# Price Sensitivity of demand for arsenic testing of drinking-water wells: Evidence from Bihar, India

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**Abstract**

Groundwater contaminated with arsenic of natural origin poses a serious threat to the health of tens of millions of villagers across South and Southeast Asia. With a field experiment conducted in Bihar, this study estimates the demand for testing well water after this service was offered at difference prices in 26 villages. The test relies on a field kit and requires less than 15 min. We record that 47% households decide to purchase the test, and the demand is highly sensitive to prices. We further study whether the use of information provided after testing is sensitive to the price paid. We also estimate additional demand after a repeated round of campaign was conducted in the same villages and explore wealth and learning as potential factors. Finally, the study provides empirical evidence that households proactively try to hide bad news regarding the status of their well with respect to arsenic.

JEL Codes: O12; Q50

**Keywords:** *Health, Development, Arsenic*

## 1 Introduction

The high social benefits associated with health products – such as insecticide-treated bed nets to prevent malaria infection, or water filters to get rid of microbial pathogens – form the basis for a compelling case for providing a full subsidy in low-income settings, where willingness to pay

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is limited even for very effective health interventions (Dupas, 2014a). Yet, public provision is beset with difficulties, from slow and unreliable provision to poor targeting of the free good toward intended beneficiaries. Innovation in products and delivery is commonly stifled. Cost-sharing is often suggested as a way to reduce dependency on public programs, but has often been found to significantly affect take-up (Kremer and Miguel, 2007; Dupas, 2014a).

This study considers the effect of fee-based provision on demand in the case of tests to ascertain the arsenic content of tubewell water. Arsenic tests are a highly efficient health intervention: the cost of a test provided through our program was a mere USD 2. The information that tests provide is not substitutable: the safety of a well cannot be determined or even 'guessed' without a test. The distribution of arsenic incidence in groundwater is difficult to predict, and varies greatly even over small distances. A well that meets the WHO guidelines for arsenic in drinking water may be found in immediate neighborhood of a very unsafe well (Figure 1). Within shallow (<100 m) aquifers tapped by most private wells, there is no systematic and predictable relationship between and arsenic and the well depth.[1] At the same time, precisely because arsenic contamination varies greatly in space, well tests make available an effective way to avoid exposure, namely switching to nearby safe wells (Ahmed et al., 2006; Opar et al., 2007; Madajewicz et al., 2007; Chen et al., 2011; Bennear et al., 2013; George et al., 2012; Pfaff et al., 2015).[2]

Finally, the health consequences avoided by ending chronic arsenic exposure are dramatic. Chronic exposure to arsenic by drinking groundwater at over 10 times the level of the current World Health Organization guideline of 10 microgram per liter has recently been shown to double allâĂŘcause deaths in a large cohort study conducted in Bangladesh (arg). Arsenic in tubewell water has also been associated with impaired intellectual and motor function in children (Wasserman et al., 2004; Parvez et al., 2011). In consequence, arsenic has been found to have a significant effect on income and labor supply: Pitt et al. (2012) estimate that lowering the amount of retained arsenic among Bangladesh prime-age males to levels encountered in uncontaminated countries would increase earnings by 9%. Matching households to arsenic exposure, Carson et al. (2011) find that overall household labor supply is 8% smaller due to arsenic exposure.

Because of their low cost and important health benefits, tens of millions of arsenic well test

[1] Madajewicz et al. (2007) show that arsenic incidence is uncorrelated with household characteristics, a finding which we confirm later in this paper

[2] E.g., Opar et al. (2007) find that 68% households are likely to switch, if there is a safer well within 50m.

have been carried out through public provision in rural communities across the Indo-Gangetic Plain (Fendorf et al., 2010). However, these important programs may need complementing. Thus, after a single blanket testing covering 5 million wells by the government of Bangladesh in 2000-2005, no such country-wide public programs have been carried out. In consequence, recent estimates suggest that more than half of currently used tube wells in Bangladesh have never been tested for arsenic (van Geen et al., 2014). This prompts the question whether a cost-shared provision might be sustainable, and whether there is the prospect of a market for arsenic tests in which local entrepreneurs would have an incentive to seek out untested wells (Miller and Babiarz, 2013).

In this paper, we use a randomized control trial to estimate demand for arsenic testing of water wells, when offered at a price. We investigate the determinants of the demand, as well as households' behavioral response to the information regarding arsenic status of private wells. In order to estimate the price elasticity of demand, we randomize assignment of price for arsenic testing of tubewells at village levels in 26 villages in Bihar, India. Five different levels of prices are assigned between Rs. 10 to Rs. 50, with the highest level approximately equal to one day of per capita income in Bihar.[3] The program offered to test household's tube well for arsenic contamination, if they agreed to pay the assigned price. The testing campaign was carried out over two years, with test being offered twice in the same villages and at the same pre-assigned prices – first in 2012, and later in 2014. After the first phase of testing, we conducted a follow up survey on how the information about arsenic was being used by the households. In the second phase, we carried out a detailed survey of the households, including their recall of the information provided by the diagnostic test.

Two limitations arising from the study's implementation are worth highlighting. A review of the field work finds that the first phase of test sales campaign was not geographically complete and did not entirely cover some of the villages. The missing area is quite large but is mainly concentrated in five villages. This is likely because second phase involved a more systematic door-to-door campaign. Secondly, an attempt to create a well owner-level panel was unsuccessful, since the well tags attached during the first phase proved to be less durable than expected, and could not be comprehensively tracked.

We find that there is a considerable demand for arsenic testing: at the mean across price

[3]In 2011-12, Per capita daily income in Bihar was Rs. 45 `http://www.indiaenvironmentportal.org.in/files/file/Economic-Survey-2014-bihar.pdf`.

groups, 47% of households purchased the test. However, the willingness to pay for arsenic testing is highly sensitive to price, and demand drops steeply with price. Our findings align well with other studies on cost-sharing of preventive health care products which has found relatively high price sensitivity of demand despite large private returns (Kremer and Miguel, 2007; Cohen and Dupas, 2010; Madajewicz et al., 2007). We record significant additional demand for arsenic test when the test is offered again after two years in the same villages. There are three possible mechanisms behind additional demand in second phase – learning from peers, increased awareness, and direct effect of revisiting the same households. In the setting of this paper, it is not straightforward to separate out these channels. However, from the policy perspective, the effect of making a repeat offer is highly relevant.

At the same time, more than half of the households decided to not purchase the test. It is not surprising that household wealth comes out as a major determinant of the decision to purchase the test. We further find three additional results. We do not find the use of information – i.e. switching to be sensitive to the price paid. In a follow up after three months, about 30% households who had an arsenic-high well, self-report to having switched to a safer tube well for their drinking and cooking water needs. Secondly, despite arsenic testing being a non-experience good (such as a mosquito net) and existing constraints to switching, we find a significant increase in demand when the test was offered again. Finally, we find evidence on selective retaining of water source quality information. We document households' proactive behavior to discard information on 'bad news', when the diagnostic test result is positive. Stigma and restrictions on water access based on affiliation to social groups may explain this.

Recent studies have looked at the question of price vs. subsidies of products with large private and public benefits. Cost-sharing (i.e. pricing) is often favored by development practitioners to ensure sustainability, to reduce the burden of 'entitlement effect' of subsidies and for better self-targeting, but it is found that take-up drops steeply with prices for products, when people have low private valuation (Kremer and Miguel, 2007; Cohen and Dupas, 2010; Madajewicz et al., 2007). Furthermore, pricing a product can also change the likelihood how the product will be used through screening, sunk cost or signal of quality (Ashraf et al., 2007; Cohen and Dupas, 2010). However, most of the studies focus on products which are repeatedly used, such as drinking water disinfectant, mosquito net and deworming pills, and all such products are already known to the people. To our knowledge, no study has attempted to estimate demand curve for diagnostic testing of water source quality for arsenic. One related study is conducted by George et al. (2013) who look at the impact of education and media campaign of increasing adoption of fee-based arsenic testing at a single price. Our study further contributes to this literature by investigating how household respond to the information regarding arsenic status of their well and whether there is any effect of price paid on switching to safer water sources.

At the policy level, this is the first study which shows that it is feasible to provide arsenic testing in a cost-shared way. Cost-sharing has its own limitations because of overexclusion[4] concerns, but similar to vaccination programs which are generally available outside of the public health system, diagnostic testing of arsenic can complement the government programs. We here also propose a different aspect on how continuously offering a product increases demand over time – the coverage increases when the product is offered second time. This is important from a policy perspective, when discussion on continuing subsidies or switching to cost-sharing is essentially dominated by studies which offer priced product only once or within a short time window.[5]

The rest of the paper is structured as follows. Section 2 discusses the details of the experiment and data. Results are discussed in Section 4 and Section 5 concludes.

# 2 Details on Experiment, Data and Methodology

## 2.1 Study setting and sample

Our study is set in a region in the Indo-Gangetic plains in Bihar, India, where geologic factors suggest that arsenic levels could be elevated in a significant proportion of drinking water wells. Arsenic testing is a new service in the study area: arsenic tests are not available in the private market (nor are they elsewhere in South Asia), and the area has not previously been covered by any government-sponsored blanket testing of wells.[6] Within the general study area, we select Bhojpur district to conduct our intervention; the district contains 1,045 villages according to the

[4]Dupas (2014a) define 'overexclusion' as the number of people who would use the product and become healthier, do not take it up because of cost sharing.

[5]Some studies which only look at one time or limited time window offer (Madajewicz et al., 2007) and three months voucher (Dupas, 2014b).

[6]One study reports arsenic testing of about 5,000 wells in six sub-districts of the study district (Nickson et al., 2007). The six sub-districts were not identified in the study, and a direct comparison to the 2011 Census is hence not possible. However, the share of wells tested was certainly a small fraction of local wells, with about 335,000 wells reported for all 14 sub-districts of the study district. A reported 26% of wells tested unsafe.

2011 Census. For convenience, we further limit the study area to four blocks (sub-districts) adjacent to the staging area for our intervention. Within these, we choose 26 villages for this study, based on a high probability of arsenic incidence, as indicated by distance from the river.[7] These villages are of moderate size, with population varying from 50 to about 400 households. Our endline survey identifies 4,084 well-owner households in total.[8]

Price setting To elicit demand, we use a simple revealed preference approach, namely, making take-it-or-leave-it offers of arsenic tests at a certain price to households in the sample villages. As is obvious, a take-it-or-leave-it offer elicits only a bound on each household's willingness to pay. For instance, if a household accepts to purchase a test at Rs. 30, we can only infer that its willingness to pay is at least Rs. 30. Similarly, rejection only suggests that willingness to pay was less than the asking price.[9]

We then randomly assign each village to one of five price levels at which households are offered arsenic tests for purchase – Rs. 10, Rs. 20, Rs. 30, Rs. 40 and Rs. 50. It was felt that offering different prices to households *within* a given village would be seen as violating fairness norms, and would deter purchases of the tests. We therefore choose not to randomize our prices within villages. The highest price was chosen based on initial local focus group discussions. It is slightly higher than the daily per capita average income of Rs. 45 in Bihar in 2011-12. We did not add a treatment arm that would have offered tests free of charge, because of a strong expectation that take-up would be near-universal at zero cost. This expectation is based on prior experience in arsenic testing campaigns – in line with broader evidence from lab (Ariely and Shampan'er, 2006) and field experiments (Kremer and Miguel, 2007; Cohen and Dupas, 2010). It was confirmed further when free tests were offered with near-complete take-up in four pilot villages for the design of our

[7]The original intention was to work in a sample of 25 villages, i.e., five villages in each price group. However, enumerators erroneously visited two villages of the same name during initial field work. We included the additional village as the 26th for the rest of the program.

[8]We cross-checked the number of households recorded in our study against 2011 Census data for 21 out of 26 villages that could be matched to the census. For these villages, the census shows 4,497 households that own a hand pump, whereas we record 3,322 attempted sales in the same 21 villages - that is, 74% of the census population . The discrepancy is in significant part due to the failure to include entire parts of some villages, because enumerators believed these to be distinct villages.

[9]Alternative techniques, such as the Becker-DeGroot-Marschak (BDM) mechanism and other auction-based methods might have provided richer information than our take-it-or-leave-it design. However, there was a strong sense that randomizing individual prices would be seen as violating fairness norms, and would have been significantly challenging to implement in the field. In addition, auctions would have been unlikely to be efficient mechanisms, given the potential buyers' uncertain and likely correlated beliefs over the value of arsenic tests. As noted earlier, tests are not sold in the market, so that households are quite unfamiliar with the technology - and it is in any case difficult to appreciate the long-term benefits of reducing arsenic exposure.

experiment .

## 2.2 Implementation âĂŞ testing campaign and surveys

Testers were recruited and trained prior to the roll-out of the campaign. Testing then proceeded in two waves; the first conducted in 2012 -13, and the second, in 2014-15 (see Table N – henceforth, we refer to the first (second) round of testing as having taken place in 2012 (2014), for simplicity).

### 2.2.1 First wave of testing – initial sales offer

The first wave of testing began with focus group meetings in each village. To increase awareness of the arsenic issue, a large poster was put on display, showing a satellite image of a pilot village along with color markers indicating the arsenic status of tested wells (Figure 2). Following the focus group meetings, testers began to offer tests door-to-door; where a sale was made , tests were conducted using a standard arsenic test kit . The protocol foresaw that for all households approached with a test offer, GPS locations would be collected, along with basic data on the household. However, in contrast with what was intended, testers did not record data from *all* households that did not purchase a test . We discuss the resulting challenges and our solution approach at length in Appendix A . During the initial wave of test offers, a total of 1,212 tests were sold across the 26 sample villages. The results of each test were posted on the pump-head of the well that was tested, with an easy-to-read metal placard color coded red for unsafe wells (>50 ug/L arsenic), green for 'borderline safe' wells where arsenic is of some concern (>10-50 ug/L), and blue for safe wells (<10 ug/L) (Figure 3). The cut-off values were chosen to correspond with the Indian national safety standard for arsenic of 50 ug/L that was current as of the time of the test campaign, and the WHO guideline of 10 ug/L (the government of India has since matched its standard for arsenic in drinking water to the WHO guideline). Smaller placards with a unique well ID were also attached to each pump-head in anticipation of a future response survey. Immediately after the first wave of arsenic testing was completed, village-level maps were exhibited in each village, showing the geo-locations of safe (Blue), borderline safe (Green) and unsafe (Red) wells (geo-locations were jittered to preserve anonymity). During home visits, households were alerted to the fact that switching from unsafe or borderline safe wells to neighboring safe wells would be an effective way to avoid arsenic exposure. The first phase of the project concluded with a follow up survey conducted approximately three months after testing was completed. Enumerators visited all households that had purchased a test, and collected information on their behavioral response to the information on arsenic status of their well - and in particular, on whether households now drew water from neighboring safe wells .

#### 2.2.2 Second wave of testing – sales offer repeated

In a second phase, commencing in 2014 – some two years after the initial visits – we offered the tests again in the same set of villages, and at the same price assigned initially. Across the 26 villages, a total of 4,084 households were approached with the intention of making a sales offer. In the second round, data was collected systematically from every household where a respondent could be interviewed, including from households that did not wish to buy the tests. Each house was visited at least two times to ensure high coverage. After two visits, about 14% of households could not be surveyed because no adult member was present or willing to answer questions. The resulting sample contains data from 3,528 households. A total of 719 tests were sold in this second phase. The household survey administered in the second round gathered socio-economic and demographic information, along with GPS locations of the wells. It also collected information on recall of tests being offered and purchased in 2012, along with test results. This recall data allows us to work around some of the constraints posed by the fact that households visited in 2012 and in 2014 cannot be matched with confidence, since the names and address of residents were not comprehensively collected at baseline, and only a small percentage of well tags placed in 2012 were still attached in 2014.

### 2.3 Summary statistics

Summary statistics from the 2015 survey show modestly well-off village communities. Households are of moderate size (3.9 members on average). Most (89%) own at least one mobile phone, and most (70%) live in houses made from durable building materials ('pucca'). Ownership of bikes (68%) and cows (67%) is common, though fewer households own consumer durables or have access to sanitation, and very few own cars (Table **??**).

A randomization check shows that the price category dummies are jointly significant for two out of the eleven variables tested (Table 1).[10] The two instances where there are significant differences

[10]Throughout the paper, we analyze data using ordinary least squares regression, with straightforward specifications. In all the regressions, we report cluster bootstrapped standard errors to account for randomization at the

(ownership of cars and access to sanitation) appear isolated, and there is no indication that the price groups in question are generally any more or less wealthy than the other groups.

# 3 Results

## 3.1 Demand for well arsenic testing

Demand for arsenic tests in the study area is substantial, but highly sensitive to price. Overall, after adjusting for repeat purchases, a total of 1,931 tests were sold at randomly assigned prices across the 26 sample villages over the entire duration of the program (2012-2015). This implies that arsenic testing covered about 46% of households approached for sales (column 12 in Table 2).[11] A map displaying the proportion of safe, unsafe, and untested wells in each village is shown in Figure 4. Demand estimation is complicated by the fact that during the first offer phase, enumerators failed to systematically record data from households that did not elect to purchase tests. In the following, we work with recall data collected during the second test wave to determine 2013 demand, because of its greater consistency. In Appendix A, we discuss in detail the challenges resulting from flawed data collection during the first wave; we describe our solution approach, assess robustness.

**Price sensitivity of demand**

In line with prior research, we find that demand is highly sensitive to price. The mean elasticity across sales at different price levels in our data is -0.36, an estimate well in line with other recent studies on the demand of similar products in developing countries (Meredith et al., 2013; Cohen and Dupas, 2010).

To estimate coverage (defined as take-up as a percentage of the total number of households) after two offers, we compute 2012 demand, by rescaling the number of sales offers that were not accepted with the same recall loss rate of 35% observed for successful offers (where data is complete). We combine this with demand observed in 2014. Figure 7 and Table 3 show the resulting estimates. At the lowest price of Rs. 10, about 67% of households purchase the test. While our experiment did not include an arm with zero price offer, uptake of free tests can be assumed to be nearly 100% (as discussed above). Thus, while there is significant demand at a moderate price of Rs. 10 (USD

village level.

[11] This final figure excludes repeat purchases: 74 households who recalled having bought the test in 2012 purchased another test in 2014. Households had been advised that, since arsenic levels in ground water are stable over time, wells need not be tested repeatedly.

0.15), charging this small amount, rather than offering the test for free, reduces coverage by about one-third. Demand further drops precipitously at higher prices, and reduces to 21% at Rs. 40, and 15% at Rs. 50 (roughly equivalent to daily per capita income in Bihar, as reported above). The cost of the test kits alone was about USD 0.60 (about Rs. 37 at January 2014 exchange rates), but the full cost of testing, including wages and test placards amounted to USD 2.50 (Rs. 155). This pronounced sensitivity is in line with demand behavior observed in studies of other health interventions (Kremer and Miguel, 2007; Dupas, 2014b; Cohen and Dupas, 2010). Perhaps the most natural comparison is to **?**, who study willingness to pay for water filters to remove pathogens. They report that, while 95% of respondents had non-zero willingness to pay (an analogue of near-universal take-up at zero cost), charging a price equivalent to 116% of daily income (or 30% of the filterâĂŹs cost) reduced demand to 21%.[12]

**Buyer selection at different prices** We test how household wealth is correlated with sales price among the households who decide to purchase the test (in 2014 endline survey data âĂŞ results for 2012 buyers are similar, and omitted for conciseness). Regression results for asset ownership shown in Table 4 indicate that surprisingly few asset categories were correlated with sales price. For those that do correlate, selection was mainly limited to the two highest price levels. Given the large drop in demand associated with a price increase from Rs. 10 to Rs. 20 (14pp, or 35% in relative terms), it is perhaps surprising that there is virtually no distinction in observed asset ownership between households that buy at these price levels. Purchasing decisions seem to be driven by different valuation of the product among similar households, or marginal utility of income differs in ways that do not correlate with characteristics we observe. Investment in sanitation – i.e. having a latrine facility in the house, is correlated with purchase decisions at high price levels (about one household in three among those who buy at Rs. 10 owns a latrine, but two in three do among those who buy at Rs. 50). This result might well speak to a concern over hygiene and health driving both investments.

Further, we test if households can predict the probability of arsenic contamination (and potentially, sort accordingly in choosing their residence). Table **??** (Col (1)) shows that this does not appear to be the case. There is no relationship between adjustable well parameters and probability

[12]Demand figures from Dupas (2014a) - they are not directly reported in **?**. Share of income based on USD 4.20 (GHS 3) price and 2010 (current) per capita GDP of USD 1323.

of high contamination – that is, households do not appear to specify well design to effectively avoid arsenic. Nor is there a distinct relationship between higher level of assets and arsenic status of wells that would suggest residential sorting (Col (2)).[13]

**Demand at repeat offer âĂŞ and some possible explanations**

A key feature of the experiment is that in each village, the initial test offer was followed by a repeat offer after some two years had elapsed – without a change in (nominal) sales price. Our purpose in re-offering the arsenic test was to assess whether additional demand (i.e. from households who did not purchase in the first phase) could be elicited after a two-year delay – in the distinct context of a product whose characteristics are not familiar to potential customer at the time of the first offer.

We find that repeating the offer again after a two-year delay did indeed generate substantial additional demand. Thus, purchases at the time of the second offer raise total coverage by some 18 percentage points (pp), from 28

Because we lack a household panel, and there may be some error in recall of first-round tests, we cannot completely rule out the concern that some of the demand at the second offer may be driven by households who may not have been approached during the first offer phase in 2012. However, about 70% of the new purchases in 2014 (i.e. 502 out of 719 tests) are made by households who recall being offered the test in 2012 but did not purchase. Thus, even if one were to assume that there is no recall loss at all, at most 30% of new purchases in 2014 could be attributed to failure to reach all the households in 2012. Perhaps most compellingly, Appendix Table GY shows that the level of 2014 demand is very similar among those who recall having been made an earlier offer and those who do not recall an offer.

From a policy perspective, the effect of making a repeat offer is remarkable: price matters greatly for demand, but at any price level considered here, repeating the offer strongly increases coverage (and from a business perspective, sales). Irrespective of the channels – learning, income growth, or marketing intensity, this simple finding underscores the need for a more careful assessment of experimental evidence generated with offers available only for a short period.

[13]Given the small number of high-arsenic wells, tests are run separately for each asset category to avoid over-fitting.

### 3.2 Why is there substantial demand at the time of the repeat offer?

It is intriguing to ask why there is a high level of demand when a repeat offer is made within the relatively short time frame of two years. One could imagine that processes at work might include (i) a direct 'marketingâĂŹ or 'nudgeâĂŹ effect of repeating the offer, (ii) changes in wealth between the first and second offer, or (iii) learning that would lead households to adjust their valuation of arsenic testing. Our data does not allow us to conclusively test different explanations; the limited suggestive evidence we show in the following may point toward a combination of effects at work.

#### 3.2.1 Wealth effects

There are some good reasons to think that a pure income effect might be at work at least to some degree in generating additional demand. Per capita real income in Bihar grew rapidly, at a rate of about 10% per year between 2012 and 2014.[14] Because the tests were offered at the same *nominal* price in both phases, inflation further reinforced this effect. In total, nominal per capita income grew by some 38% between the two offers. – On the other hand, as reported above, we find that observable wealth does not correlate much with willingness to pay. The *prima facie* evidence is thus ambiguous.

Our data offers limited direct insight into whether changes in wealth are a plausible explanation for demand at the time of the repeat offer. With the single exception of data on the ownership of (any) consumer durables, questions used to collect asset ownership information differed too much between the 2012 and 2014 surveys to allow for useful comparisons. Therefore, we are constrained to comparing wealth as observed in the year 2014, among households that bought in 2012 and households that bought in 2014. In this comparison, our data suggests quite clearly that first-round buyers were better off than second-round buyers when surveyed in 2014 (Table 5). Difference in ownership of durables such as TV and âĂŸwhite goodsâĂŹ are significant. In addition, second round buyers have significantly less education than first round buyers. We also find notable differences in caste composition: families in the second wave of buyers are far less likely to be from high castes than those among the first wave of buyers.[15] This finding does not allow us to draw strong conclusions:

[14] State GDP growth for India from `http://planningcommission.nic.in/data/datatable/data_2312/`.

[15] We note that, strictly speaking, we are comparing between one group observed pre-treatment (2014 buyers) and one group observed post-treatment (2012 buyers). However, since the health effects of Arsenic are long-term, one would not expect a strong treatment effect a mere two years after the test, even conditional on households effectively avoiding exposure. We acknowledge that in principle, Arsenic testing could have had effects upon wealth through

it is consistent with wealth effects, but also does not exclude a contribution of learning.[16]

### 3.2.2 Learning

We test in the following way for evidence on learning after the first wave of tests. We note that, because the distribution of arsenic in ground water varies substantially and unpredictably over small distances, variation in the results of first-round tests is exogenous. We then posit that different distributions of first-round results at the village level may induce differential effects on second-round demand. In particular, we speculate that, when a high share of wells tested âĂŸunsafeâĂŹ during the first wave, concern in the village community over arsenic contamination might have been raised, translating into learning – namely, greater awareness of the health risks associated with arsenic, and the benefits of testing and well-switching. Empirically, the relationship between second-phase purchases and the share of wells tested ‘unsafeâĂŹ in the first phase has the expected sign, across a range of specifications (Table 9). However, results are not significant with cluster bootstrap standard errors. Since arsenic tests are distinctly a non-experience good, it is quite plausible to suggest that learning might be chiefly driven by increased awareness of the probability of arsenic contamination, and the risks of exposure. We cannot clearly assess in the current framework whether the process of raising awareness ought to be thought of as peer learning.

In summary, our evidence is limited on mechanisms that may have promoted demand at the time of the repeat offer. Wealth effects may be present; neither prima facie evidence nor comparison of buyer groups allows us to conclusively prove or disprove them. We show some evidence of learning, but do not have sufficient statistical power to establish a clear result.

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conduits other than health – for instance, a change in the value of houses with wells tested safe/unsafe, or a change in social status with implications for future wealth.

[16]There are two possible tests to reject wealth effects (at the mean). Most obviously, one would like to compare wealth among the two groups of buyers *at the time of purchase*, that is, in 2012 and 2014, respectively. This comparison would allow us to reject wealth effects as an explanation if it were to emerge that second-round buyers were less well-off at the time of purchase than first-round buyers were at the time their wells were tested – with the assumption that the two groups initially had the same valuation of the tests. In principle, the comparison made above (in wealth of the two groups in 2014) could also reject wealth effects: namely if second-round buyers were weakly better off in 2014 than first-round buyers – and we were willing to assume that growth in wealth among the two groups was such that the wealth ranking was not reversed since 2012, and (less appealingly) that the wealthier group initially had a lower valuation of the tests.

### 3.3 Behavioral response to test results: low switching rates, regardless of purchase price, and efforts to hide bad news

Among households that purchased the test in 2012, 31% reported that they had switched to safer water sources at the time of the follow-up survey (data on well switching among second-round buyers is not yet available). This is a distinctly low rate: similar studies in Bangladesh have reported switching rates of 30-70%.[17]

We further find that the propensity to switch does not depend on the purchase price (Table 6). This is somewhat counter-intuitive: the current literature on preventive health care products emphasizes the screening and sunk cost effects of buying at high price. Both effects will tend to increase usage (in our setting, the respective arguments are as follows: 'those who buy at high price care more about health, and will therefore be more likely to switch wellsâĂŹ; and 'those who buy at high prices have invested more in the test, and will hence more highly value the information it yieldsâĂŹ) (**?**).

### 3.4 Hiding the bad news

We find evidence that households not only prefer not to report adverse arsenic test outcomes during follow up, but also take proactive action to remove markers of unwelcome test results.

Table 7 offers a test for selective recall. It compares the proportion of tests in each category of arsenic contamination levels (Red, Green and Blue) observed in first-round test outcomes 2012 to the proportion of tests in the same category among outcomes *recalled* in 2014. We have three different measures of recalled arsenic status – namely, (1) those households where the test placard is still affixed to the well; (2) those where the placard has been removed from the well, but is still kept in the house; and (3) those where the placard is neither on the well nor kept in house, but the respondent reports being able to remember the arsenic contamination status. As is evident, the proportion of wells respondents believe to be unsafe is consistently some nine to eleven percentage points (pp) lower than the true proportion of red tests recorded in 2012. It is also noteworthy that there is a discrepancy even among households where the test placard is still attached to the well: since it is inconceivable that red tags are more likely to be accidentally lost than others, this is

[17]One might ask whether a potential reason for non-switching could be the limited number of wells identified to be safe, because of lower take-up of the for-fee service, as opposed to blanket testing. However, prior studies suggest that owners of unsafe wells often switch to untested wells.

clear evidence of an intent either to hide the wellâĂŹs status, or to avoid being reminded of it. The magnitude of the effect is very significant: 20% of wells tested 'redâĂŹ in 2012 âĂŞ hence, about 50% of the households with wells that were high in arsenic intentionally sought to hide the test outcome. We also note that respondents tended to preferentially indicate that wells were tested 'greenâĂŹ âĂŞ suggesting that households prefer to claim a medium arsenic level in their highly contaminated wells.

These findings are consistent with general theoretical and experimental evidence of 'self-serving bias' and 'over-confidence'. Eil and Rao (2011) have found that negative feedback on personal intelligence and beauty were not used by people to update one's prior, as one would expect from the Bayesian updating. 'Good news', on the other hand, is well received and inference conforms closely to Bayes' rule. More practically, we note that efforts to hide unsafe well status could be related to low well switching rates in various ways. It could be that well owners hide bad news because it is (for unrelated reasons) impossible to take action to remedy the situation. For instance, it is quite plausible that restrictions on sharing water based on caste affiliation and religion raise the cost of switching – in an adjacent state, caste is particularly found to be a major factor in impending water trade within a village (Anderson, 2011). Similarly, 90% of households in our survey report that they prefer to exchange water within their own caste or relation. It is also possible that both the reluctance to share and the propensity to hide bad news speak to a social stigma or material loss (e.g., in house value) being attached to owning an unsafe well.

Finally, we find some indication that wealthier households may be more likely to hide adverse test results. To show this, we compare test results and recall as above – but distinguish between households that owned and did not own consumer durables (the one asset ownership indicator collected consistently in both survey rounds). As is evident, while all households under-report, households that do own durables are about twice as likely to do so; the difference is significant for the larger samples.

SUGGEST MOVING TO APPENDIX?

**Digression: Comparison of recorded and recall sales data**

As noted earlier, during the first offer phase in 2012, testers did not systematically collect data from households that did not want to purchase the test (Column 2 and 4 , Table 2). In addition, there is qualitative evidence that testers offered tests less systematically in parts of the villages where people showed strong reservations against the idea of arsenic tests being offered for a fee (rather than free of charge) during focus group meetings.

We hence face a considerable challenge in reliably assessing baseline demand, since the number of households to whom the test was offered in 2012 cannot be completely ascertained. Figure **??** shows the number of offers and sales recorded in the 2012 survey and in the 2014 endline survey. We address this challenge with the following strategy. (1) We first compute demand based on recall data collect in the 2014 follow-up survey (i) on whether households were offered the test at baseline, and (ii) on whether they purchased the test at baseline. (Column FUGU, Table 2). To assess whether the recall-based estimate is reasonable, we also (2) estimate demand from 2012 sales, based on the assumption that as many households were approached during the 2012 campaign as during the 2014 campaign (Column 9). This estimate is correct to the degree that (i) sales approaches were comprehensive in 2012 (while numerators neglected to keep records of some visits), and (ii) the number of households has remained constant between survey rounds.

Reassuringly, as is evident from Table 2, the estimates obtained by recall and by imputing the number of sales approaches never significantly diverge. Overall first-wave demand estimates are well-aligned – 30% in recorded data (Col 9) and 27% in recall data (Col 10) – as are demand estimates in the Rs. 10-30 groups. Estimates diverge more at higher prices. (See also Figure 6.) There also is a good match between the ratio of *recalled 2012* sales to *recorded 2012* sales (0.65) on the one hand, and the ratio between *recalled 2012* offers and *recorded 2014* sample size on the other (0.60). If we assume that recall error is similarly likely for offers and sales, this comparison provides at least some reassurance that the 2012 data is affected by failure to record unsuccessful sales attempts, rather than selective sales attempts.

Although data collection did not follow protocol, we are hence able to offer two sensible demand estimates, and show that they match up well with each other. In the main body of the paper, we discuss results based on recall data – arguably, the more internally consistent estimate.

# 4 Policy Discussion and Conclusion

This study measures willingness to pay for a water quality diagnostic product. Demand is highly sensitive to prices, as we also know from other studies in preventive health care research that cost-sharing reduces take-up significantly. The study measures how cost-sharing would affect demand.

Since the demand is greatly affected by the extent of cost-sharing, the role of subsidy remains critical in ensuring maximum coverage.

Further, we find that switching rate is not affected by the price paid to buy the test. However, overall switching rates are relatively low. Increasing awareness about adverse effects of arsenic exposure can definitely increase switching rates (George et al., 2012), though the time period to experience the effect of switching to safe water source is typically much longer which restricts the ability to learn by doing. At the same time, when travel cost is high or there are barriers to access safe water wells, a lower switching rate would be observed. Our empirical evidence on households' preference to hide the outcome of arsenic testing underscore further need for research. There may be restrictions put by socio-economic structure with in the village and lack of awareness feeding to stigma attached to having a contaminated well. This is highly policy relevant, particularly when ex-ante decision to purchase a test is also affected by any motivation to avoid bad news.

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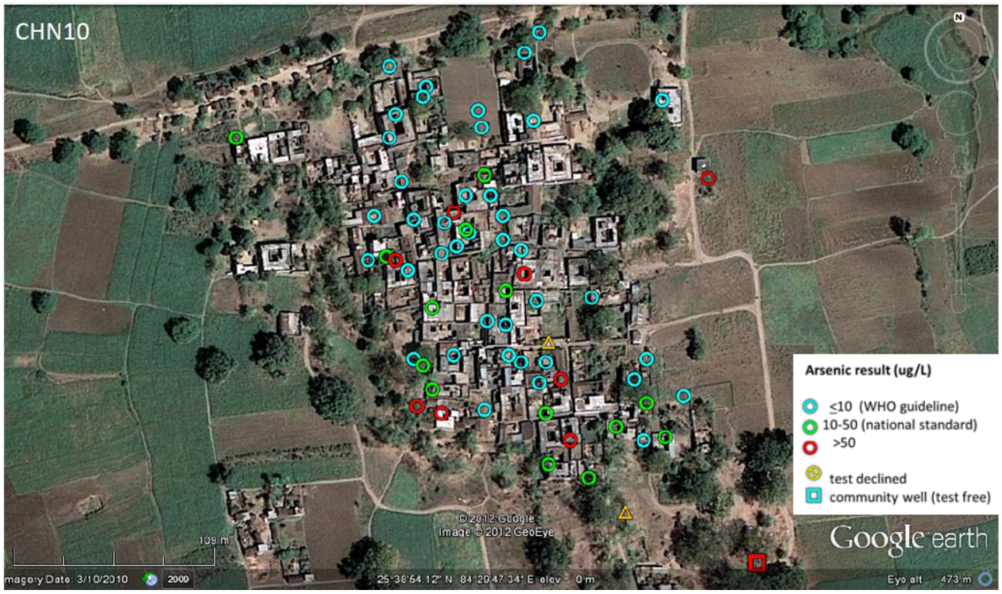
Figure 1: Showing Arsenic Incidence in a village in Bhojpur district, Bihar (India)




Note: A map sample village from the study is shown with the outcome of arsenic testing. Red circles denote high arsenic drinking water wells ($> 50$ ug/L). Green wells are relatively high but still can be used for drinking and cooking purpose, as per the national standard. Blue villages are low in arsenic and safe to drink water from.

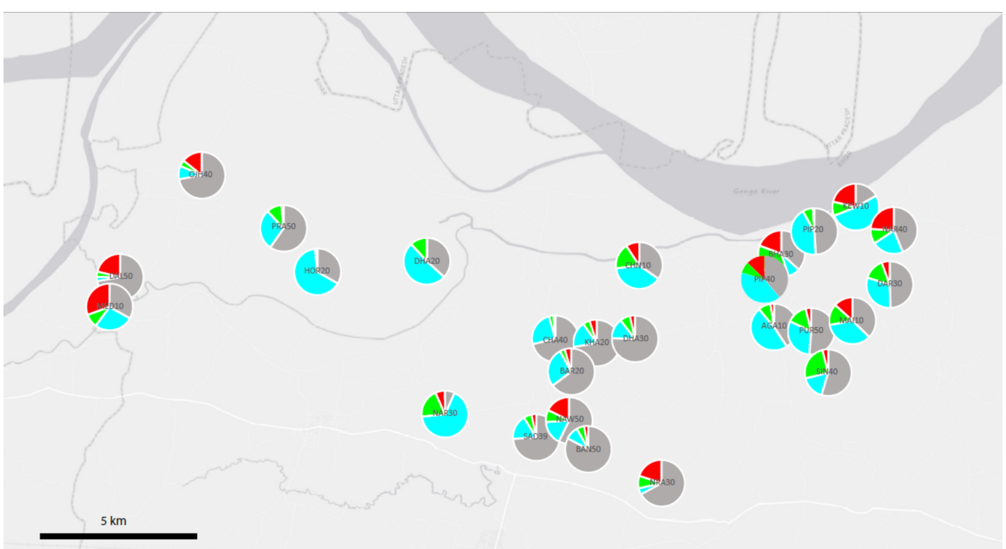
Figure 2: Google maps from nearby villages were shown in focus group meetings

Note: Village level meetings and exhibition of posters showing safe and unsafe wells from near by villages. The geo-location of wells were jittered because of privacy concerns.

Figure 3: Metal Placard showing arsenic status after testing

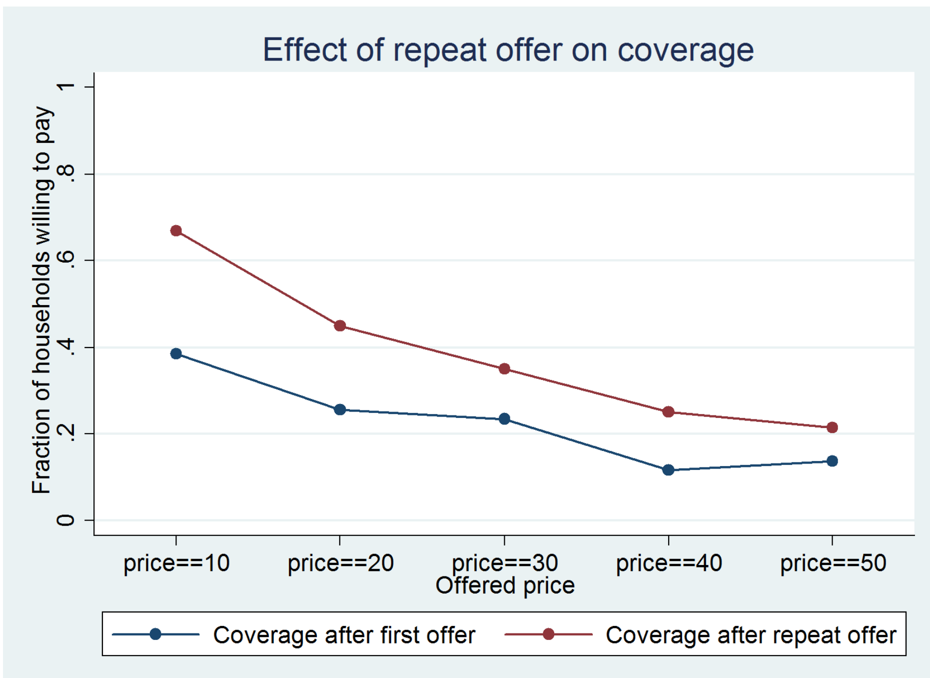

Note: Red (Arsenic high), Green (Arsenic moderate) and Blue (Arsenic safe) placard were fixed on the tubewells after arsenic testing.

Figure 4: Map showing village locations with the arsenic test outcomes




Note: This map shows the location of villages, take-up and outcome of the arsenic testing in subject area. Red (Arsenic high), Green (Arsenic moderate) and Blue (Arsenic safe) colors show the outcome of arsenic testing. Grey color shows the proportion of untested wells.

Figure 5: Effect of repeat offer on total coverage




Note: This plot shows the comparison of demand pattern in first phase (2012) and second phase (2014). Percentage increase in demand is comparable at all price levels, but overall demand becomes steeper at low prices because of downward slope of the curve.

| | |
|---|---|
| 1st round As testing | November 2012 – February 2013 |
| Follow up on switching | February 2013 – May 2013 |
| 2nd round As testing | November 2014 – January 2015 |

Table 1: Randomization balance among different price groups

| | Households Members | | | House | | Other Assets | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total Adults | Infants | Children | Concrete | Has_latrine | Car | Cell | TV | Bike | Motorbike | Cow |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| Price=Rs. 20 | 0.678 | 0.0830 | 0.238 | -0.227 | -0.0667 | -0.0110 | 0.0124 | 0.0308 | -0.0277 | -0.0515 | -0.00546 |
| | (0.672) | (0.104) | (0.250) | (0.154) | (0.0855) | (0.0196) | (0.0735) | (0.105) | (0.0518) | (0.0578) | (0.0944) |
| Price=Rs. 30 | -0.729 | 0.0618 | -0.134 | -0.0372 | 0.0257 | -0.0127 | 0.0532 | 0.0214 | -0.0469 | 0.00206 | 0.125 |
| | (0.584) | (0.148) | (0.228) | (0.102) | (0.102) | (0.0166) | (0.0634) | (0.114) | (0.107) | (0.0367) | (0.0852) |
| Price=Rs. 40 | 0.268 | 0.141 | 0.0633 | -0.142 | 0.166 | -0.0276* | 0.0623 | -0.00814 | -0.137 | 0.0297 | 0.00104 |
| | (0.749) | (0.126) | (0.242) | (0.100) | (0.112) | (0.0146) | (0.0565) | (0.128) | (0.128) | (0.0321) | (0.0795) |
| Price=Rs. 50 | 0.439 | 0.176 | 0.157 | -0.0304 | 0.270** | 0.000127 | 0.0576 | -0.0392 | -0.0583 | 0.0644 | 0.0387 |
| | (0.998) | (0.167) | (0.312) | (0.108) | (0.125) | (0.0223) | (0.0699) | (0.0766) | (0.0793) | (0.0574) | (0.0875) |
| N | 3,526 | 3,528 | 3,522 | 3,758 | 3,528 | 3,527 | 3,528 | 3,528 | 3,528 | 3,528 | 3,527 |
| R-squared | 0.040 | 0.004 | 0.019 | 0.040 | 0.059 | 0.003 | 0.007 | 0.003 | 0.009 | 0.009 | 0.011 |
| Mean at Price=Rs. 10 | 3.741 | 0.242 | 0.492 | 0.795 | 0.278 | 0.0384 | 0.855 | 0.198 | 0.722 | 0.214 | 0.638 |
| *Joint significance* | | | | | | | | | | | |
| Wald chi2(df) | 4.848 | 2.295 | 2.464 | 3.558 | 15.08 | 9.317 | 1.752 | 0.811 | 1.685 | 3.793 | 4.509 |
| Prob > chi2 | 0.303 | 0.682 | 0.651 | 0.469 | 0.00455 | 0.0536 | 0.781 | 0.937 | 0.793 | 0.435 | 0.342 |

Note: Above table shows difference in mean value of key demographic and assets variables across different price groups. Joint significance test result is reported in the bottom rows. Cluster bootstrap standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Sales of arsenic tests

| Price (Rs.) | Well-owners visited in endline survey | Recorded sales | Recorded offers | Recalled sales | Recalled offers | Sales | Completed sales offers | Sales among those who recall being offered a test in 2012 | Demand based on recorded sales | Demand based on recall | 2015 demand | 2015 demand among those who recall a prior offer | Coverage after two offers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| | | | | | | | | | (3)/(2) | (5)/(6) | (7)/(2) | (9)/(6) | (3)+(7)-repurchases /(2) |
| 10 | 960 | 361 | 431 | 249 | 615 | 288 | 860 | 187 | 0.38 | 0.40 | 0.30 | 0.30 | 0.66 |
| 20 | 1105 | 310 | 423 | 206 | 804 | 183 | 985 | 135 | 0.28 | 0.26 | 0.17 | 0.17 | 0.45 |
| 30 | 815 | 218 | 352 | 125 | 460 | 117 | 662 | 74 | 0.27 | 0.27 | 0.14 | 0.16 | 0.39 |
| 40 | 653 | 196 | 327 | 92 | 441 | 86 | 554 | 72 | 0.30 | 0.21 | 0.13 | 0.16 | 0.37 |
| 50 | 551 | 127 | 289 | 52 | 350 | 45 | 467 | 34 | 0.23 | 0.15 | 0.08 | 0.10 | 0.30 |
| All | 4084 | 1212 | 1822 | 724 | 2670 | 719 | 3528 | 502 | 0.30 | 0.27 | 0.18 | 0.19 | 0.45 |

Note: This table summarizes the number of offers, sales and demand in both phases. Difference between demand calculated with recorded data in first phase (2012) and recalled data for first phase purchases during endline survey (2014) is shown in column 9 and 10. Note that N (column 2) denotes the total number of households as counted in the endline survey (2014).

Table 3: Estimated Demand

| | purchased_2013_simulated | purchased_2013_recall_original | purchased2015 | coverage_simulated |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Price = Rs. 20 | -0.0955 | -0.146 | -0.134* | -0.198* |
| | (0.133) | (0.184) | (0.0723) | (0.105) |
| Price = Rs. 30 | -0.109 | -0.132 | -0.156* | -0.252** |
| | (0.121) | (0.163) | (0.0867) | (0.108) |
| Price = Rs. 40 | -0.0759 | -0.195 | -0.168* | -0.272*** |
| | (0.122) | (0.164) | (0.0903) | (0.0776) |
| Price = Rs. 50 | -0.146 | -0.255 | -0.218*** | -0.335*** |
| | (0.123) | (0.167) | (0.0725) | (0.0922) |
| Constant (ean at Price = Rs. 10) | 0.376*** | 0.403*** | 0.300*** | 0.644*** |
| | (0.108) | (0.151) | (0.0702) | (0.0633) |
| Observations | 4,084 | 2,666 | 4,084 | 4,084 |
| R-squared | 0.011 | 0.034 | 0.037 | 0.053 |

Note: Above table shows estimated additional demand in 2014 and total demand at the end of the two year. Recalled data is scaled up assuming constant recall loss in number of offers and purchases in order to estimate demand in 2012. Cluster bootstrap standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Selection at high price levels

| | House Type | | Other Assets | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 'Pucca' | Has Latrine | Car | Cell | TV | Bike | Motorbike | Cow |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Panel A: Linear specification | | | | | | | | |
| Price | -0.00162 | 0.00747** | 0.000154 | 0.00156 | 0.00180 | -0.000673 | 0.00296*** | 9.18e-05 |
| | (0.00294) | (0.00302) | (0.000374) | (0.00164) | (0.00324) | (0.00197) | (0.00100) | (0.00237) |
| Panel B: Breakdown by price levels | | | | | | | | |
| Price=Rs. 20 | -0.189 | -0.0350 | -0.00346 | -0.0304 | 0.0459 | -0.0366 | 0.0297 | -0.0546 |
| | (0.136) | (0.114) | (0.0164) | (0.120) | (0.135) | (0.0705) | (0.0742) | (0.0873) |
| Price=Rs. 30 | -0.0367 | 0.0171 | 0.00884 | 0.0121 | 0.0394 | 0.0425 | 0.0279 | 0.0882 |
| | (0.119) | (0.136) | (0.0184) | (0.0757) | (0.143) | (0.0778) | (0.0422) | (0.0805) |
| Price=Rs. 40 | -0.173 | 0.254** | -0.0121 | 0.107*** | 0.0837 | -0.0805 | 0.115*** | -0.0501 |
| | (0.118) | (0.116) | (0.0135) | (0.0407) | (0.183) | (0.146) | (0.0428) | (0.102) |
| Price=Rs. 50 | 0.0112 | 0.334** | 0.0168 | 0.00559 | 0.0489 | -0.0168 | 0.116*** | -0.0221 |
| | (0.0922) | (0.135) | (0.0235) | (0.0733) | (0.150) | (0.0824) | (0.0417) | (0.107) |
| mean at Price= Rs. 10 | 0.803 | 0.330 | 0.0267 | 0.886 | 0.223 | 0.789 | 0.221 | 0.685 |
| N | 1,301 | 1,366 | 1,365 | 1,366 | 1,366 | 1,366 | 1,366 | 1,365 |

Note: Above table shows correlation between higher wealth and purchase of test at higher prices. Cluster bootstrap standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

| | arsenic high well | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
| well_age | -0.00234 | | | | | | | | | | | | | | |
| | (0.00297) | | | | | | | | | | | | | | |
| well_depth | 0.00114 | | | | | | | | | | | | | | |
| | (0.00129) | | | | | | | | | | | | | | |
| well_cost | 1.48e-06 | | | | | | | | | | | | | | |
| | (8.68e-06) | | | | | | | | | | | | | | |
| has_car | | 0.172 | | | | | | | | | | | | | |
| | | (0.132) | | | | | | | | | | | | | |
| has_cell | | | -0.0148 | | | | | | | | | | | | |
| | | | (0.0875) | | | | | | | | | | | | |
| has_several_cells | | | | -0.0558 | | | | | | | | | | | |
| | | | | (0.0840) | | | | | | | | | | | |
| has_tv | | | | | -0.00610 | | | | | | | | | | |
| | | | | | (0.0615) | | | | | | | | | | |
| has_bike | | | | | | 0.0626* | | | | | | | | | |
| | | | | | | (0.0345) | | | | | | | | | |
| has_motorbike | | | | | | | -0.0285 | | | | | | | | |
| | | | | | | | (0.0426) | | | | | | | | |
| has_cow | | | | | | | | 0.102** | | | | | | | |
| | | | | | | | | (0.0407) | | | | | | | |
| has_several_cows | | | | | | | | | 0.0529 | | | | | | |
| | | | | | | | | | (0.0480) | | | | | | |
| has_whitegoods | | | | | | | | | | 0.0377 | | | | | |
| | | | | | | | | | | (0.0657) | | | | | |
| pucca | | | | | | | | | | | -0.0255 | | | | |
| | | | | | | | | | | | (0.0572) | | | | |
| latrine | | | | | | | | | | | | 0.0981 | | | |
| | | | | | | | | | | | | (0.0668) | | | |
| household size | | | | | | | | | | | | | -0.00480 | | |
| | | | | | | | | | | | | | (0.00913) | | |
| infants | | | | | | | | | | | | | | 0.0125 | |
| | | | | | | | | | | | | | | (0.0202) | |
| children | | | | | | | | | | | | | | | -0.00866 |
| | | | | | | | | | | | | | | | (0.0242) |
| Observations | 677 | 718 | 719 | 719 | 719 | 719 | 719 | 718 | 718 | 719 | 677 | 719 | 718 | 719 | 716 |
| R-squared | 0.007 | 0.004 | 0.000 | 0.002 | 0.000 | 0.004 | 0.001 | 0.012 | 0.003 | 0.001 | 0.001 | 0.011 | 0.001 | 0.002 | 0.001 |

Note: Above table shows correlation between probability of well having high arsenic status with various well-related and socio-economic factors. Col (1) confirms that it is difficult to adjust well parameters (such as depth and cost) to minimize arsenic risk. Overall, no clear indication on sorting is evident (Col (2)). Cluster bootstrap standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 5: Households characteristics of first and second phase buyers

| | 2014 buyers | 2012 recall | 2014 vs. 2014 recall |
|---|---|---|---|
| | (1) | (2) | (1) - (2) |
| *Household characteristics* | | | |
| Number of HH members | 4.919 | 4.311 | 0.608 |
| | (0.367) | (0.325) | (0.382) |
| Infant living in HH | 0.302 | 0.223 | 0.0798** |
| | (0.0459) | (0.0246) | (0.0370) |
| Child living in HH | 0.488 | 0.438 | 0.0497 |
| | (0.0585) | (0.0618) | (0.0657) |
| Several children living in HH | 0.201 | 0.140 | 0.0612 |
| | (0.0447) | (0.0437) | (0.0496) |
| *Education* | | | |
| HH head has no formal education | 0.134 | 0.100 | 0.0336* |
| | (0.0225) | (0.0244) | (0.0194) |
| HH head has primary education | 0.610 | 0.632 | -0.0225 |
| | (0.0691) | (0.0495) | (0.0637) |
| At least one HH member has more than primary education | 0.429 | 0.445 | -0.0152 |
| | (0.0923) | (0.0731) | (0.0738) |
| *Caste* | | | |
| Scheduled caste or tribe | 0.0163 | 0.0386 | -0.0223 |
| | (0.00852) | (0.0240) | (0.0226) |
| Other backward caste | 0.227 | 0.127 | 0.0995** |
| | (0.0518) | (0.0298) | (0.0411) |
| Kshatriya | 0.0767 | 0.124 | -0.0473 |
| | (0.0309) | (0.0455) | (0.0371) |
| Brahmin | 0.251 | 0.388 | -0.137*** |
| | (0.0658) | (0.0646) | (0.0510) |
| Baniya | 0.297 | 0.203 | 0.0940* |
| | (0.0670) | (0.0446) | (0.0537) |

| | 2014 buyers | 2012 recall | 2014 vs. 2014 recall |
|---|---|---|---|
| | (1) | (2) | (1) - (2) |
| *Asset ownership* | | | |
| HH has whitegoods | 0.225 | 0.301 | -0.0766* |
| | (0.0404) | (0.0563) | (0.0405) |
| Has cell phone | 0.912 | 0.861 | 0.0507 |
| | (0.0230) | (0.0578) | (0.0460) |
| Has several cell phones | 0.163 | 0.145 | 0.0175 |
| | (0.0532) | (0.0453) | (0.0469) |
| Has TV | 0.208 | 0.298 | -0.0905** |
| | (0.0372) | (0.0573) | (0.0424) |
| Has bicycle | 0.783 | 0.811 | -0.0285 |
| | (0.0187) | (0.0402) | (0.0382) |
| Has motorbike | 0.248 | 0.261 | -0.0131 |
| | (0.0254) | (0.0243) | (0.0260) |
| Has cow | 0.680 | 0.680 | 6.24e-05 |
| | (0.0417) | (0.0319) | (0.0353) |
| Has several cows | 0.259 | 0.219 | 0.0398 |
| | (0.0527) | (0.0475) | (0.0587) |
| *Housing characteristics* | | | |
| House pucca | 0.701 | 0.756 | -0.0553 |
| | (0.0556) | (0.0504) | (0.0391) |
| Well depth (ft) | 82.51 | 80.80 | 1.702 |
| | (3.692) | (3.922) | (2.806) |
| Has latrine | 0.330 | 0.408 | -0.0778 |
| | (0.0551) | (0.0496) | (0.0553) |

Note: Above table shows correlation between higher wealth and purchase of test at higher prices. Cluster bootstrap standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 6: Effect of price paid on the behavioral response to information

| | Switched to arsenic safe well | Switched to arsenic moderate/safe well |
|---|---|---|
| | (1) | (2) |
| Price = Rs. 20 | 0.242 | 0.227 |
| | (0.275) | (0.277) |
| Price = Rs. 30 | -0.0326 | 0.00227 |
| | (0.216) | (0.227) |
| Price = Rs. 40 | 0.0254 | 0.0292 |
| | (0.228) | (0.226) |
| Price = Rs. 50 | 0.0424 | 0.0773 |
| | (0.123) | (0.110) |
| Constant | 0.258*** | 0.273*** |
| | (0.0981) | (0.1000) |
| Observations | 211 | 211 |
| R-squared | 0.018 | 0.014 |

Note: This table shows that – use of the information provided – i.e. switching to safer well is not affected by the price paid for test. Cluster bootstrap standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Selective retaining of the arsenic test outcome

| | Fixed on Well | | | Kept in House | | | Recall of Placard Color | | | All three combined | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Placard color | Red | Green | Blue | Red | Green | Blue | Red | Green | Blue | Red | Green | Blue |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Second Phase | -0.0942*** | 0.0584 | 0.0358 | -0.0925** | 0.155*** | -0.0621 | -0.116*** | 0.0555* | 0.0601 | -0.0955*** | 0.118*** | -0.0221 |
| | (0.0262) | (0.0419) | (0.0374) | (0.0422) | (0.0513) | (0.0744) | (0.0253) | (0.0312) | (0.0435) | (0.0233) | (0.0317) | (0.0403) |
| N | 1,529 | 1,529 | 1,529 | 1,379 | 1,379 | 1,379 | 1,762 | 1,762 | 1,762 | 1,840 | 1,840 | 1,840 |
| R-squared | 0.010 | 0.004 | 0.001 | 0.006 | 0.016 | 0.002 | 0.020 | 0.004 | 0.003 | 0.014 | 0.018 | 0.000 |

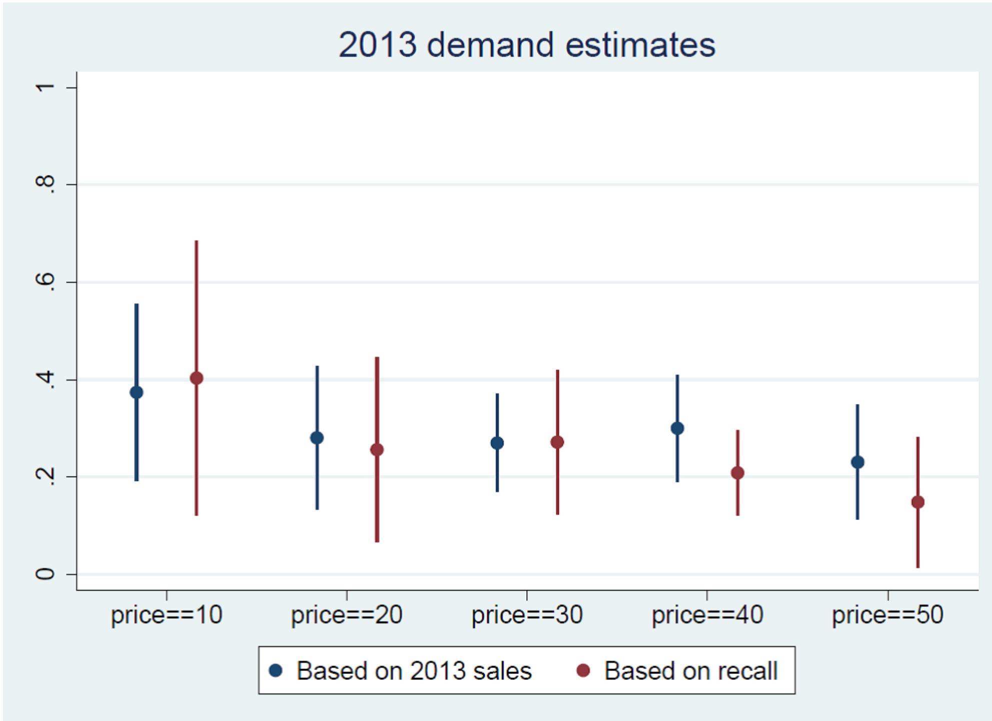
Note: Above table compares the proportion of Red, Green and Blue wells in the recalled and recorded data from phase 1. In phase 1, a placard was fixed to the well after arsenic test, but not all households keep it attached to the well. We also collect evidence if households keep the placard in the house. Overall, the table shows that households proactively take steps to hide the bad news of 'red' (arsenic high) well and prefer to substitute to 'green' (arsenic moderate) status. Cluster bootstrap standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 8: Selective recall and household assets

| | red_test_On_Well | red_test_In_House | red_test_Re | red_test_ALL |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Phase 2 | -0.0831*** | -0.0688 | -0.0919*** | -0.0760*** |
| | (0.0285) | (0.0507) | (0.0286) | (0.0256) |
| has_whitegoods | 0.0423 | 0.0423 | 0.0423 | 0.0423 |
| | (0.0402) | (0.0405) | (0.0406) | (0.0397) |
| Phase 2 X has_whitegoods | -0.0571 | -0.0661 | -0.0903** | -0.0728* |
| | (0.0495) | (0.0662) | (0.0409) | (0.0407) |
| Observations | 1,497 | 1,350 | 1,730 | 1,808 |
| R-squared | 0.012 | 0.007 | 0.023 | 0.016 |

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure 6: Comparison of demand estimate from first phase data and recall




Note: Above plot shows the difference in demand estimates between recorded data in 2012-13 and recalled data in 2014-15. Except higher prices (Rs. 40 and Rs. 50) coefficients are of similar magnitude.

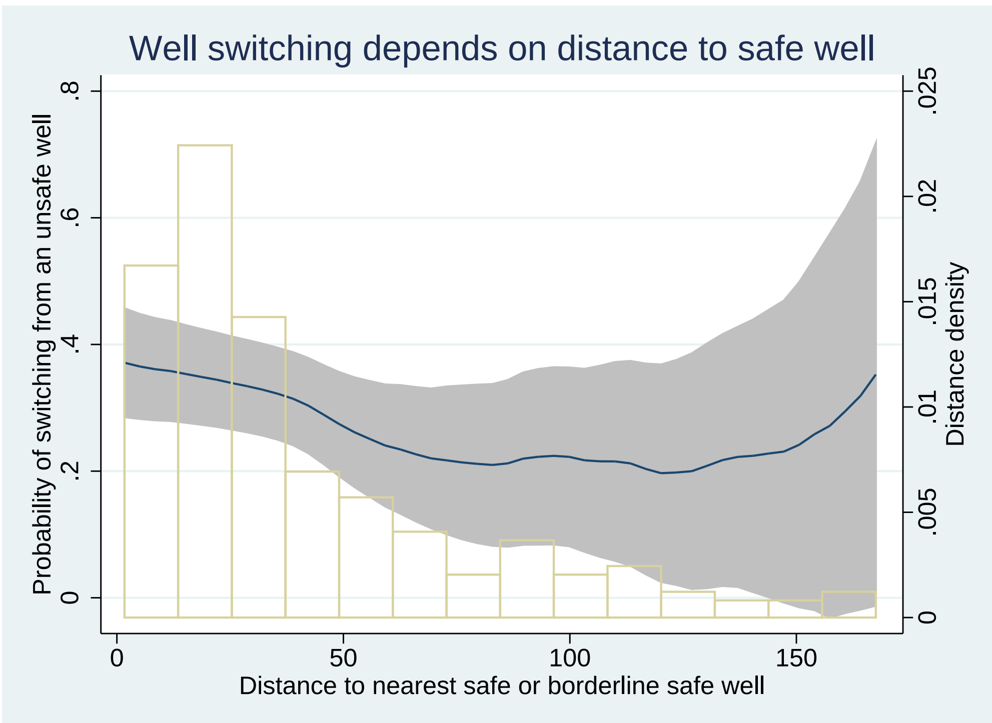
*Switching conditional on distance to blue/green

Table 9: Outcome of test in first phase on the demand in second phase

| | Demand in Second Phase | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Share of wells in village tested arsenic high (red) in first round | 0.0384 | 0.0699 | 0.0437 | 0.0933 | 0.117 |
| | (0.112) | (0.125) | (0.107) | (0.114) | (0.130) |
| | [0.0301] | [0.0384] | [0.0301] | [0.0326] | [0.0404] |
| *Controls* | | | | | |
| Price | Yes | Yes | Yes | Yes | Yes |
| First-round demand | No | No | Linear | Quadratic | Quadratic |
| Wealth proxies | No | Yes | No | No | Yes |
| N | 4,084 | 3,002 | 4,084 | 4,084 | 3,002 |
| R-squared | 0.037 | 0.060 | 0.051 | 0.059 | 0.082 |

Note: This table summarizes the correlation between arsenic test outcome in the first phase on the demand in second phase. The estimated coefficients are positive but not significant with cluster bootstrap standard errors. Cluster bootstrap standard errors in parentheses, classical standard errors in square brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure 7: Switching conditional on distance to blue/green




Note: Switching conditional on distance to blue/green.