The Face-to-Face Questionnaire is Complete

With this newsletter our team is pleased to announce that we have completed administering the household survey questionnaire component of the Eastern Coachella Valley Environmental Justice Data project. That study used face-to-face interviews and represents 1824 Survey respondents from 685 households in the communities of Oasis, Thermal, Mecca, North Shore and Coachella city. That was a huge task to complete and we are grateful for all of the promotoras, community partners, LLU students and the gracious households for allowing us to ask detailed questions about their life. The field survey questionnaire is finished, but there is still plenty of work on cleaning and analysis of the data and work to complete this project’s sub studies.

The Environmental Assessment

The household hygiene environmental assessment successfully gathered data from all housing types across the five study areas. The assessment was an add-on to the survey questionnaire and required the participant to allow an assessment team to take environmental measurements within the home on air quality (PM$_{1.0}$), surface hygiene (ATP swab), home temperature (IR temperature for delta T), water testing for microbial contamination (ATP test), Water testing for Arsenic test (HACH portable low range arsenic kit), mold (ERMI assessment) and a dust measurement using a black light. The team also collected several observations on the household hygiene and crowding with a structured assessment tool based on other farm worker assessments. It was a unique assessment with immediate feedback to the household, avoiding laboratory measurements. Despite the opportunity, many survey questionnaire participants did not agree to have the environmental assessment portion of the survey to be administered. Fortunately, over 170 households did agree which allows this assessment to compare the self-reported health findings with environmental variables across the many housing types and other environmental variables.

This difficulty in administering the household hygiene environmental assessment allowed the project to re-assess its purpose and opportunity. The 2015 interim project stakeholder meeting motivated the environmental team to focus on a few detailed sub-studies that were high priorities for the stakeholders. We responded to stakeholder concerns with data about specific addressable problems.
Community Requested Data

As we managed the household surveys we had formal and informal feedback processes from community members and partner advocates. This allowed us to share interim results and preliminary hypotheses with stakeholders. That process allowed us to continuously address feedback about additional data needs to be used to advocate for the quality-of-life issues in the ECV. Many stakeholders asked about the indoor mold topic and the water topic. Others brought up community concerns that were initially voiced during the preliminary project scoping meetings in 2014. One of those was the need for outdoor air quality sensors. We addressed the community feedback with four additional sub studies to address questions about outdoor air quality, drinking water vending machines and on-site wastewater management.

Sub-Study #1: Drinking Water Vending Machines

The household hygiene assessment allowed community members and surveyors immediate feedback from real-time measurements of bacterial contamination in drinking water. Our field surveyors used this sensor to test drinking water from the tap, the water cooler 5-gallon jug, a filter source or other source of drinking water in the household. Our survey questionnaire informed us that many households used 5-gallon jugs on a water cooler dispenser for their primary source of drinking water. They report to fill the 5-gallon jug at a water vending machine or a water store. Fewer households used a commercial water delivery service for their drinking water. The ATP test allowed us to find more evidence suggesting microbial contamination in self-filled 5-gallon jugs. Stakeholders were interested in this finding; we added a field assessment to test a hypothesis about the water vending machines and water stores. We want to know if the contamination is a result of the vending machine water or poor cleaning of the 5-gallon jugs. This topic highlights many other concerns about access to safe drinking water.

Progress: Our team mapped and photographed all water vending machines in the ECV. We found most of them are clustered in Coachella City with a few in the stores around Mecca. Our spigot photographs on the water vending machines found that over half of them had microbial contamination in self-filled 5-gallon jugs.
some rust, indicating poor maintenance. Our team was unable to find a date of service or other evidence of maintenance on most machines.

**Method:** While conducting the field assessment, our team had assembled and validated a research workflow for microbiological evaluation of the vending machines and other water sources in households. We contacted the federal USEPA (MERL) Microbial Exposure Research Laboratory for assistance on how to collect these unique environmental samples. They suggested a filter and pump setup that will collect bacteria and viruses from water. We configured and adapted the USEPA method for our studies sample requirement. The benefit of using a filter sampling method is that many more liters of water can be sampled and it is not necessary to transport bulk water samples back to the laboratory. This will allow us to sample hundreds of liters of water instead of the traditional 0.1 Liter of water for analysis. The USEPA and other expert environmental microbiologists also suggested a panel of microorganisms with a high likelihood of finding in contaminated vending machine water. The sampling process will take place in January and February and be in line with a doctoral student who is required to finish the project before April.

**External Support and Funding:** The Metropolitan Water District (MWD) of Southern California was also interested in funding a doctoral student to pursue this topic. An LLU doctoral student, Mr. Thomas Hile, obtained $10,000 to purchase student laboratory time, travel and supplies to fund this initiative. The MWD funding requires a project completion and presentation by April of 2016.

**Sub Study #2: Mold Assessment**
Another community concern/hypothesis that we targeted is small children’s exposure to contaminants that could cause or exacerbate asthma. The community is strongly concerned about asthma and its potential linkage to the unregulated dumpsites and poor outdoor air quality. Responding to outdoor air quality concerns is addressed in another sub-study. Our environmental assessment team investigated indoor air quality in the four house types and
found that many have excessive mold contamination. We are currently in the analysis phase, but preliminary results show that the older mobile home house types in Coachella City and Thermal had high concentrations with modern houses having the lowest concentrations of mold.

External Support and Funding: The USEPA Microbial Exposure Research Laboratory’s Dr. Stephen Vesper agreed to process samples from our 5 communities. Their laboratory has processed 120 samples from the Eastern Coachella Valley without charge. Those 120 samples would normally cost $285 per sample at the EPA recommended commercial laboratory; representing a total of $34,200.

Sub Study #3: Septic System Risk Assessment

A chronic public health problem identified by our group in 2013 was the wide occurrence of failing on-site septic systems. Our survey questionnaire has a data topic addressing this and it is well known that the water district’s sanitary sewer does not connect to many rural homes in the Eastern Coachella Valley.

We are addressing the community concern of this by collecting additional sewage samples to precisely identify the pathogen hazard to children who live close to these failures. We have collected 20 samples from three mobile home park locations where we found human fecal indicator pathogens such as *Salmonella* and *Listeria*.

The work is ongoing and a genetic test is now used to test that the samples collected are specific human health hazards. We are working to validate these results and refine our microbial risk assessment from data gathered during the survey questionnaire. The results of this work will be to publish this finding in a peer-reviewed journal and develop a policy brief about the seriousness of this problem and the health risks to children. This information will be used to advocate for improved on-site wastewater systems in the many rural mobile home parks and off-grid communities in the Eastern Coachella Valley.
Sub Study #4: Outdoor Air Quality Sensor Network

An ongoing community concern in the ECV is for a better network of air sensors that could serve community’s ongoing requests for dust and air contaminant monitoring. This type of technology and data is rapidly advancing and there are now tools to measure outdoor air quality in real time using community-hosted sensors. The goal is to provide the community with localized air quality information that can help them gauge the outdoor air quality as they go throughout the day. This will allow (1) parents to determine if it is safe for their asthmatic children to play or participate in recess activities at school, (2) geolocating hotspots for poor air quality that may be linked with industry or the Salton Sea issues.

During the winter of 2015, our LLU team of students began developing a system that uses a laser based particulate sensor to upload real-time air quality measurements. Our system successfully uploaded air quality data to the internet every 30 seconds. The system was located at PUCDC’s San Jose Community Center in Oasis and had one month of air quality data streaming to the internet. We used ideas from the IVAN sensor setup in Imperial county and adapted our own design to make this sensor v0.1 function. The system was a prototype with a cost of about $500. It wasn’t expected to last for an entire month and we were pleased that it did.

After this experience, we were fortunate to find an already assembled and functioning laser based system with a reasonable price. The purpleair.org system is maintained by a hardware engineer in Utah to address a nearby gravel pit dust issue. The purpleair sensor design is functioning well and the South Coast AQMD recently conducted an evaluation on the sensor. The SCAQMD found the sensor to be an excellent approximation for the regulatory sensors and recommends that it is deployed for citizen science air monitoring. The purpleair company provides sensors to non-profit groups for a discounted price of $120.

The uses and results of this system can have an immediate impact on communities as they are now able to monitor outdoor air quality in their neighborhoods. A long-term output is to analyze the data stream coming from the sensors to forecast potential health risks to certain vulnerable groups. Our team is currently looking for hosts of the sensor with an immediate project goal to place sensors in all five ECV communities. Potential hosts could be schools, community centers or private homes. We currently have 4 sensors deployed and are planning to have another 10 deployed in the first quarter of 2017. See current data here: https://goo.gl/gEr0Ec or search at purpleair.org.