

Dissertation Defense

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“Survey of Drinking Water Quality and Health in Alabama's Black Belt”

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Abstract -Worldwide, approximately 768 million people drink unsafe water, which is potentially contaminated by the 2.5 billion people without sanitation facilities. The need for basic services such as safe drinking water and effective waste treatment in underserved and un-served human populations is usually associated with developing countries, but poor, rural areas of the US with small populations are also at risk.

The majority of US public water systems serve small populations, creating unique financial, operational, and infrastructure sustainability challenges that limit the ability of the system to provide drinking water that meets current Environmental Protection Agency standards. Small water systems in Alabama’s rural Black Belt face these challenges, with potential impacts on the health of the consumers. To investigate drinking water quality in this region, a cross sectional pilot study of 305 households using both private wells and county public supply in a rural Alabama county was initiated. Results found a substantial number of water samples were positive for fecal coliforms and members of households with positive samples were more likely to experience illness. These data suggested that access to safe water may be limited in this area, putting residents at risk for illness.

To test hypotheses generated in the pilot study, the research area was expanded to include 910 households in 3 counties representing 14 water systems. At each household, water samples and measurements were taken, and a survey was completed. Consumer-reported data were found to be of limited utility in predicting potential microbiological risks, although consumer feedback on low pressure—a risk factor for contamination—may be relatively reliable and therefore useful in future monitoring efforts. Also, poor water service delivery and aesthetic characteristics were shown to be good indicators for reported gastrointestinal illness.

To examine the water quality at the system level, large volume water samples were taken from 12 water systems across the same 3 counties. Within each system, 10 sample locations were chosen and sampled at 3 different time points. Overall, sample collection location within the distribution system proved to have minimal effects on water quality suggesting that time and possibly seasonality were potential indicators of water quality and contamination events.

It was concluded that for the study area wastewater containment at the household level, and water quality at the household and system level were both found to be substandard. However, regulation of household wastewater is a required prerequisite to improving water quality in the Black belt of rural Alabama.