

United Nation's Sustainable Development Goal 6 emphasizes universal accessibility and affordability of drinking water, yet many in the developing world lack this basic right. Challenges in the provision of drinking water due to supply-side constraints and corruption lead to inadequate piped infrastructure and intermittent water supplies, especially in low-income communities (Beard & Mitlin, 2021). With no or restricted access to piped water, people look for other alternative sources of water.

The urban water market in Karachi, Pakistan, exemplifies this struggle. 17% of the population depends on informal water vendors including big tankers, small carts, and motor bikes for their water supply (UNICEF, 2018). This dependence intensifies in towns such as Orangi, Korangi, Lyari and Malir that are entirely cut off from the piped water system and where informal water vendors are the only source of clean drinking water. Although these vendors play a crucial role in undoing allocative inefficiencies present in the system by supplying water to households unconnected to piped infrastructure, the city's government maintains a strict stance against these informal water vendors and has frequently enforced actions to shut down their operations (KWSB, 2023). Such actions, with no expansion in piped water infrastructure, have often left these unconnected neighborhoods without water or forced the residents to consume unsafe water (Express Tribune, 2017).

Introducing uninformed policies that fail to understand the true consequences of the informal water vendors has proven to adversely impact consumers' economic, physical and mental well-being. This indicates the need for evidence-backed policymaking that fully accounts for the role that these vendors play in the supply of drinking water. Unfortunately, there is a dearth of research that attempts to do so. With this proposed research, I hope to bridge the gap in the literature by formally quantifying the welfare effects of the presence of informal water vendors in markets without complete access to piped water delivery and by simulating how these effects vary across different policy alternatives.

To shed light on dynamics of such a complex market, I require data that provides detailed information on water consumption and expenditures for households in an urban water market with both formal and informal vendors. Currently, no such dataset exists that showcases the institutional and behavioral complexities of this market. By collaborating with a professor leading the Karachi Water Project funded by Habib University (KWP, 2024), I will implement a novel survey instrument that captures intricate decision-making dynamics within households in Karachi, when faced with both formal and informal water sources. The survey will do so by obtaining information on variables such as prices, preferences, and consumption from different water sources along with households' socio-economic demographics. Funding secured from the Agricultural, Food and Resource Department at Michigan State University will support the initial implementation of the survey effort. If awarded the short-term grant, additional funds will be used to expand the scale of the survey effort and support the use of a more rigorous water diary-based approach.

Data gathered from the survey effort will be employed to parameterize a structural models of household demand for formal and informal water sources. Estimation of these water demand models based in utility maximization theory will yield elasticity estimates that will facilitate welfare analysis. Consumer surplus, the economic measure of welfare, will be estimated for households participating in Karachi's water market under status quo and under a wide range of policy alternatives. For instance, a policy intervention targeting complete elimination of informal water supplies will be simulated and changes in the consumers' surplus will be traced. Instead of working with an aggregated measure of consumer surplus for entire survey population, the results will focus on tracking changes in consumer surplus across different income groups. Such an approach will yield findings that would assist in development of policies targeted towards low-income communities, who disproportionately bear the burden of intermittent water supplies and inadequate piped infrastructure.