

Willingness to Pay for Cleaner Water in Less Developed Countries: Rigorous Evidence and Directions for Future Research

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Introduction

- Public health/epidemiological research concentrates on efficacy of various diarrhea prevention measures
 - Water quality
 - Water quantity
 - Hygiene (hand-washing)
 - Sanitation (latrines)
- In practice, the impact of technologies depends on consumers' willingness to use them
 - White & Gunnarsson (2008): efficacy studies that generate high usage rates with resource-intensive interventions do not provide actionable guidance to policy-makers

Focus of this Review

- Willingness to pay for cleaner water in less developed countries
 - Limit to technologies that affect water quality but not water quantity (primarily point-of-use)
- Rigorous evidence
 - Randomized prices
 - Real purchase decisions
 - Objective measures of use

Background

- Historically, more emphasis on WTP for infrastructure rather than point-of-use technologies
- Led to reliance on contingent valuation methods
 - Policy makers need to know if investments will be valued by constituents *ex ante*
- Many concerns about accuracy of stated preferences in hypothetical situations
 - Before the investment in infrastructure is made, users might not know how much they will value it *ex post*
 - Difficult to prevent strategic behavior
 - Implementation problems (Whittington, 2002)
- Discrete choice analysis based on cross-sectional variation avoids some of these problems but has other weaknesses

Experimental Methods

- Easier to design revealed preference studies of point-of-use technologies than large infrastructure
- Each time water is collected, new decision of whether or not to use
- Can vary cost of use and infer willingness to pay
 - Straightforward for point-of-use technologies that get used up (e.g. chlorine, PUR)
 - For durables (filters) more complicated because of potential credit constraints but still possible
 - Costs might involve monetary, time, effort, or some combination of these

Search Methods

- Searched databases
- Accessed papers on efficacy studies
- Contacted researchers
- Cross-checked bibliographies

Database Search Methods

Databases	Search Terms
Cochrane Library, Google Scholar, IDEAS, LILACs, Medline, PubMed, Web of Science	ONE OF: clean water, drinking water, clean drinking water, drinking water quality AND ONE OF: willingness to pay, willingness-to-pay, valuation, demand

Less-developed countries as defined by the World Bank's list of low- and middle-income countries

Search Results

- Database search found 407 papers of which:
 - Most excluded on basis of country income or irrelevant content
 - 5 we are still trying to obtain
 - 16 unique citations appeared relevant for the review
 - 3 excluded as piped water studies
 - 12 used contingent valuation
 - 1 was discrete choice
- Efficacy studies
 - 5 papers using contingent valuation
 - 1 experimental study
- Experimental studies
 - 3 working papers
 - 2 projects (at least) in progress

Efficacy Studies Results

- Lots of opportunities to include willingness to pay component, but rarely done
- 1 paper with randomized price
- 5 papers mention valuation using CV methods
- Examples include:
 - Clasen et al. (2004): willingness to pay for filter < 40% of cost after 6 month study
 - Luby et al. (2008): only 5% of households had recently purchased flocculant-disinfectant 6 months after study but 93% said they would use it if it were half the price

Experimental Results

- Most of the experimental evidence on WTP is currently reported in working papers
 - Kremer et al. (2009b) : protected springs in rural Kenya
 - Ashraf et al. (2008): dilute chlorine in urban Zambia
 - Kremer et al. (2009a) : dilute chlorine in rural Kenya
- Some on-going experiments on WTP
 - Berry et al. (underway): ceramic water filters in Ghana
 - Dupas et al. (underway): dilute chlorine distributed through clinics in Kenya

Kremer et al. (2009b)

- Randomized evaluation of spring protection in rural Kenya – exogenous variation in distance to cleaner water
- Estimate willingness to pay for cleaner water using a travel cost model
 - Compare this to stated preferences using ranking and contingent valuation questions
- Results:
 - Median valuation is \$1.76 per household/year
 - State preference estimates three times as large as revealed preference method

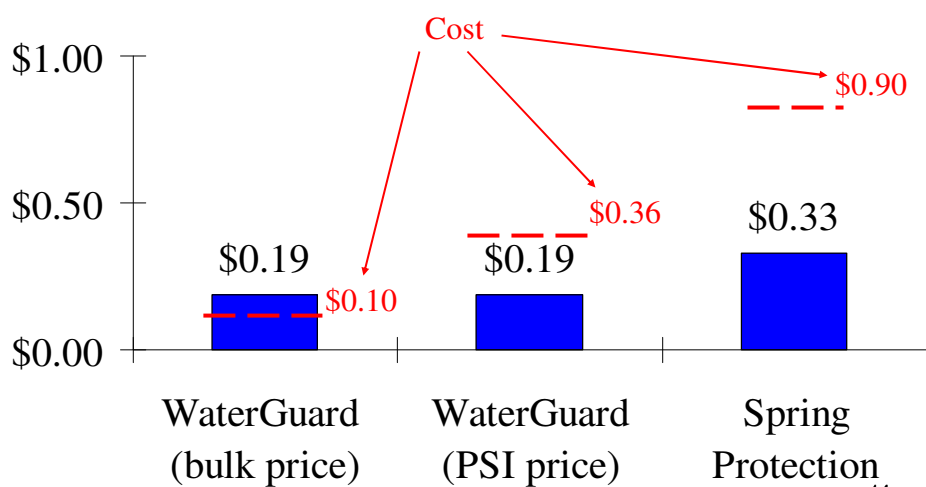
Ashraf, Berry, Shapiro (2008)

- Door-to-door marketing campaign for dilute chlorine in peri-urban Zambia
- Two-stage design separates “screening” and “sunk cost effects” of higher prices
- Results:
 - Higher prices reduce demand - as would expect
 - Households with higher willingness to pay are more likely to use (screening effect)
 - Caveat: chlorine is storable and households might use intermittently...could bias relationship between price and use
 - No evidence of sunk-cost effects or that households who paid any positive amount are more likely to use

Kremer et al. (2009a)

- Series of randomized evaluations designed to increase use of dilute chlorine in rural Kenya
 - Coupons for 50% and 100% discounts
 - Free distribution of bottles to homes
 - Free distribution via community dispensers
- Results:
 - Free distribution plus visit achieves usage rates of over 60% relative to 5-10% among comparisons
 - Very low willingness to pay based on low rates of coupon redemption with 50% discount
 - Non-price interventions such as locally-elected promoters or frequent survey visits can affect use
 - Chlorine dispenser achieves over 60% take up without HH visit

Average valuation of 1 averted case of child diarrhea versus intervention cost



Summary of Experimental Results

- Cost of water quality improvements is often > willingness to pay
 - No evidence that those who stand to benefit more from cleaner water have a higher valuation for it
- Coupons are useful data collection tool
 - Easy and cheap to implement; avoids courtesy / social desirability bias
- Several other studies currently in the field, but more will still be needed

Determinants of Willingness to Pay

- Household characteristics
 - Income, education, demographics
 - Evidence mainly from cross-sectional studies
- Context
 - Social norms, local promoters, frequent surveys
 - Starting to understand some of these better; important consideration for research design
- Information / beliefs
 - Positive correlations between valuation and recognition of relationship between water and sickness (Kremer et al. 2009a and Luby et al. 2008)
 - Causal effects based on randomized information provision campaigns (Madajewicz et al. 2007 and Jalan and Somanathan 2008)

Market Inefficiencies

- Can lead to underinvestment in water quality relative to the social optimum
- Externalities
 - Health
 - Learning
- Legal institutions

Conclusion

- Testing efficacy is the necessary first step, but willingness to pay is important in determining take-up in water quality interventions
- To date, there is a dearth of evidence
- More research needed, particularly studies that use:
 - Interdisciplinary approaches
 - Randomized prices (easily implemented with coupons)
 - Real purchase decisions
 - Objective measures of use