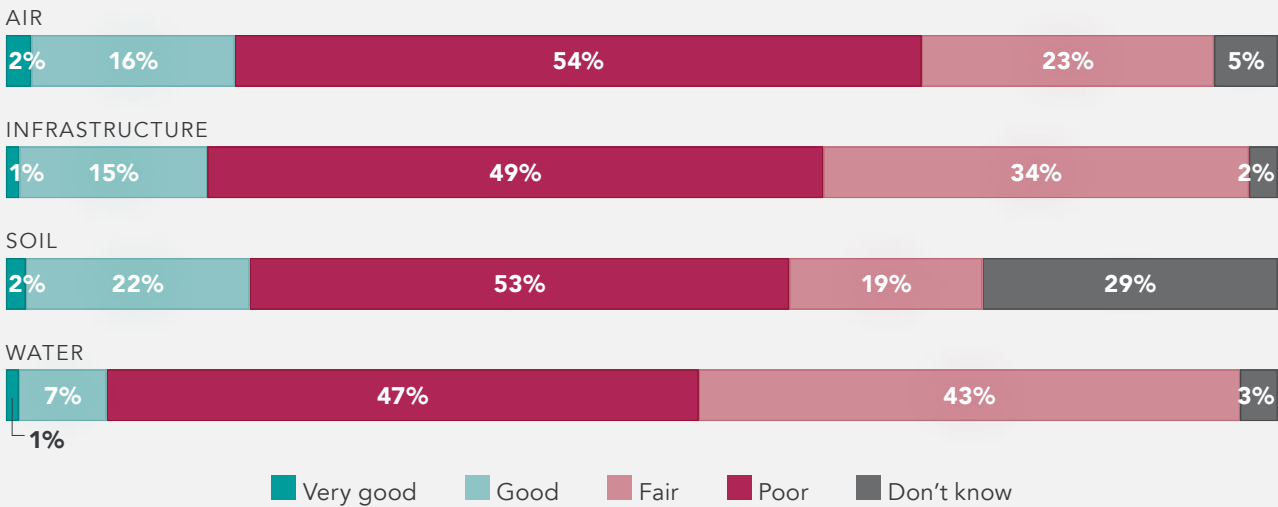
PATTERNS OF WATER USE



“WATER CONTAMINANTS SUCH AS ARSENIC AND LEAD INCREASE THE RISK OF VARIOUS HEALTH ISSUES, including cancers and non-cancer diseases such as hypertension, diabetes, respiratory diseases, heart disease, and cognitive impairments, even at low levels of exposure. Exposure during childhood poses an even greater risk to long-term health.”

—DR. TAEHYUN ROH

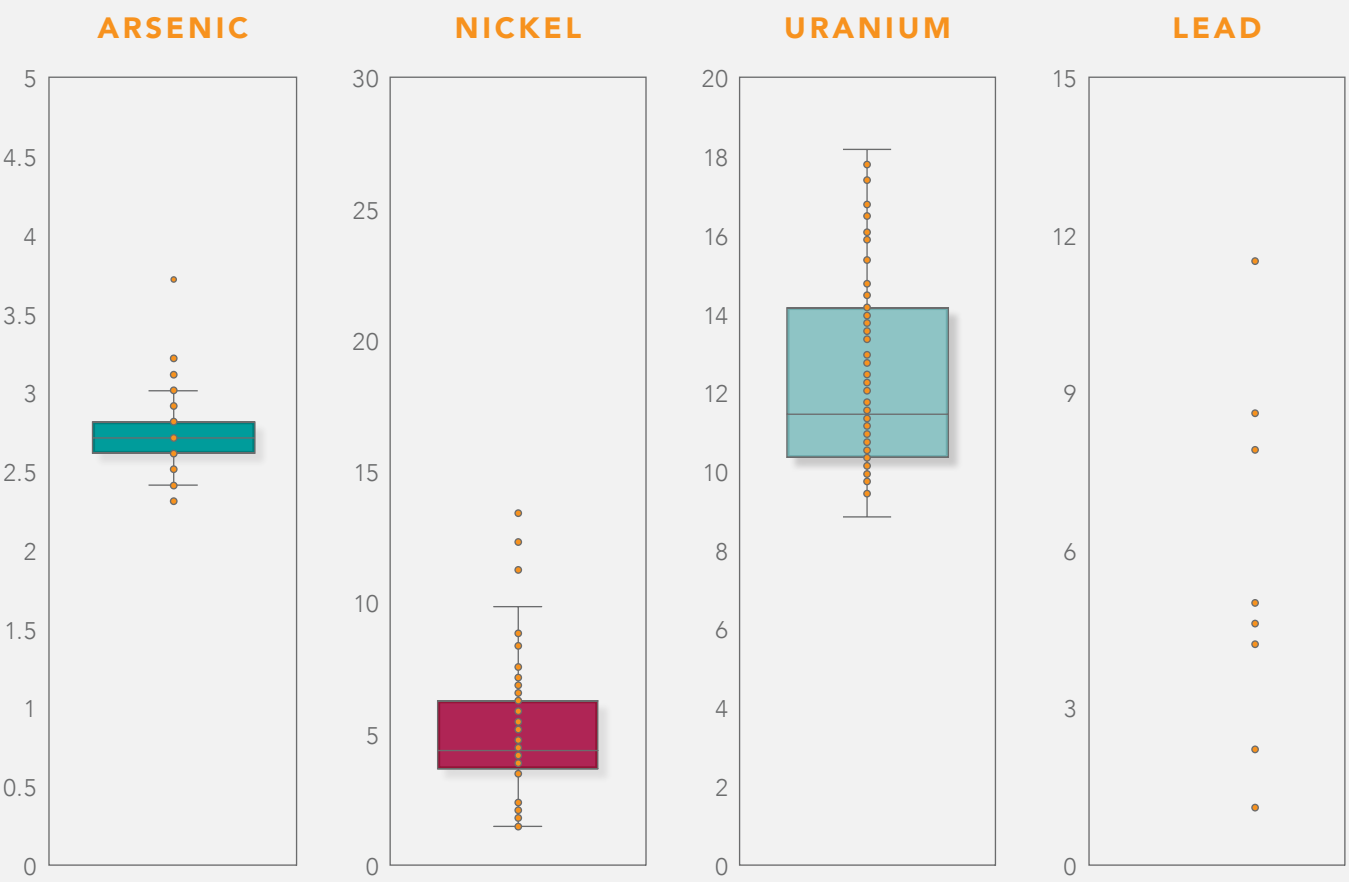
PERCEPTION OF ENVIRONMENTAL QUALITY



WATER QUALITY – METALS

The water analysis results showed significant variation, with some samples having lower contaminant levels and others higher.

Arsenic, nickel, and uranium were detected in every water sample, while lead was found in fewer than 10% of samples. Although all results were below USEPA action levels, it is important to note that no amount of lead or arsenic is considered safe, and the goal for their maximum levels in water is set to zero in the United States. Long-term exposure to these contaminants can lead to serious health risks, including cancer, kidney damage, developmental issues, and neurological effects, particularly in vulnerable populations such as children and pregnant women.



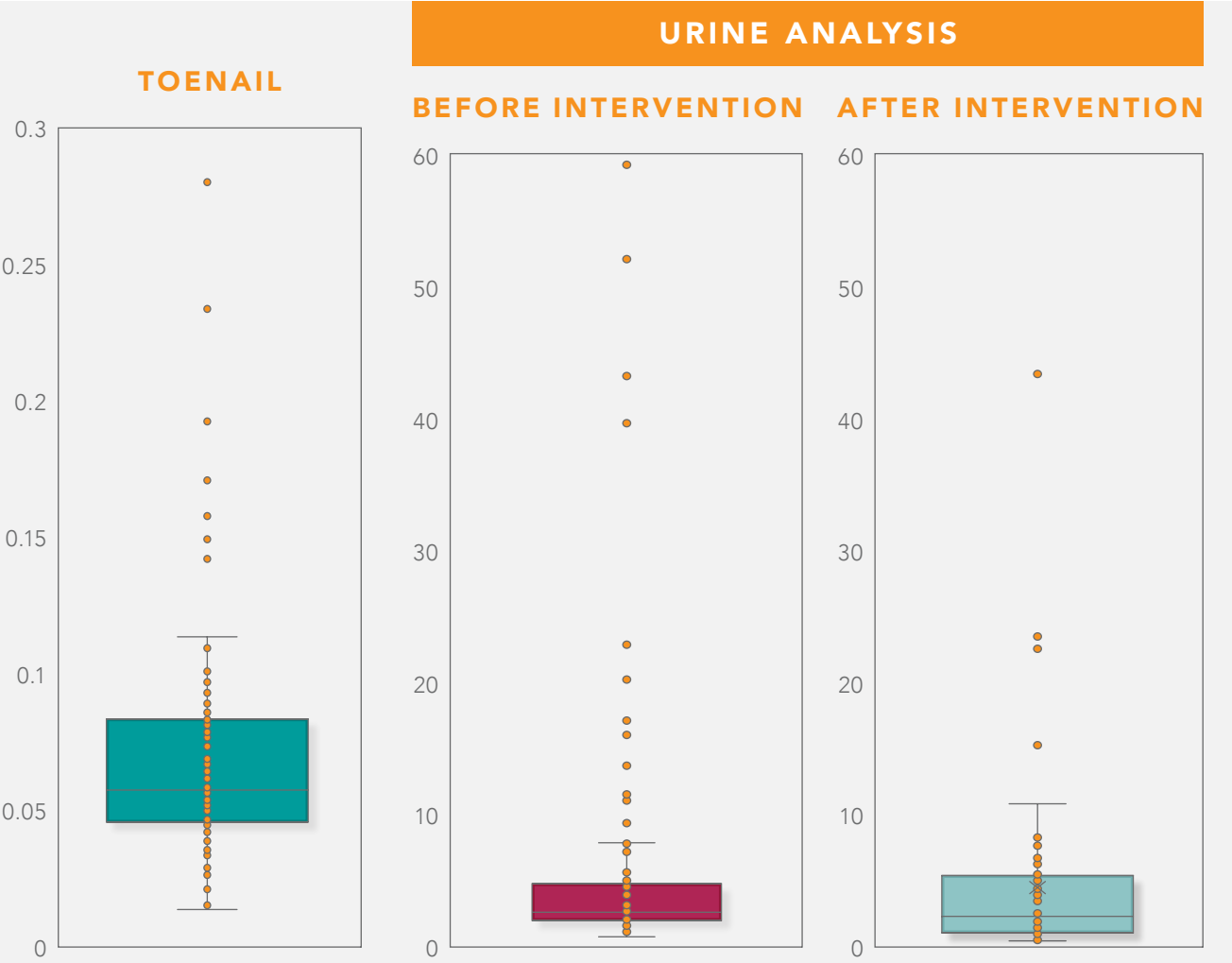
% Homes with detection	100%	100%	100%	2%
Ranges of levels	2.3 – 3.7 ppb	1.4 – 13.4 ppb	8.8 – 18.1 ppb	ND – 1.6 ppb
EPA Action level	10 ppb	100 ppb	30 ppb	15 ppb
Maximum contaminant goal	0 ppb			0 ppb

ppb = parts per billion

BIOMONITORING – ARSENIC

These results highlight the findings from biomarker assessments, revealing what was present within participants’ bodies.

Notably, there was a significant reduction in the number of individuals in the high-risk category following the implementation of filtered water provided to participants. This suggests that at least part of their exposure likely originated from tap drinking water sources, underscoring the importance of interventions to mitigate risks and improve water quality for affected populations.



% Participants with detection	100%	100%	100%
Ranges of levels	0.01 – 0.57 µg/g weight	0.91 – 59.3 µg/g creatinine	1.72 – 31.2 µg/g creatinine
% High risk	9%	27%	15%

µg/g = micrograms per gram of feces

VITAMIN LEVELS

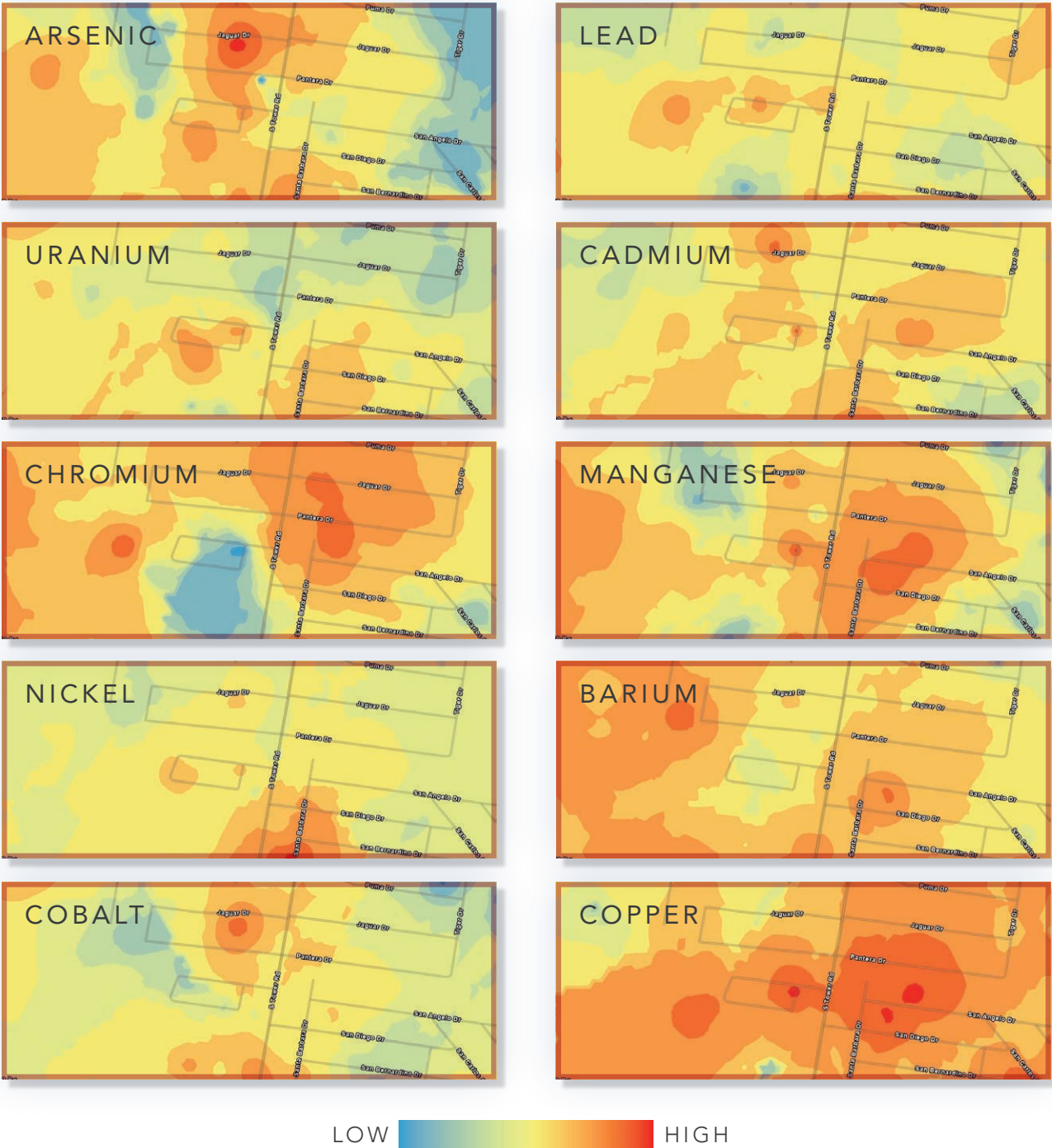
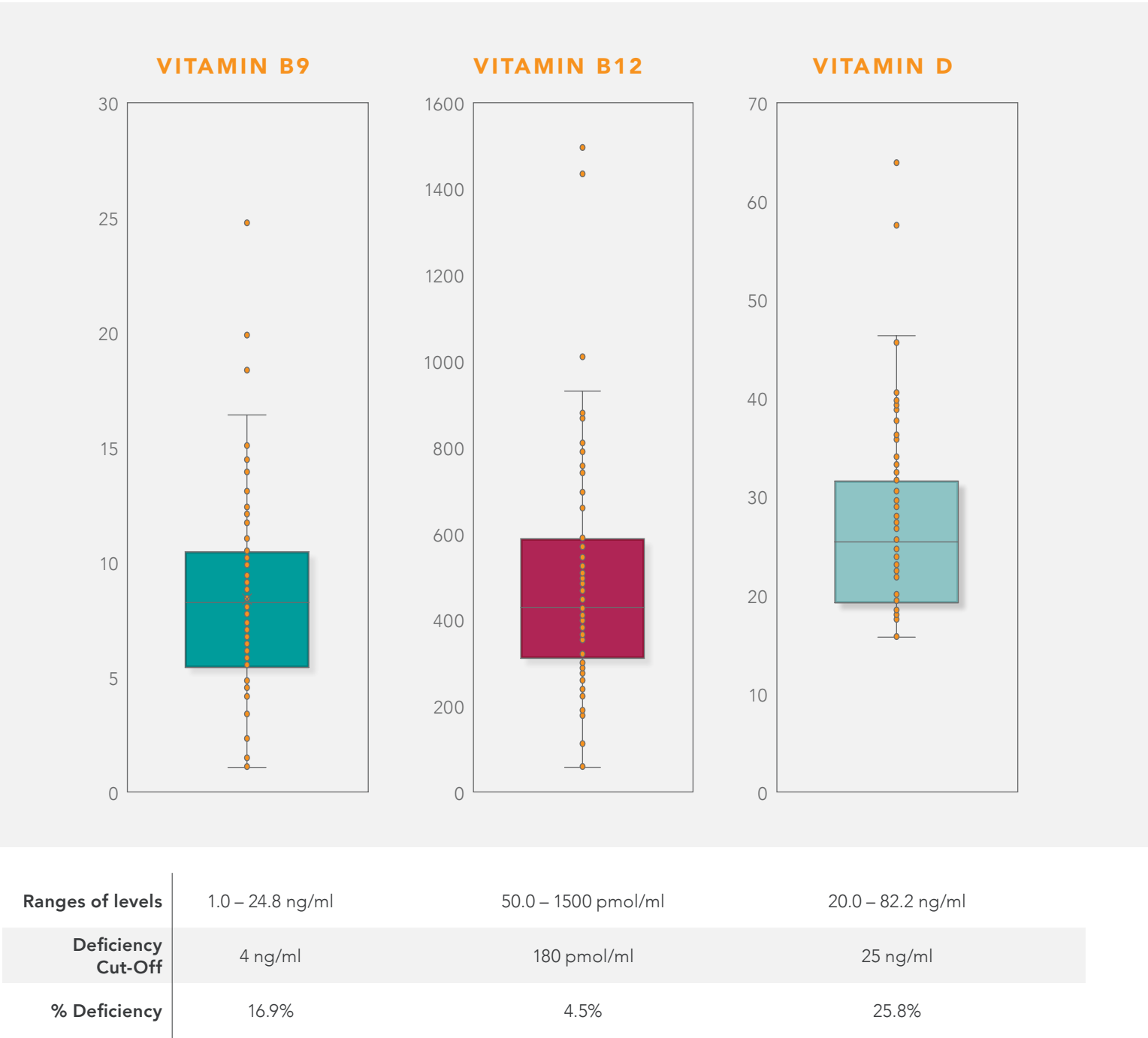
Vitamin B9, B12, and D levels were assessed, with a particular focus on vitamin D, which was notably deficient in more than one in four participants.

Low vitamin D levels are associated with heavy metal exposures, including arsenic specifically, and can increase vulnerability to the toxic effects of these metals by impairing detoxification and immune function.

SPATIAL PATTERNS OF HEAVY METALS IN TOENAILS

This heatmap illustrates the clustering and highest concentrations of heavy metals detected in individuals' bodies.

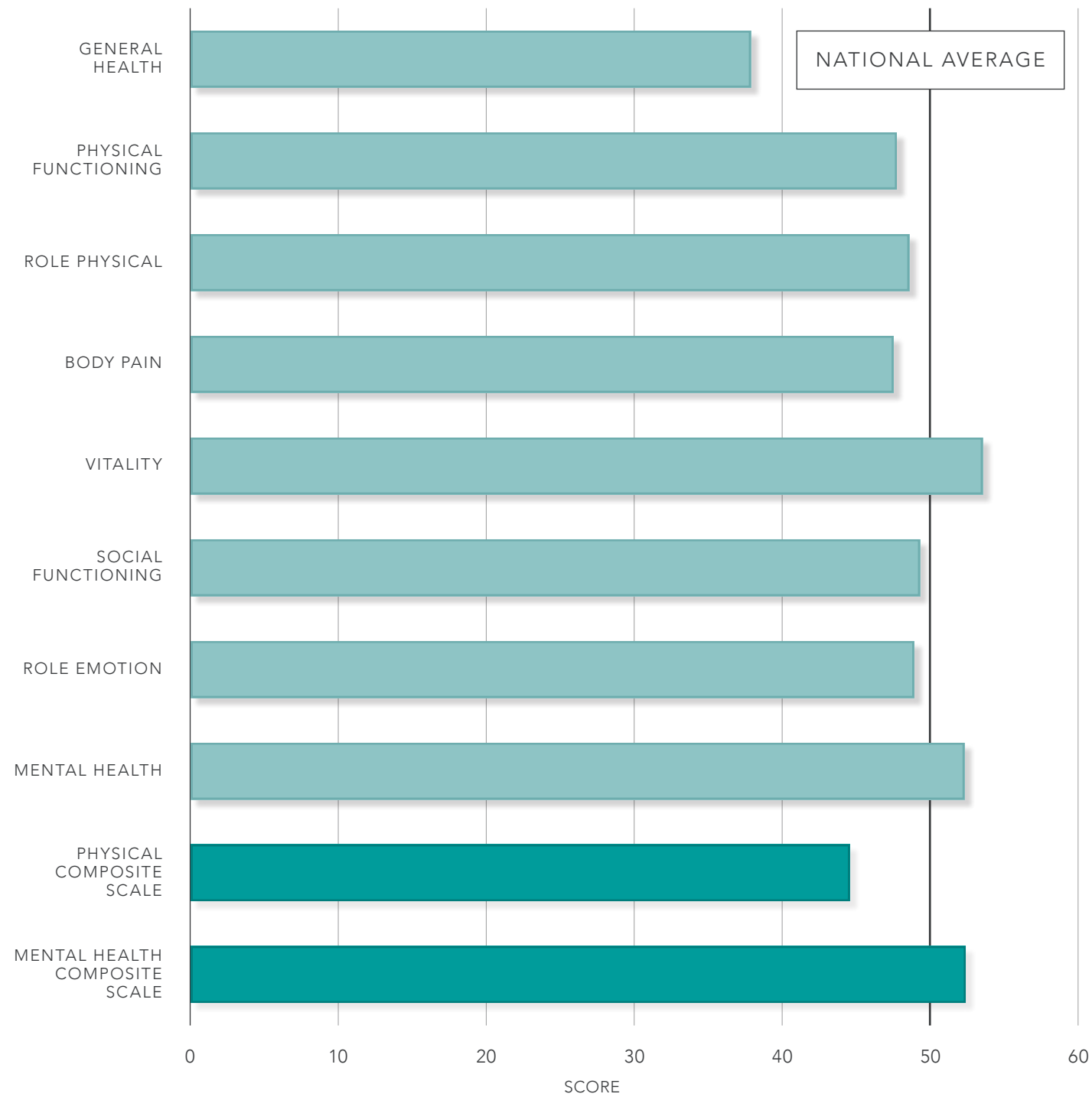
Particularly concerning is the consistent clustering across multiple metals—those with elevated exposures to one metal, such as chromium, are more likely to have higher exposures to others, such as copper, indicating potential cumulative or shared sources of exposure.



PERCEIVED HEALTH STATUS

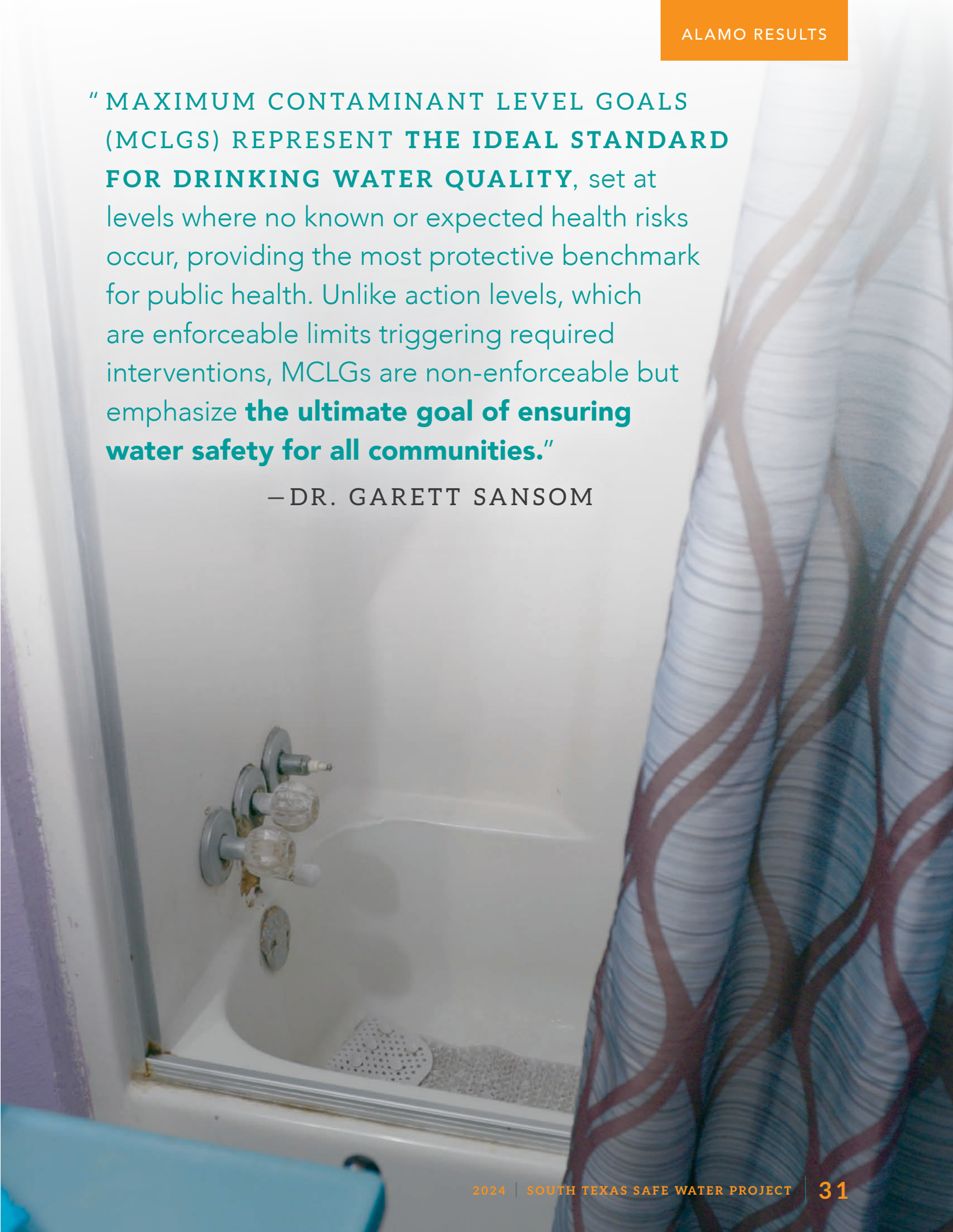
The results from the mental and physical health assessment reveal a statistically significant reduction in physical health compared to county and state averages.

Interestingly, the mental health score is above average—an uncommon finding—highlighting the resilient spirit of the community despite facing serious public and environmental health challenges.



"MAXIMUM CONTAMINANT LEVEL GOALS (MCLGS) REPRESENT THE IDEAL STANDARD FOR DRINKING WATER QUALITY, set at levels where no known or expected health risks occur, providing the most protective benchmark for public health. Unlike action levels, which are enforceable limits triggering required interventions, MCLGs are non-enforceable but emphasize **the ultimate goal of ensuring water safety for all communities.**"

—DR. GARETT SANSOM



PROGRESO RESEARCH RESULTS

(PERCENTAGES BASED ON 103 PARTICIPANTS)

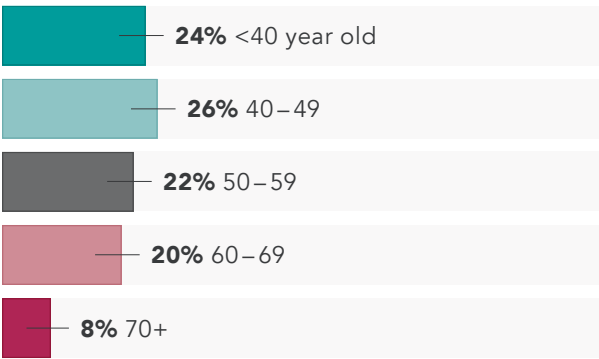


CHARACTERISTICS OF PARTICIPANTS

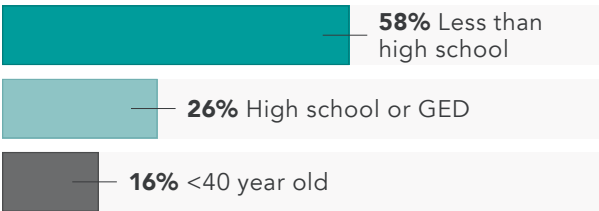
GENDER



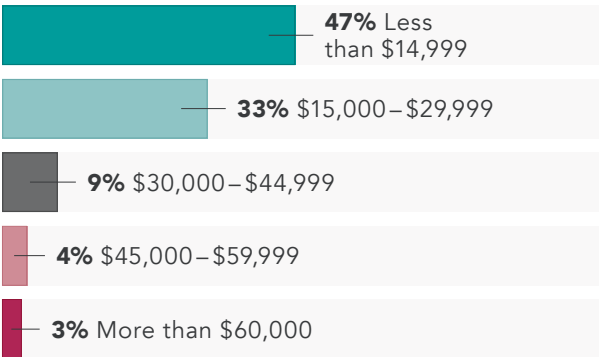
AGE



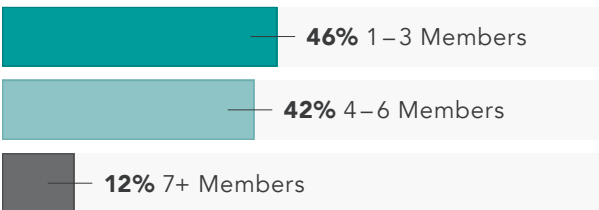
EDUCATION



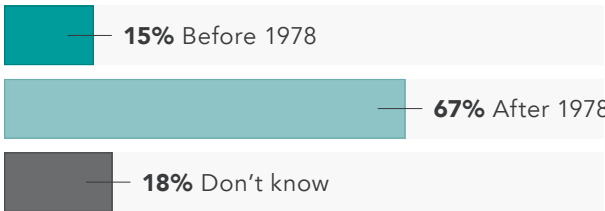
INCOME



NUMBER OF FAMILY MEMBERS



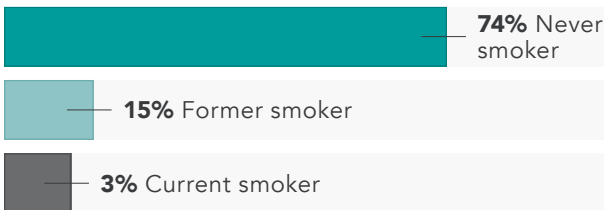
YEAR HOUSE WAS BUILT



DURATION OF RESIDENCE



SMOKING

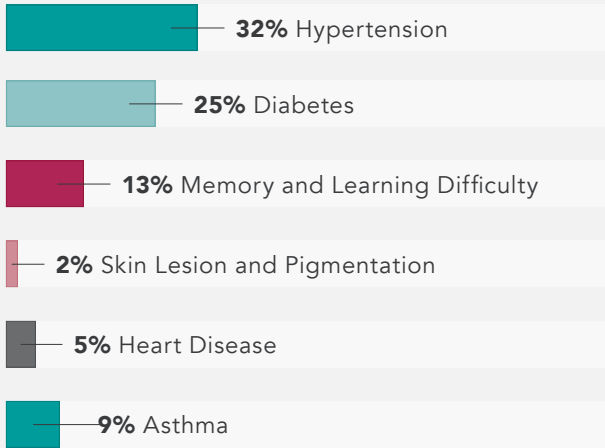


ALCOHOL DRINKING

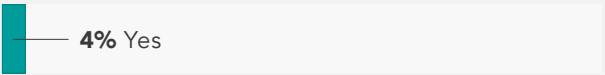


HEALTH STATUS

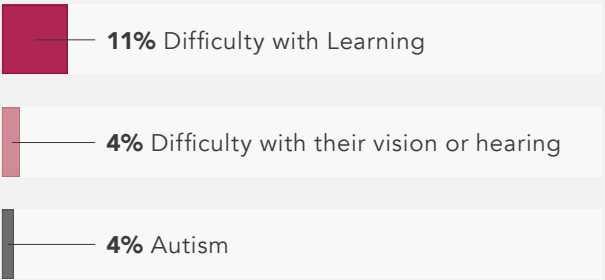
CURRENT CHRONIC DISEASE IN ADULTS



EVER HAD CANCER IN ADULTS



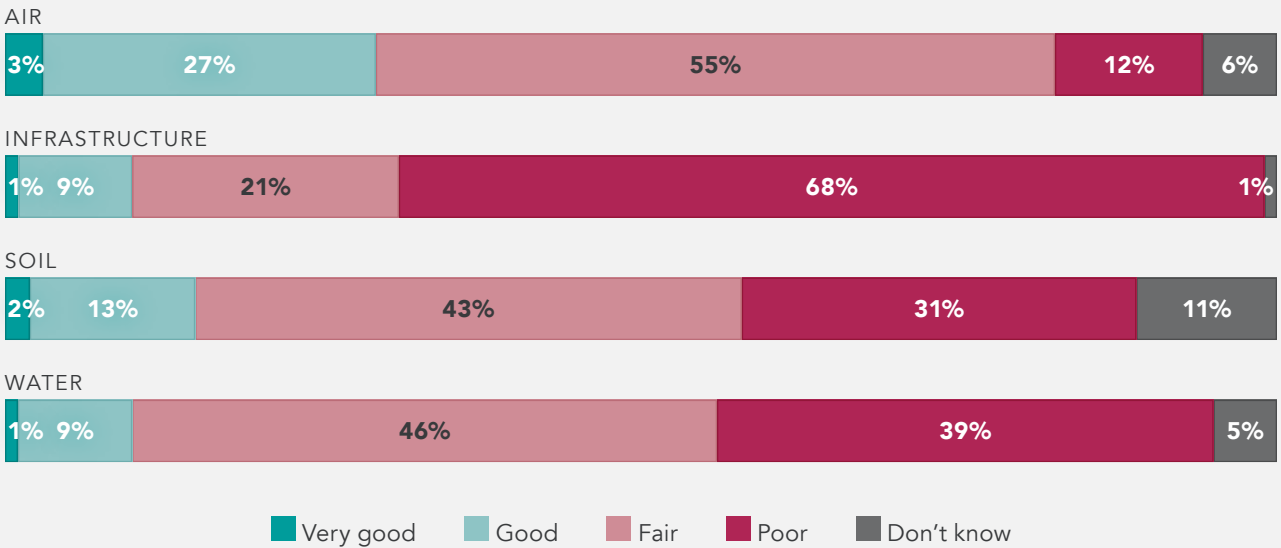
DISABILITY OR IMPAIRMENT IN CHILDREN



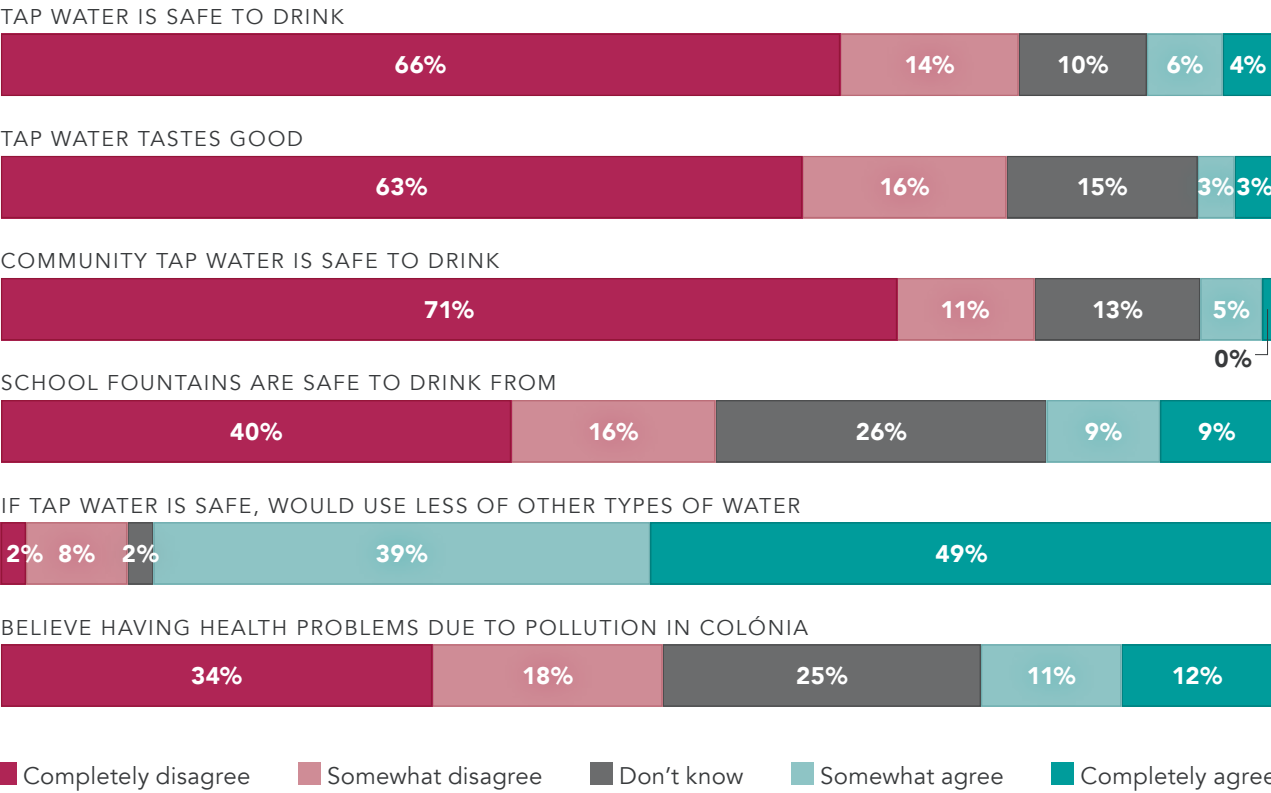
“COMMUNITY MEMBERS HAVE TOLD US THAT IT IS VERY DIFFICULT FOR THEM TO WASH WHITE CLOTHES because instead of leaving it clean, it leaves it **dirty and stained**, and that they can’t even use it to drink or brush their teeth.”

—TEXAS A&M PROMOTORA

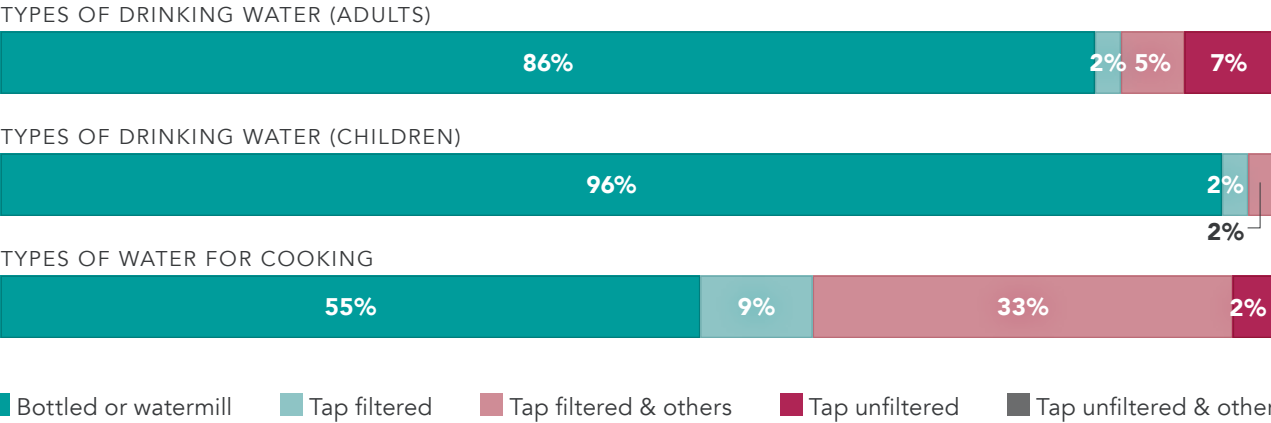
PERCEPTION OF ENVIRONMENTAL QUALITY



PERCEPTION OF DRINKING WATER QUALITY



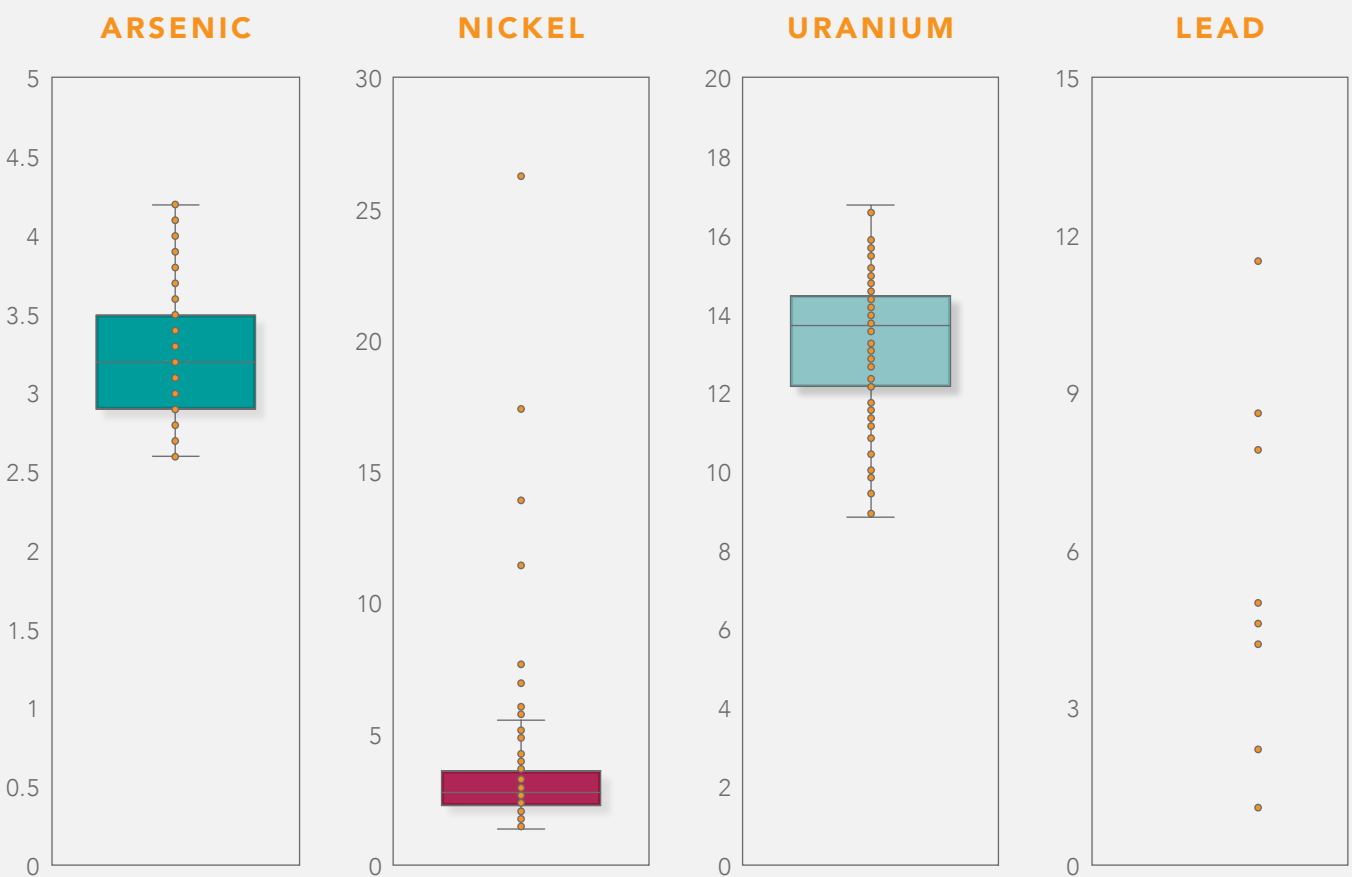
PATTERNS OF WATER USE



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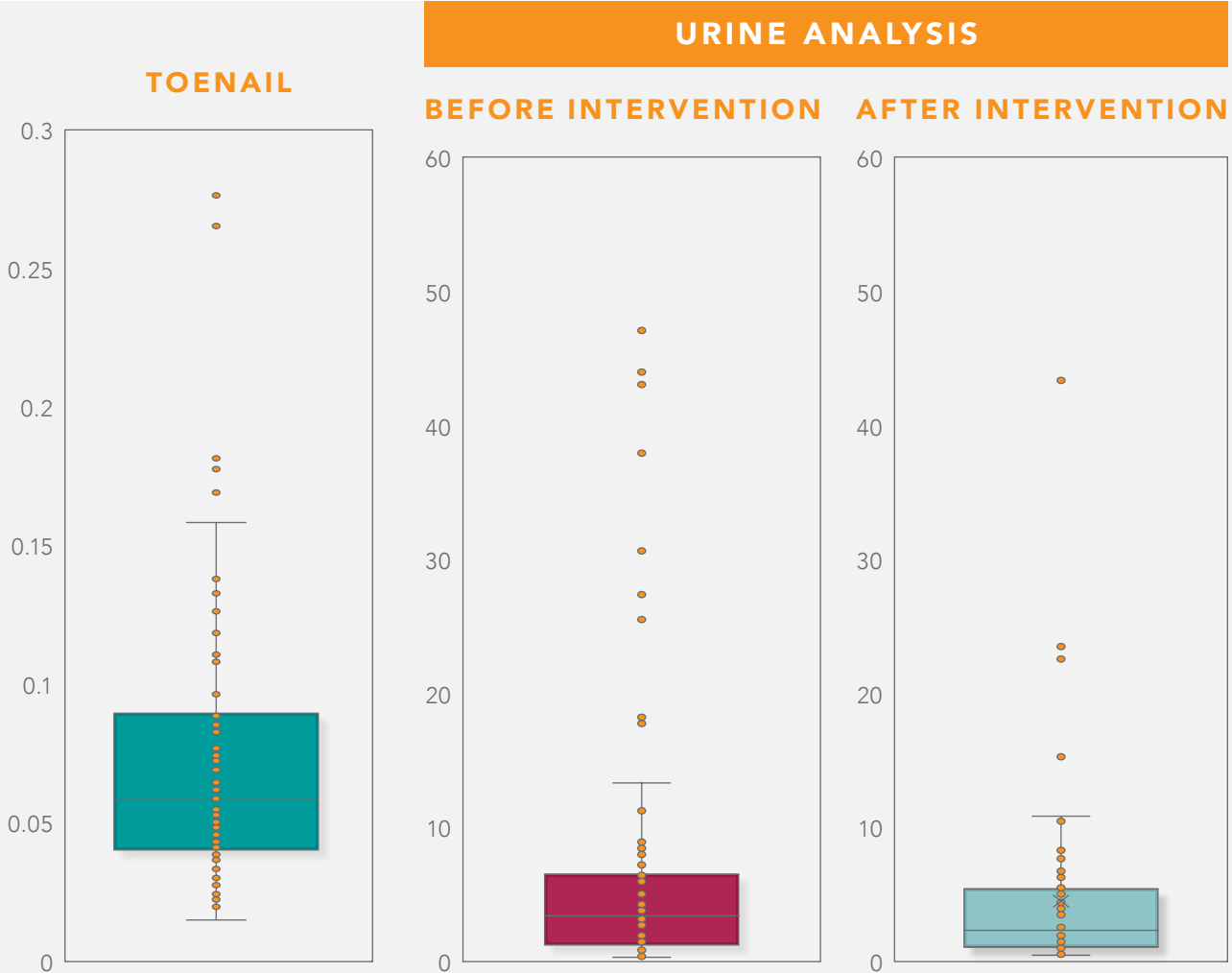
% Homes with detection	100%	100%	100%	7%
Ranges of levels	2.6 – 4.2 ppb	1.3 – 26.3 ppb	8.8 – 16.7 ppb	ND – 11.5 ppb
EPA Action level	10 ppb	100 ppb	30 ppb	15 ppb
Maximum contaminant goal	0 ppb			0 ppb

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% Participants with detection	100%	100%	100%
Ranges of levels	0.03 – 0.37 µg/g weight	0.21 – 47.2 µg/g creatinine	0.29 – 43.4 µg/g creatinine
% High risk	20%	23%	13%

µg/g = micrograms per gram of feces

VITAMIN LEVELS

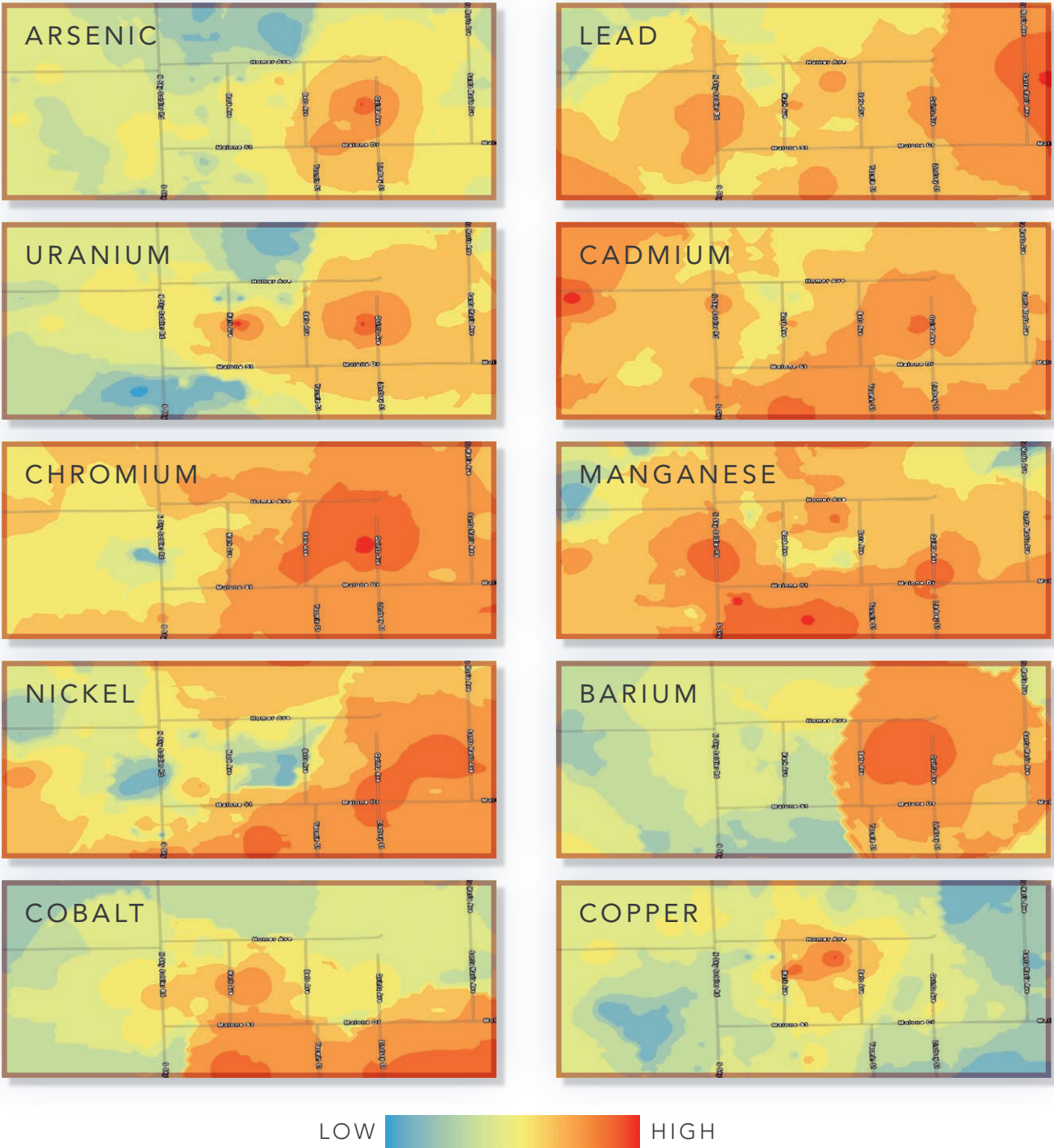
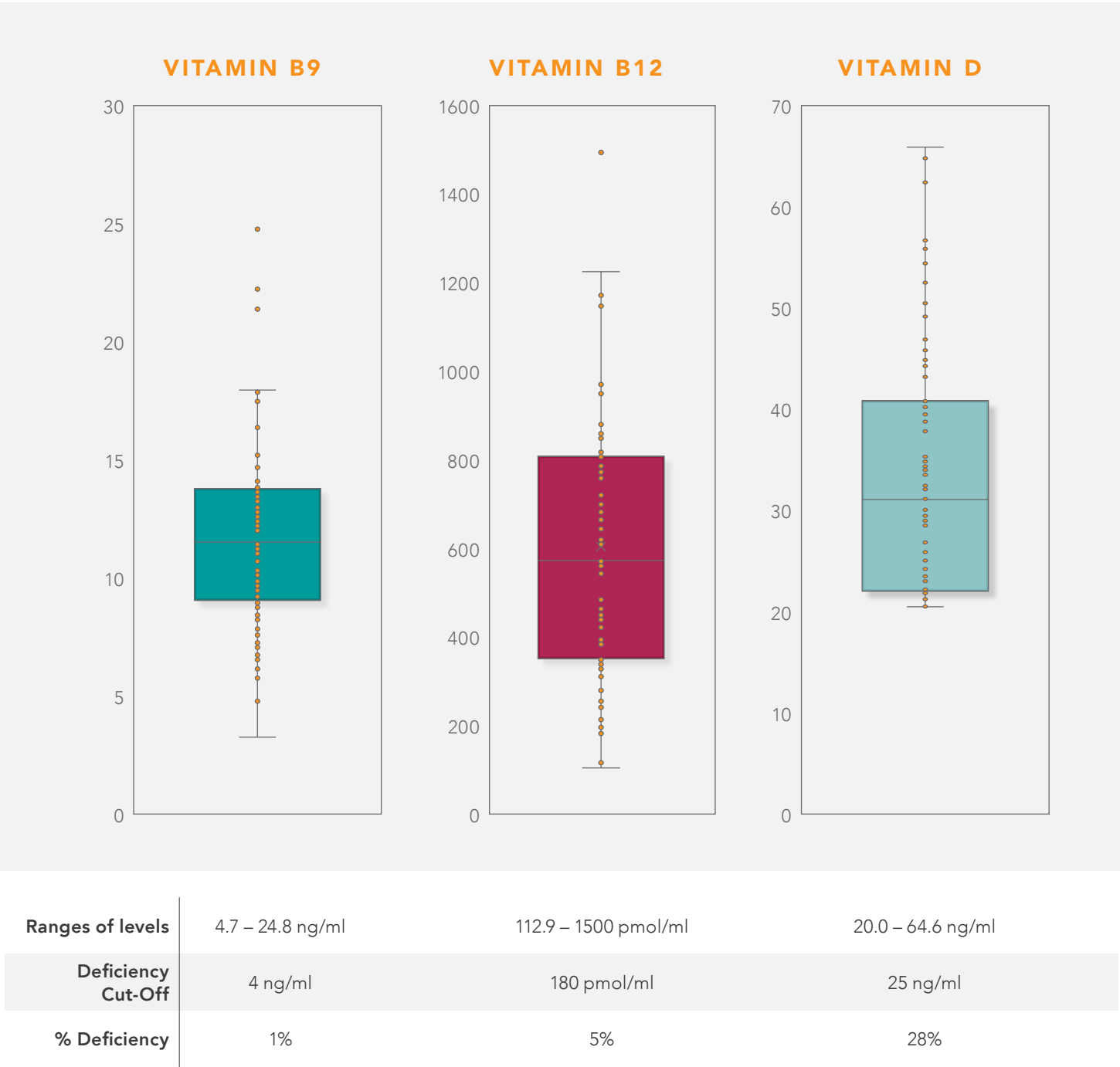
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SUMMARY OF SELF-REPORTED OPINIONS OF CITIZEN SCIENCE PROGRAM

The citizen and family sessions inspired active participation and understanding of environmental health risks, equipping families with tools to address local challenges.

Through hands-on activities and expert guidance, participants explored issues like water contamination and air quality. These sessions fostered trust and collaboration while motivating students who had not planned on pursuing higher education to enroll in science courses, such as engineering. By shifting their academic goals, these students embraced new opportunities, highlighting the program’s role in empowering families and inspiring future STEM leaders to advocate for healthier communities.

IMPACT OF THE CITIZEN SCIENCE PROGRAM

The program had a significant impact on both the students and the broader research project. By participating, students contributed valuable, actionable data that informed programmatic and policy recommendations on water quality issues in colonia communities. Their work demonstrated the power of engaging local youth in community-based research, promoting increased environmental awareness and advocacy.

Summary of Self-Reported Student Feedback

✓ **PROGRAM SATISFACTION:** 100% of participants agreed or strongly agreed that they were satisfied with the program.

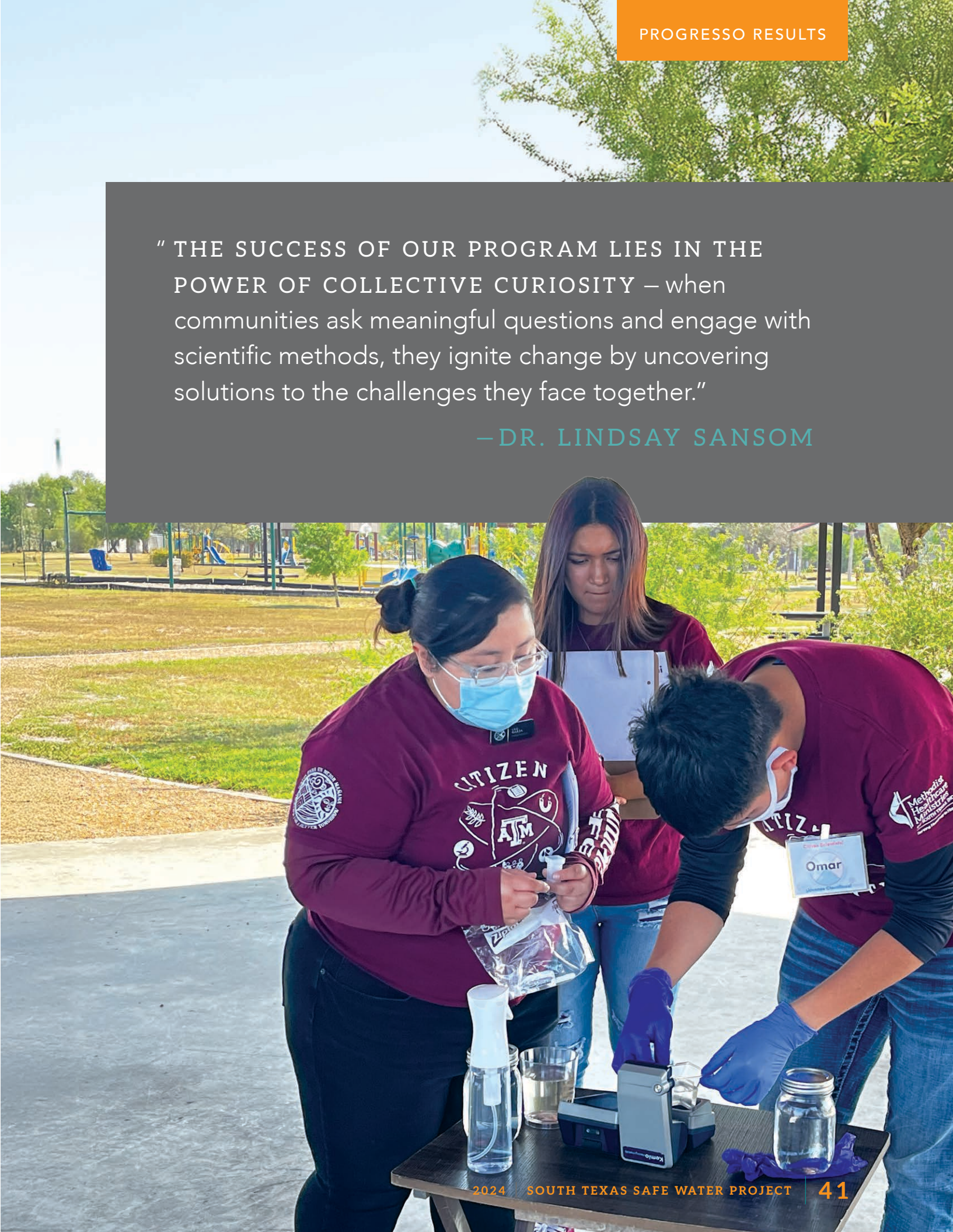
▶ **REASONS FOR SATISFACTION:** Students cited learning new information and having the opportunity to contribute to community improvements as key factors in their satisfaction.

✓ **IMPACT ON COLLEGE ASPIRATIONS:** All respondents (100%) reported that participating in the program made them more likely to pursue higher education.

✓ **LIKELIHOOD TO RECOMMEND:** Every student indicated they were very likely to recommend the program to their peers.

✓ **SKILLS LEARNED:** Students highlighted the program’s benefits in enhancing their environmental health knowledge, providing valuable skills for community advocacy, and preparing them for college-level scientific study.

Overall, the Citizen Science Program successfully engaged students in meaningful environmental research, provided them with a sense of accomplishment, and inspired aspirations for higher education. The initiative created a pathway for continued involvement in science and advocacy, demonstrating a sustainable model for integrating youth education with community-driven research.



“ THE SUCCESS OF OUR PROGRAM LIES IN THE POWER OF COLLECTIVE CURIOSITY – when communities ask meaningful questions and engage with scientific methods, they ignite change by uncovering solutions to the challenges they face together.”

– DR. LINDSAY SANSOM

The policy workshop held on October 18–19, 2024, at the Texas A&M University San Antonio Campus brought together key stakeholders to address significant environmental health challenges in South Texas colonias.

Identified Needs and Community Insights

Efforts to address challenges in underserved areas require targeted strategies based on community insights. **Key needs include:**

- 

improving emergency response
- 

policy dissemination
- 


public health education
- 

water quality
- 

community engagement

BELOW IS A CONCISE SUMMARY OF THESE NEEDS AND THE PERSPECTIVES SHARED BY COMMUNITY MEMBERS AND STAKEHOLDERS.


Emergency response efforts are hampered by distrust in law enforcement and emergency agencies. Building relationships with trusted local leaders, such as church officials and community organizations, can bridge this gap. Infrastructure deficiencies, including flooding, lack of fire hydrants, and poor street lighting, increase vulnerabilities. Preparedness training tailored to community needs and delivered by trusted voices can significantly improve resilience.

 **COMMUNITY PERSPECTIVE:** Residents value resilience hubs and multi-generational preparedness education, emphasizing practical and immediate challenges over large-scale disasters.

Public health education must address water quality issues and barriers to healthcare access. Temporary solutions like bottled water and filters are costly and unsustainable. Expanding healthcare resources, such as mobile clinics and Medicaid access, and providing culturally relevant, multilingual educational materials are critical. Maternal and child health must also be prioritized due to the vulnerability of these populations.

 **COMMUNITY PERSPECTIVE:** Trusted community members are crucial for effectively disseminating public health information. Educational efforts must balance cultural relevance and accessibility with families’ competing priorities.

Policy dissemination faces challenges from weak enforcement, insufficient funding, and inaccessible reporting processes. Many residents are unaware of their rights or how to advocate effectively. Simplifying water quality reports, providing them in Spanish, and engaging trusted community organizations can enhance communication. Strong partnerships with non-profits and local leaders can help close these gaps.

 **COMMUNITY PERSPECTIVE:** Outreach through PSAs, newsletters, and door-to-door campaigns is recommended to foster trust and ensure policies address community needs.

Water quality concerns include repeated violations by water providers and insufficient accountability. Comprehensive water testing, including assessments of plants, main lines, and service lines, is essential. Education about filing complaints and the limitations of temporary solutions like filters is also needed to empower residents.

 **COMMUNITY PERSPECTIVE:** Communities call for stronger enforcement and transparency. Faith organizations and local officials are valuable allies in advocating for clean water and educating residents about their rights.

Community engagement must focus on empowering residents through advocacy tools and education. Reinstating roles like Colonia Ombudsman and requiring Community Advisory Boards (CABs) for water supply companies can provide better representation. Collaboration with schools, churches, and community centers is crucial for sustainable engagement.

 **COMMUNITY PERSPECTIVE:** Accessible, culturally relevant advocacy training in Spanish is vital. Empowering CABs and fostering collaboration between community members and stakeholders can build trust and improve accountability.

This synthesis highlights the importance of trust-building, transparent policies, culturally competent education, and robust community advocacy. Addressing these challenges with community-driven solutions can create meaningful progress and improve resilience in underserved areas.

POLICY AND PROGRAMMATIC SOLUTIONS IDENTIFIED

The workshop generated actionable policy and programmatic solutions aimed at addressing the systemic challenges in underserved areas.

These solutions focus on emergency response, public health, water quality, and community engagement, and emphasize leveraging existing resources, creating new frameworks, and enhancing accountability and transparency.



EMERGENCY RESPONSE

- **INCLUSION IN COUNTY PLANS:** Ensure unincorporated regions are incorporated into emergency response plans, addressing their unique vulnerabilities.
- **RESILIENCE HUBS:** Establish local resilience hubs modeled after successful examples, such as those in Hidalgo County, to serve as resource and coordination centers during emergencies.
- **STAKEHOLDER ENGAGEMENT:** Develop partnerships with local organizations, faith-based groups, and civic leaders to build trust and improve community response capacity.

- **COMMUNITY TRAINING:** Provide culturally tailored training on emergency preparedness, engaging schools, churches, and local groups to reach diverse populations.

PUBLIC HEALTH AND HEALTHCARE

- **MOBILE HEALTHCARE:** Invest in mobile clinics and transportation infrastructure to ensure healthcare access in isolated areas.
- **SUSTAINABLE WATER QUALITY SOLUTIONS:** Develop programs to subsidize or distribute sustainable water filtration systems while addressing long-term infrastructure improvements.
- **CULTURALLY COMPETENT OUTREACH:** Create multilingual educational materials and recruit trusted Community Health Workers to disseminate information on maternal and child health, water safety, and healthcare access.



WATER QUALITY

- **COMPREHENSIVE TESTING AND REPORTING:** Implement regular, multi-source water testing (plant, main lines, and service lines) and enforce transparency in reporting water quality issues to the community.
- **ENHANCED ACCOUNTABILITY:** Strengthen penalties for water quality violations and establish a monitoring body to ensure corrective actions are taken.
- **GRANT ACCESS FOR WATER PROVIDERS:** Train water companies to apply for federal and state grants aimed at infrastructure upgrades and compliance with EPA standards.

COMMUNITY ENGAGEMENT

- **EMPOWERED ADVISORY BOARDS:** Require community advisory boards (CABs) for water providers and ensure community members are represented in decision-making processes.
- **ADVOCACY TRAINING:** Provide residents with tools and education to engage in the legislative process and advocate for local issues.

- **CLEARINGHOUSE FOR RESOURCES:** Establish a centralized repository for research, funding opportunities, and advocacy tools to enhance coordination among community organizations and stakeholders.

POLICY IMPLEMENTATION AND DISSEMINATION

- **SIMPLIFIED REPORTING:** Make policy and program updates accessible to residents through PSAs, newsletters, and door-to-door outreach in plain language and multiple languages.
- **STATE-LEVEL ADVOCACY:** Advocate for unfunded mandates to be revisited and funded, addressing gaps in infrastructure and services caused by lack of state-level support.
- **CONSORTIUM MODEL:** Create a statewide consortium to coordinate water quality and public health efforts, ensuring consistent standards and sharing of best practices.



POLICY WORKSHOP ON ENVIRONMENTAL HEALTH CHALLENGES IN SOUTH TEXAS COLONIAS



The event focused on water quality issues and broader public health risks, aiming to identify not only policy solutions but also programmatic interventions and knowledge gaps that may require further research.



The workshop centered on the severe water quality concerns faced by colonia residents, where outdated infrastructure and unreliable access to safe drinking water pose ongoing health risks.



Attendees included a diverse mix of colonia residents, state and local government officials, public health experts, and academic researchers.



Community advocacy organizations and public health leaders also contributed, offering perspectives that connected lived experiences with broader policy discussions.



The workshop created an open forum for dialogue, with presentations, interactive discussions, and breakout sessions aimed at identifying policy gaps, exploring programmatic solutions, and highlighting areas requiring additional research to address environmental health risks effectively. This collaborative approach built strong relationships and laid the groundwork for actionable recommendations tailored to the needs of the colonias.



"I WANTED TO SAY THAT THE TAP WATER COMES OUT BROWN when I wash clothes and it is dirty and **stains my clothes**. I don't even give my dog tap water because of how dirty it is. My bathroom when I clean it or when I shower stays stained with the same brown color and when the water comes out it **looks brown**."

—PROGRESO PARTICIPANT



BY THE NUMBERS



14 CITIZEN SCIENTISTS

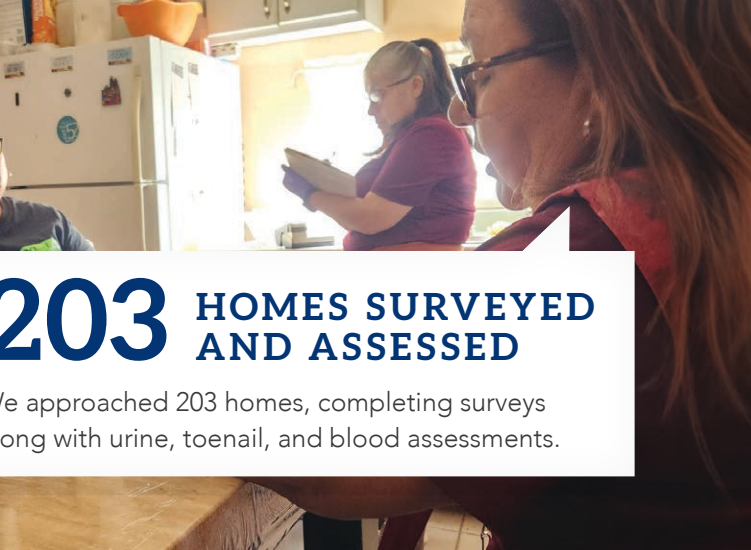
We graduated 14 citizen scientists, providing them with certificates and pathways to higher education.

30 COMMUNITY PARTNERSHIPS

We strengthened and maintained 30+ community organizations and stakeholders to support our Community-Based Participatory Research (CBPR) efforts.

13 PARENTS TRAINED FOR HIGHER EDUCATION PREPARATION

We trained 13 parents to support their students in preparing for higher education.



3 COMMUNITY ADVISORY BOARDS STRENGTHEN WITH 60+ PARTICIPANTS

We maintained three Community Advisory Boards with over 60 active participants.

203 HOMES SURVEYED AND ASSESSED

We approached 203 homes, completing surveys along with urine, toenail, and blood assessments.

400+ WATER FILTERS DISTRIBUTED

We provided over 400 water filters to households in need.

63%+ REDUCTION IN ARSENIC LEVELS

We successfully reduced arsenic levels in 63% of Alamo participants and 65% of Progreso participants.

43%+ ARSENIC REDUCTION FROM HIGH-RISK TO LOW-RISK LEVELS

In Progreso, we successfully reduced the number of participants with high-risk arsenic levels to low-risk, in 43% of participants. Similarly, in Alamo, we successfully reduced the number of participants with high-risk arsenic levels to low-risk, in 44% of participants.

\$48,000+ GIVEN BACK TO SOUTH TEXAS COMMUNITIES



LIMITATIONS AND LESSONS LEARNED

While our program successfully fostered meaningful university-community engagement, several limitations highlight areas for future research and programmatic expansion.

A significant gap identified is the need to extend efforts to more rural and vulnerable locations that rely heavily on well water. These communities often face unique environmental health challenges that require tailored engagement strategies and resources, which were beyond the current scope of this initiative.



Additionally, structural challenges, such as the segmentation of university missions and limited institutional support for community engagement, remain obstacles. These systems often prioritize traditional research outputs over community-focused initiatives, underscoring the need for systemic changes to support and reward such work.

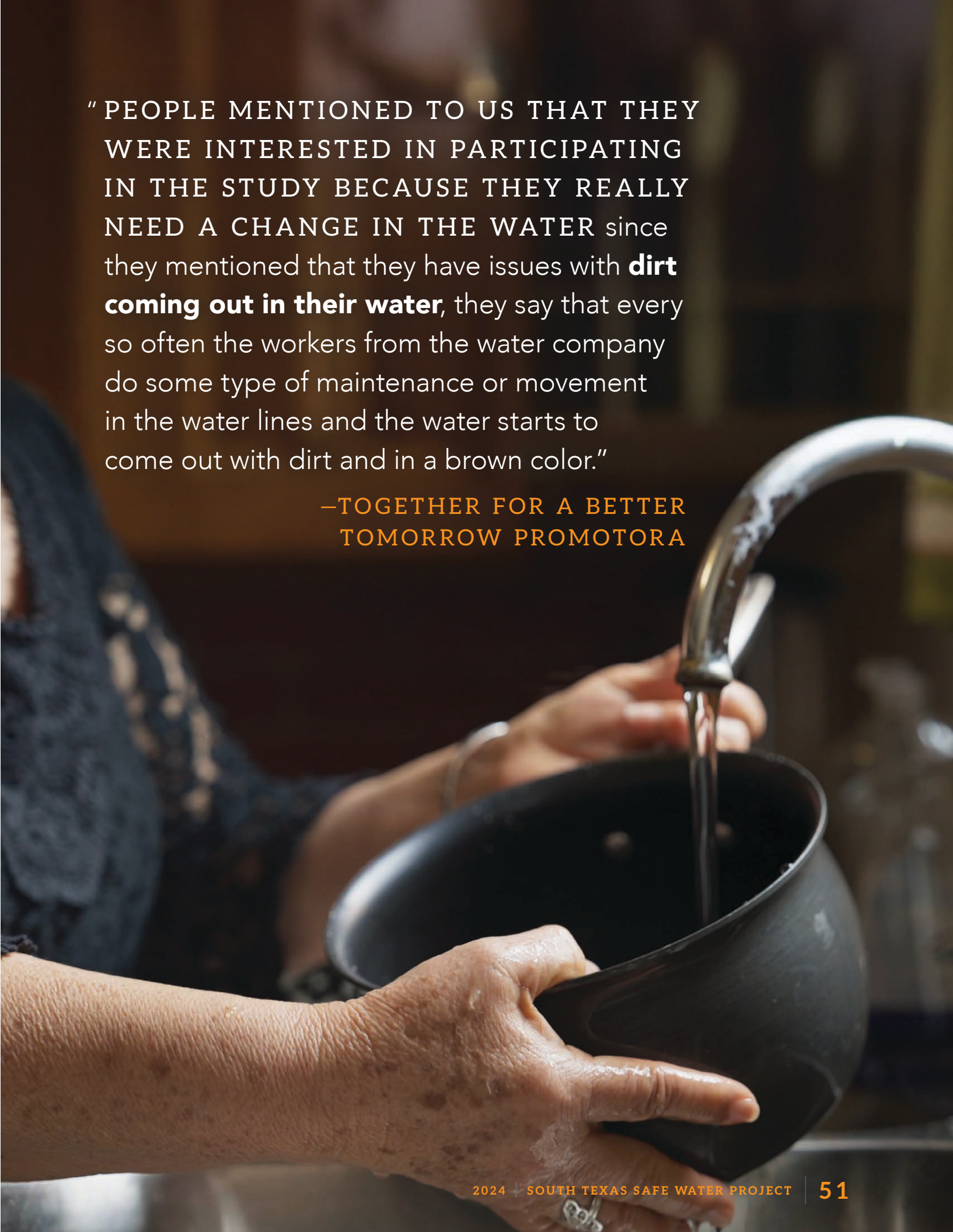
Future efforts should focus on expanding to underserved areas, incorporating well water assessments, and advocating for institutional reforms to enhance the sustainability and impact of university-community partnerships.



University-community engagement often encounters institutional challenges, including rigid structures and the undervaluation of such efforts within traditional academic reward systems. Our program sought to overcome these barriers through inclusive communication strategies and initiatives focused on mutual benefit. However, this type of work would be significantly more challenging under a more traditional funding mechanism. The partnership between Methodist Healthcare Ministries and Texas A&M University created the flexibility and alignment necessary to address the complexities of engagement in meaningful ways.

“PEOPLE MENTIONED TO US THAT THEY WERE INTERESTED IN PARTICIPATING IN THE STUDY BECAUSE THEY REALLY NEED A CHANGE IN THE WATER since they mentioned that they have issues with **dirt coming out in their water**, they say that every so often the workers from the water company do some type of maintenance or movement in the water lines and the water starts to come out with dirt and in a brown color.”

—TOGETHER FOR A BETTER TOMORROW PROMOTORA



PROJECT EXPANSION


Expanding the program across additional counties in South Texas is a critical next step to address the region's diverse environmental and public health challenges.

A broader geographical reach will enable engagement with a wider range of communities, including those that rely on various water sources such as well systems, watermills, and municipal supplies. This expansion will provide a more comprehensive understanding of water quality issues and the unique vulnerabilities faced by different populations.

There is also a pressing need to investigate potential sources of water contamination through soil sampling. Identifying contaminants in the soil is vital, as they can infiltrate groundwater and exacerbate water quality problems. This expansion should include a broader range of chemicals of concern, such as polycyclic aromatic hydrocarbons (PAHs) and indicators of septic and sewage infiltration. These efforts will allow for a deeper understanding of how environmental factors contribute to contamination and provide critical data for mitigation strategies.

Furthermore, the program should include an expanded assessment of health conditions within these communities. By increasing the scope and scale of health evaluations, the program can better understand the relationships between environmental exposures and public health outcomes. This includes addressing under-reported health concerns and capturing a more diverse array of health data to inform targeted interventions.

Expanding geographically, chemically, and diagnostically will enhance the program's impact, ensuring it addresses the interconnected environmental and health challenges faced by South Texas communities.



"I AM GRATEFUL TO YOU FOR YOUR STUDIES: they are very important to me since I have children at home, and I like that you take them into account and help us to know more about water. I would like to ask for continuity because **more people need to know more about water** and to know things about it. Thank you for the filter and the pitcher, it helps me and my family a lot. Thank you very much in advance, not only from me but from my family."

—ALAMO PARTICIPANT



CORPORATE HEADQUARTERS

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TEXAS A&M UNIVERSITY

School of Public Health

TOGETHER FOR A BETTER TOMORROW

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