# The Be Well Study:
## *Creating treatment decision-making materials for well water contaminated with arsenic, nitrate, or lead*

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Oregon State University

# What is the Be Well Study?

- A 4-year, $1.45 million grant from the National Institute of Environmental Health Sciences (NIEHS) to develop and test a well water treatment decision program for private well owners in Jackson County, Oregon

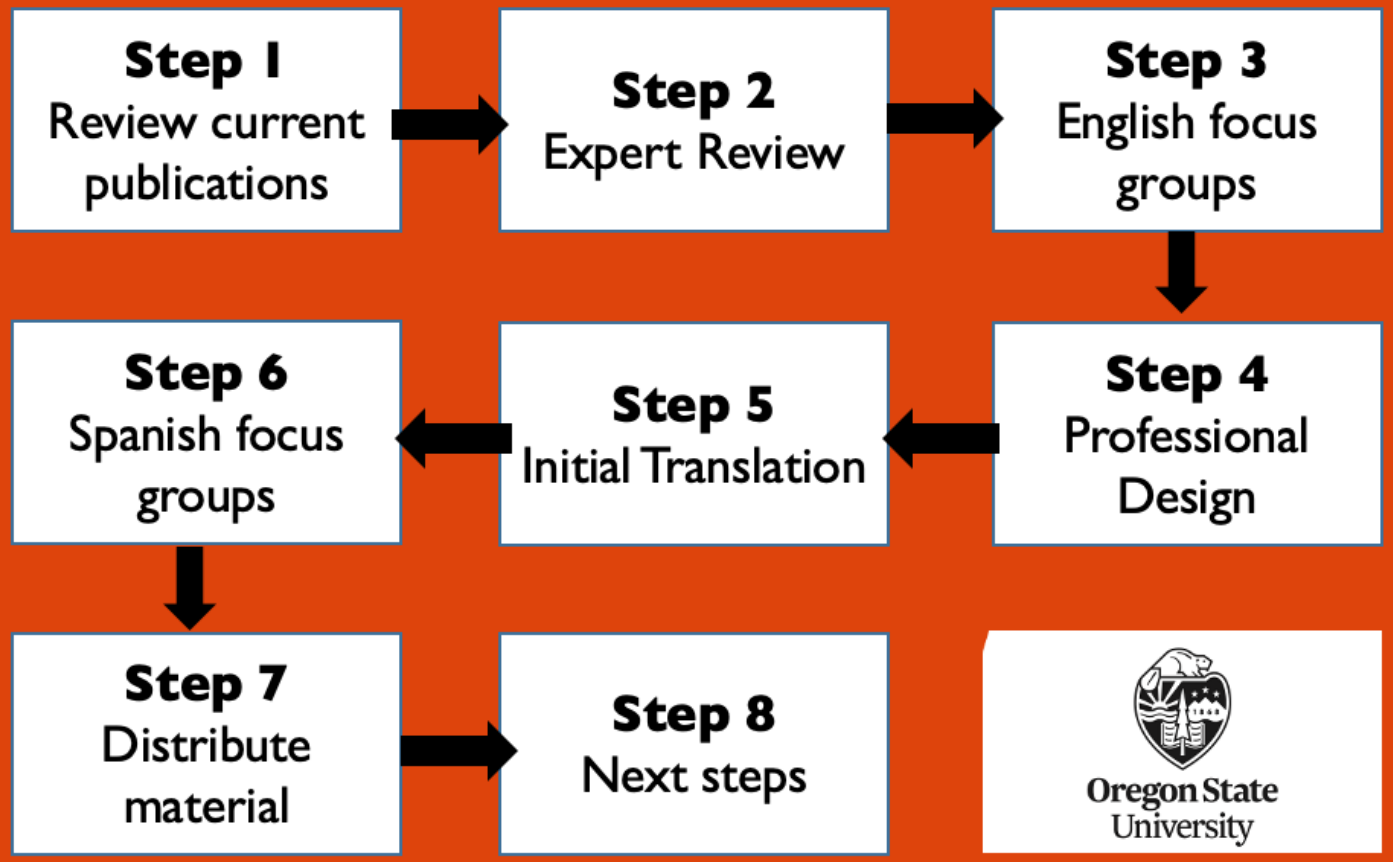
- Pilot project funded by OHSU Knight Cancer Institute, Community Partnership Program, a grant program that supports communities across Oregon in addressing local cancer-related needs

# Study Overview

- 34 million Americans rely on unregulated private wells for drinking water.
  - Many of these wells have toxic chemicals (arsenic, nitrate, lead, etc.) present in concentrations exceeding health standards for public water.
- No comprehensive material available for water treatment decision-making.
- We conducted qualitative research methods to develop *risk communication material* in order to increase well water testing and treatment.
- This material is being integrated into our RCT, The Be Well Study

**Goal:** Create extended messaging material about the water contaminants lead, arsenic, and nitrate.
**Material will have an overview of exposures, health effects, prevention tips, and water treatment options.**

# Material Development Steps



# Step 1: Review Current Publications

- *Goal: Find existing materials in the field.*
- Reviewed key dissemination sites for current materials for the community
  - Have previous groups created water-testing materials?
  - What water contamination material already exists?
  - How effective are the existing materials
- Key Takeaways from Existing Publications:
  - Information was frequently inconsistent and out of date
  - Information on contaminants, their health effects, and appropriate treatment was all housed in different materials
  - Limited information on treatment

# Step 2: Expert Review

- *Goal: improve contaminant guides through expert feedback*
- Experts reviewed the contamination guides
  - Expert reviewers included: Oregon DEQ, OHA, EPA, and multiple county health departments
  - Reviews focused on health aspects and levels of concern  for each contaminant and how contaminants enter our water sources
- Key Takeaways from Expert Review
  - Change the health effects pages to reflect additional demographics
  - Modify contaminant action steps and treatment options
  - Confirm risk levels based upon contaminant levels were accurate

# Step 3: English Language Focus Groups

- *Goal: Improve contaminant guides through community advice, impressions, and general feedback.*
  - Our focus groups were unique because themes were pre-developed before participants gave feedback
- Participants were recruited from across the state, with a concentration on OSU and Oregon State Grange list serves
  - We conducted 5 separate focus groups
- Contaminant guides were reviewed, then interviews were conducted for feedback
- Participants evaluated three education materials on lead, arsenic, and nitrate for the following:
  - What information was new, stale and missing
  - Was the material suitable, did it feel like it was for them?
  - Understandability-written in plain language

# Step 4: Basic Design to Professional Design

- *Goal: create contaminant guides that can provide easy to understand information using linguistic and culturally-appropriate images and language.*
- Graphic designer used icons and images to convey important scientific and health information and risks
- Key Takeaways from graphic design help
  - Need visual representations of complex ideas and processes
  - Images helped to support text heavy information
  - Importance of variety of types of images

# Health Effects, Before and After

## ARSENIC HEALTH EFFECTS

Damage from chronic exposure to arsenic builds up over time and can lead to many health conditions

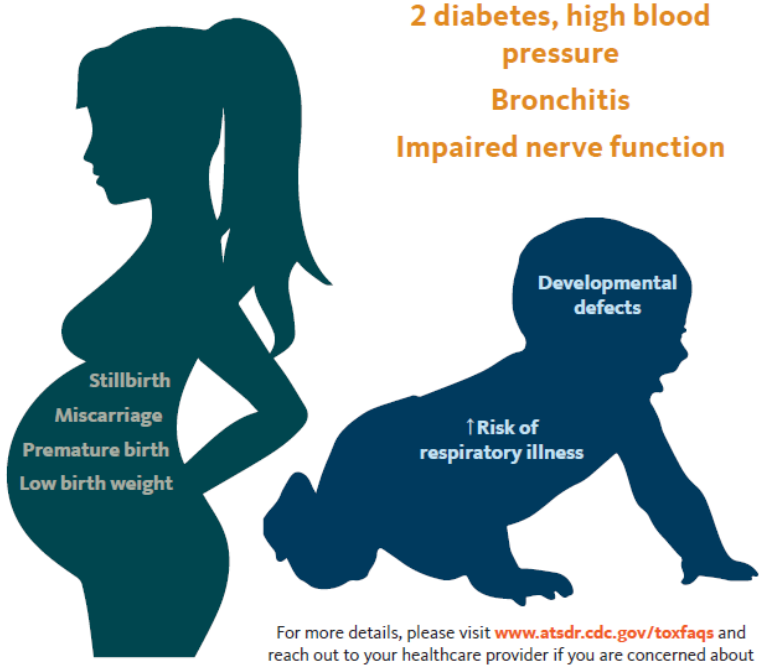
**Skin lesions, discoloration, abnormalities**

**Cancer of the skin, liver, bladder, kidney, lungs**

**Heart attack, stroke, type 2 diabetes, high blood pressure**

**Bronchitis**

**Impaired nerve function**

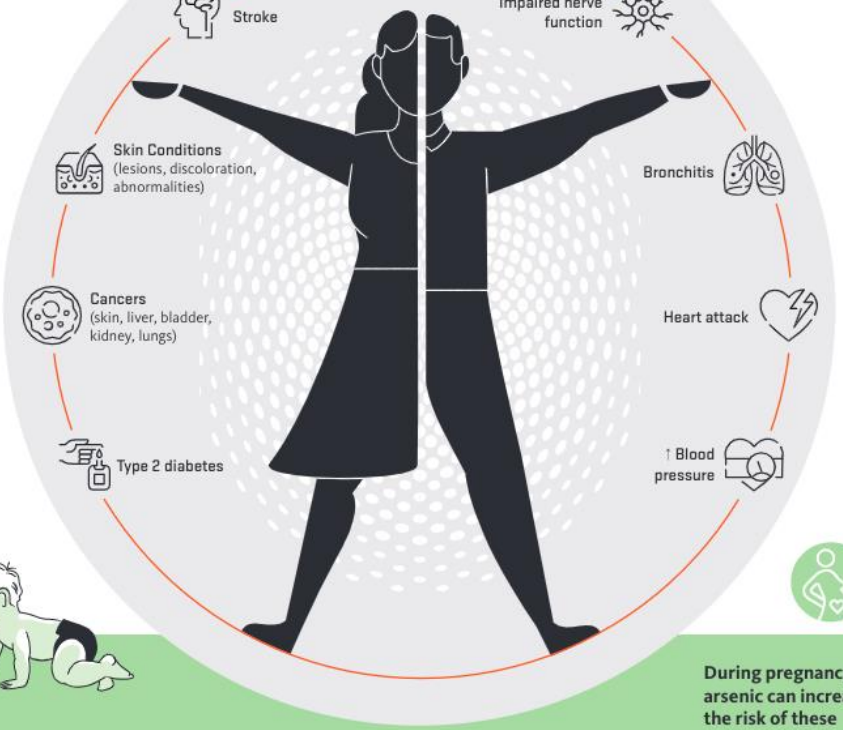



For more details, please visit www.atsdr.cdc.gov/toxfaqs and reach out to your healthcare provider if you are concerned about arsenic exposure.

***BEFORE***

What are the most common health effects linked to drinking water contaminated with arsenic?

For more details, please visit **atsdr.cdc.gov/toxfaqs** and reach out to your healthcare provider if you are concerned about arsenic exposure.




**Arsenic can increase the risk of these health conditions in children:**

- Developmental defects
- Risk of respiratory illness

**During pregnancy, arsenic can increase the risk of these health conditions:**

- Stillbirth
- Miscarriage
- Premature birth
- Low birth weight

***AFTER***

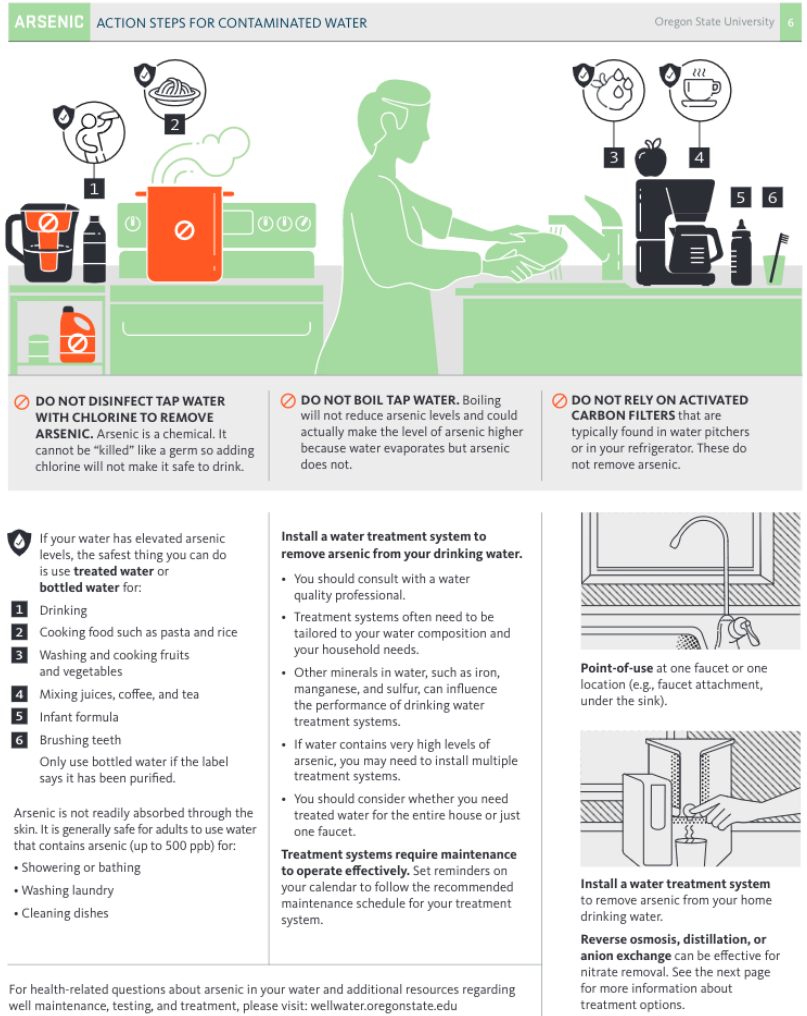
# Action Steps, Before and After

## ARSENIC ACTION STEPS FOR CONTAMINATED WATER

| | | |
|---|---|---|
| 1 | The safest thing to do is to **use treated water (see next page) or bottled water** from a reputable US water supplier that states that the water been treated and purified for:<br>• Drinking<br>• Cooking food such as pasta and rice<br>• Washing and cooking fruits and vegetables<br>• Preparing drinks such as coffee, tea, and lemonade | Arsenic does not readily get absorbed through the skin. It is generally safe (unless there are young children in the house) to use tap water with high arsenic levels (up to 500 ppb) for uses where water is not ingested, including:<br>• Showering or bathing<br>• Washing laundry<br>• Cleaning dishes<br><br>Supervise children to ensure they do not swallow water while bathing, brushing teeth, etc. |
| | • **DO NOT BOIL** tap water. Boiling will not reduce arsenic levels and could actually make the level of arsenic slightly higher because some of the water will evaporate but the arsenic will not.<br>• **DO NOT RELY ON ACTIVATED CARBON FILTERS**, such as those typically found in a water pitcher or on your refrigerator. These do not remove arsenic.<br>• **DO NOT DISINFECT** tap water with chlorine. Arsenic is a chemical, not a germ that can be "killed," so disinfecting your water will not make it safe to drink. | |
| 2 | **Install a water treatment system** to remove arsenic from your home drinking water. It is important to consult with a water quality company to identify the correct water treatment system for your house. Other minerals in the water can influence the performance of drinking water systems. For example, the presence of iron or manganese could hinder the effectiveness of arsenic removal.<br><br>Therefore, you may need a pre-treatment system to remove these minerals prior to treating the water for arsenic. Some treatment equipment may not be effective if arsenic levels are very high. See the the next page for more information about treatment options. | |
| 3 | Treatment systems require careful maintenance for effective operation. If a treatment system is installed, **test your treated water for arsenic every year** to ensure it is working correctly. Test untreated water (pre-treatment unit) at least every 3 years. | |

**For health-related questions about arsenic in your water and additional resources regarding well maintenance, testing, and treatment, please visit wellwater.oregonstate.edu**

***BEFORE***




***AFTER***

# Treatment Options, Before and After

## ARSENIC TREATMENT OPTIONS

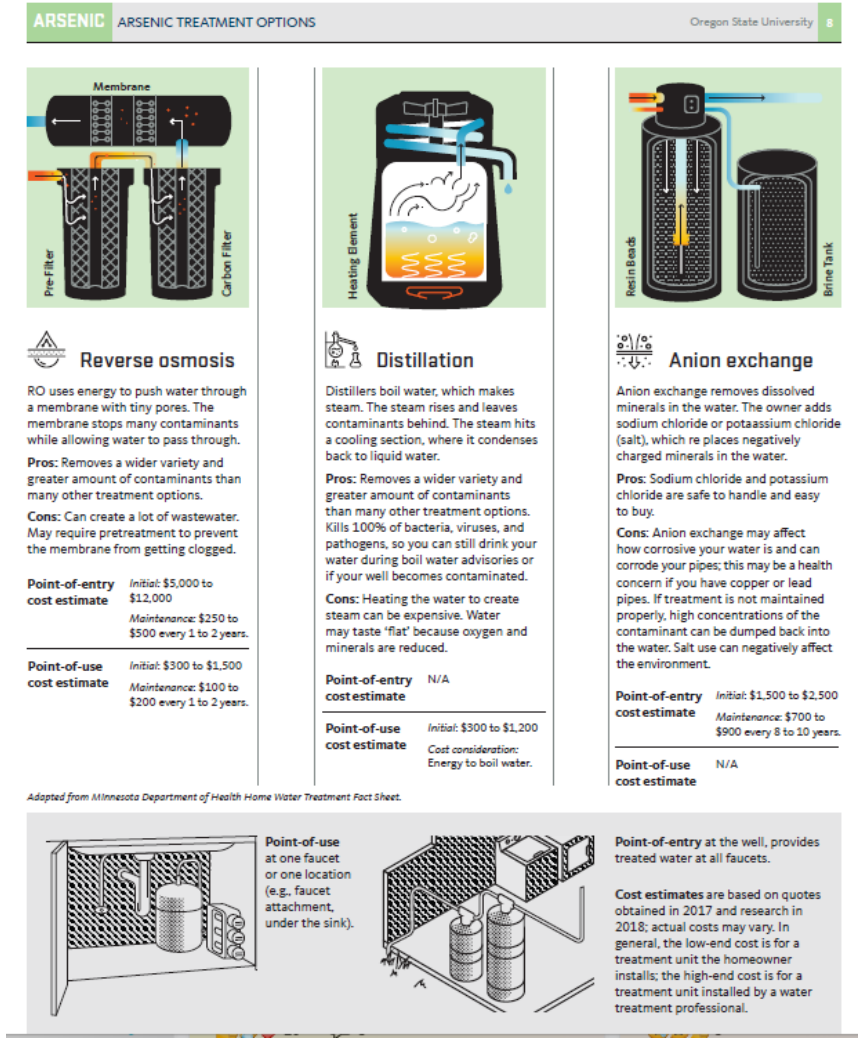
| Treatment System | Description | Pros and cons | Point-of-use [1] cost[3] estimate | Point-of-entry[2] cost[3] estimate |
|---|---|---|---|---|
| **Reverse osmosis (RO)** | RO uses energy to push water through a membrane with tiny pores. The membrane stops many contaminants while allowing water to pass through. | **Pros**: Removes a wider variety and greater amount of contaminants than many other treatment options.<br><br>**Cons**: Can create a lot of wastewater. May require pretreatment to prevent the membrane from getting clogged. | *Initial*: $300 to $1,500<br><br>*Maintenance*: $100 to $200 every 1 to 2 years | *Initial*: $5,000 to $12,000<br><br>*Maintenance*: $250 to $500 every 1 to 2 years |
| **Distillation** | Distillers boil water, which makes steam. The steam rises and leaves contaminants behind. The steam hits a cooling section, where it condenses back to liquid water. | **Pros**: Removes a wider variety and greater amount of contaminants than many other treatment options. Kills 100% of bacteria, viruses, and pathogens, so you can still drink your water during boil water advisories or if your well becomes contaminated.<br><br>**Cons**: Heating the water to create steam can be expensive. Water may taste 'flat' because oxygen and minerals are reduced. | *Initial*: $300 to $1,200<br><br>*Cost consideration*: Energy cost to boil water. | N/A[4] |
| **Anion exchange** | Anion exchange removes dissolved minerals in the water. The owner adds sodium chloride or potassium chloride (salt), which replaces negatively charged minerals in the water. | **Pros**: Sodium chloride and potassium chloride are safe to handle and easy to buy.<br><br>**Cons**: Anion exchange may affect how corrosive your water is and can corrode your pipes; this may be a health concern if you have copper or lead pipes. If treatment is not maintained properly, high concentrations of the contaminant can be dumped back into the water. Salt use can negatively affect the environment. | N/A[4] | *Initial*: $1,500 to $2,500<br><br>*Maintenance*: $700 to $900 every 8 to 10 years |
| **Adsorptive media filtration** | A charged media bed causes ions of the opposite charge (contaminants) to be pulled out of the water and attach to the media. | **Pros**: Produces very little wastewater. Does not require adding chemicals to the water.<br><br>**Cons**: Treatment effectiveness may depend on the pH of the water. | *Initial*: $300 to $700<br><br>*Maintenance*: $300 to $500 every 6 to 12 months | *Initial*: $2,400 to $4,500<br><br>*Maintenance*: $700 to $900 every year |

1 **Point-of-use** = at one faucet or one location (e.g., pour-through pitchers, faucet attachment, under the sink, refrigerator water dispenser)

2 **Point of entry** = at the well, provides treated water at all faucets

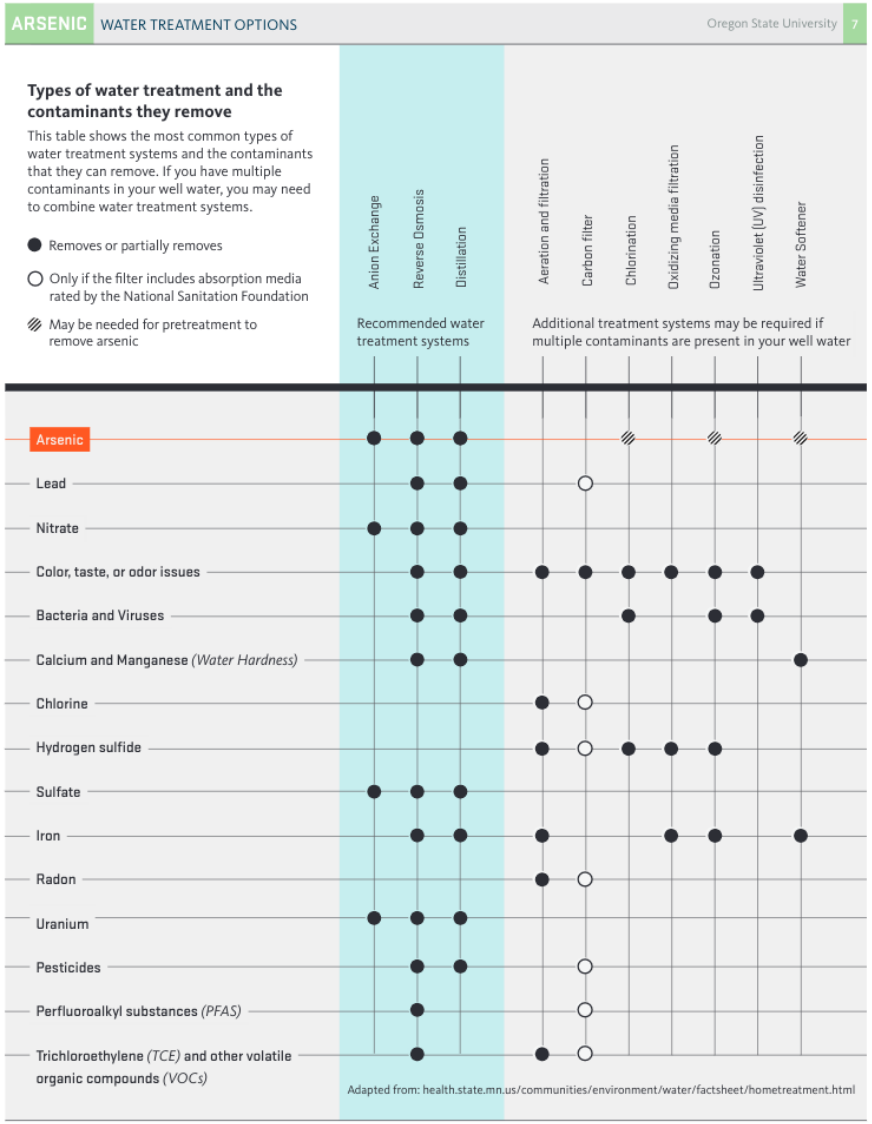
3 Point-of-use and point-of-entry cost estimates are based on quotes obtained in 2017 and research in 2018; actual costs may vary. In general, the low-end cost is for a treatment unit the homeowner installs; the high-end cost is for a treatment unit installed by a water treatment professional.

**BEFORE**




**AFTER**

# Treatment Options (New Requested Materials)



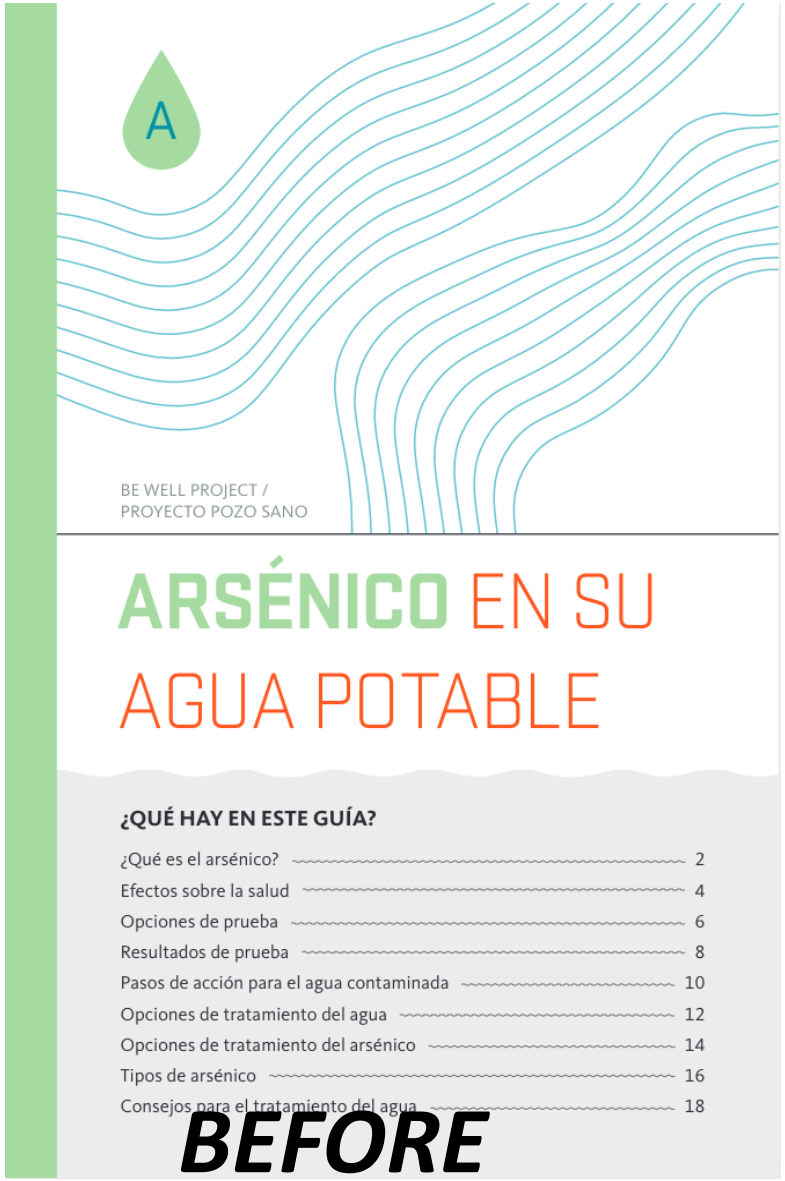
# Step 5: Initial Translation

- *Goal: Adapt English language materials to Spanish*
  - Contaminant guides were first translated to Spanish for wider accessibility
- *Adaptation,* not just *translation,* was emphasized.
  - Community feedback focused on cultural awareness to enhance the contaminant guides.

# Step 6: Spanish Language Focus Groups

- Goal: *Improve adapted contaminant guides based on community feedback*
- Participants in focus groups were recruited from OSU Extension and PCUN list serves, Corvallis y Albany Eventos e Información list serves, Radio Poder interview with our Spanish Focus Group facilitator,  tabling at El Día de Niño at the Woodburn School District.
  - We conducted 1 separate focus group with two participants
- Changes made to the Spanish contaminant guides based on community feedback:
  - Add culturally appropriate images of multigenerational household members and images that normalize water quality conversations
  - Change specific phrases to use terms more widely recognized
  - Add labels, “low, high and dangerous” to images with arrows to indicate risk (don’t rely on color shading to indicate severity)

# Spanish adaptions: Before and After Cover

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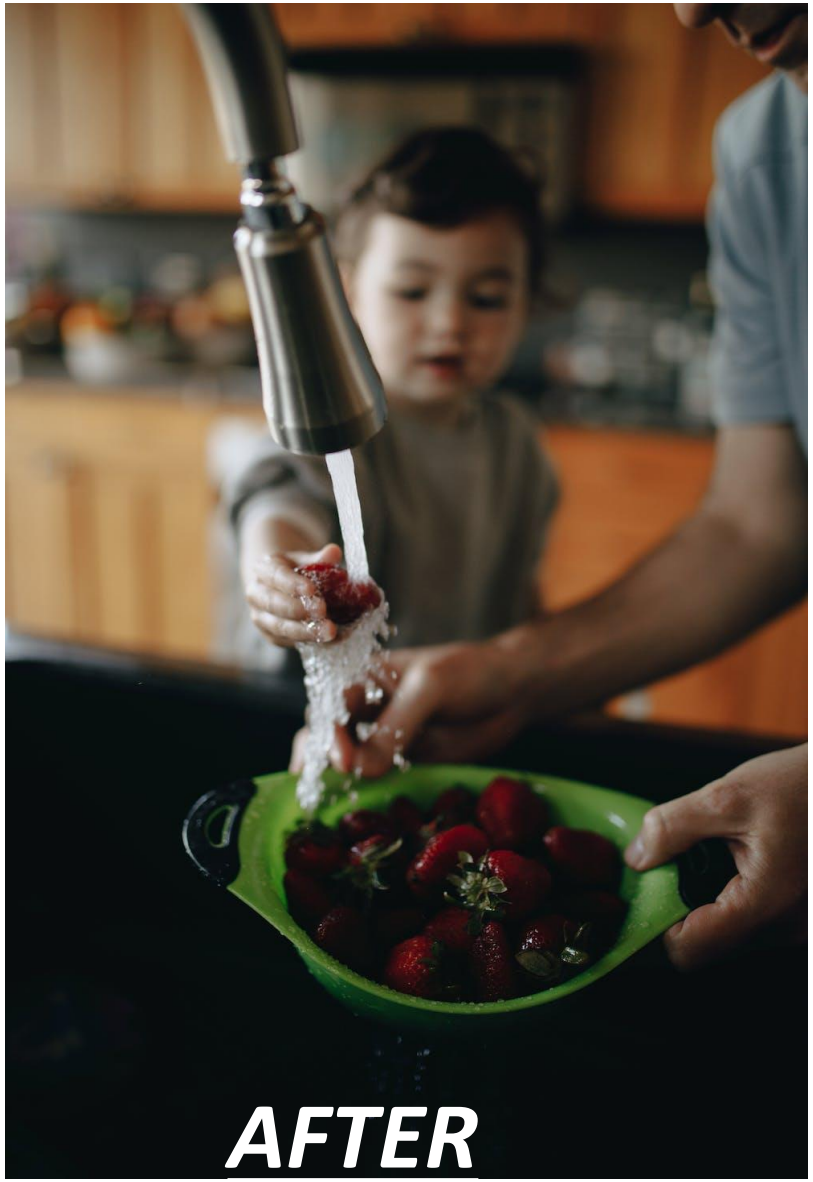
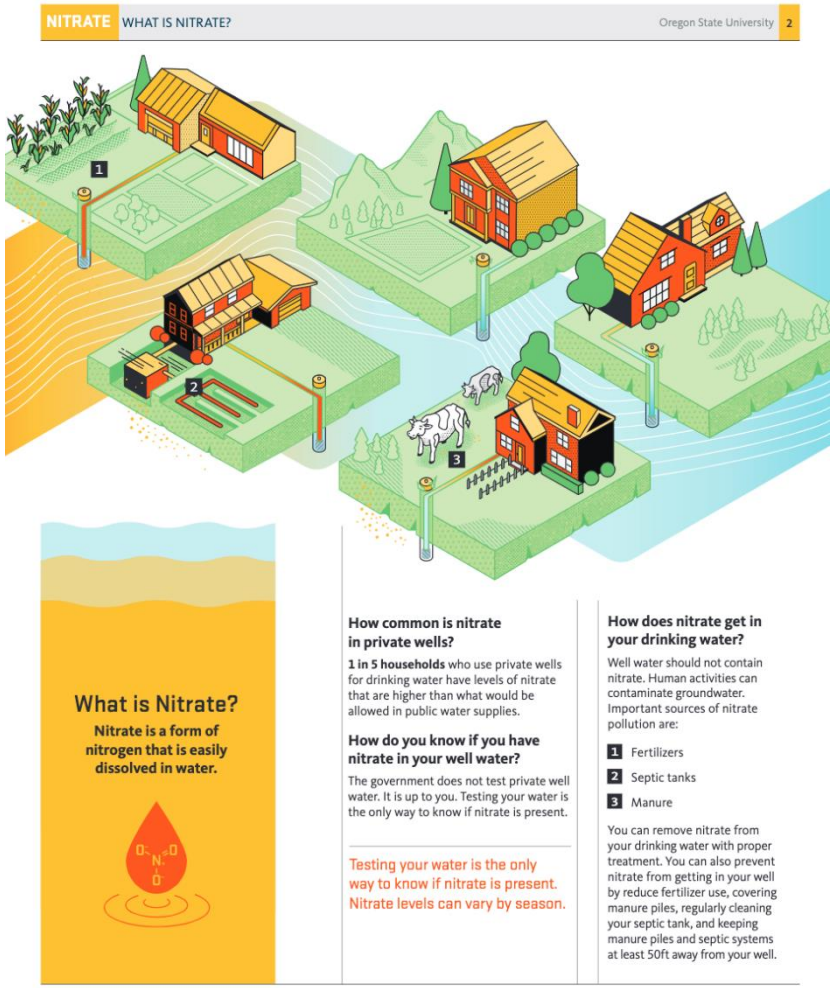


**AFTER**

# Spanish Adaptions: Additional Photo Additions


# Step 7: Distribute Final Product (In-Progress)

- *Contaminate guides are being made publicly available*
  - Distribution to all Spanish and English households entering the study
  - Future plans also include posting on:
    - OHA Domestic Well Safety Program website
      https://www.Oregon.gov/oha/PH/HealthyEnvironments/Drinkingwater/SourceWater/DomesticWellSafety/Pages/index.aspx
    - OSU Well Water Program website
      https://wellwater.oregonstate.edu
    - OSU Extension Catalog (in vetting process)
      https://catalog.extension.oregonstate.edu/



# Next Steps

- Analyze online survey with well owners to get additional feedback and suggestions
- Post materials online for general use
- Publish methods in Journal of Extension
- Investigate alternative modes of delivery
  - Spanish language audio and video inserts
  - Developing a mobile app
  - Develop a workbook for children to encourage multigenerational learning opportunities
  - Develop partnerships with 4H and other youth groups to increase environmental hazard education opportunities for young audiences

# Thank you!  Questions?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