SURVEY-BASED APPROACH

CONTINGENT BEHAVIOR

If ...., would you do X? ____ YES ____ NO

CONTINGENT VALUATION

If it cost $A to bring about ...., would you vote for this? ____ YES ____ NO

From the responses, one can fit a sort of demand function.

The area under the demand function, or something like that, yields an estimate of WTP

With open ended, you get a direct statement of WTP or WTA

Can use OLS regression to investigate factors that explain this. WTP = f(income, Tap Water quality, . . .)

The only statistical issue is: how to deal with the preponderance of zeroes - people who would not pay anything.

For this you need a special statistical technique known as TOBIT analysis

With closed-ended, you don't get a direct statement of WTP or WTA. Instead you get a series of "yes" and "no" responses

If you plot the proportion of "yes" answers against the dollar amount offered, you obtain the WTP distribution or WTA distribution.

since $Pr\{\text{"Yes" to \$A}\} = Pr\{WTP \geq A\}$

CONTINGENT VALUATION

- USES SURVEYS OF INDIVIDUALS

- CONFRONTS THEM WITH A CHOICE/PAYMENT SITUATION

- THROUGH THIS, IT ELICITS THEIR WTP

TWO FORMS OF CHOICE QUESTION:

- OPEN-ENDED

  "What is the most that you poersonally would be willing to pay for .. ?"

- CLOSED-ENDED

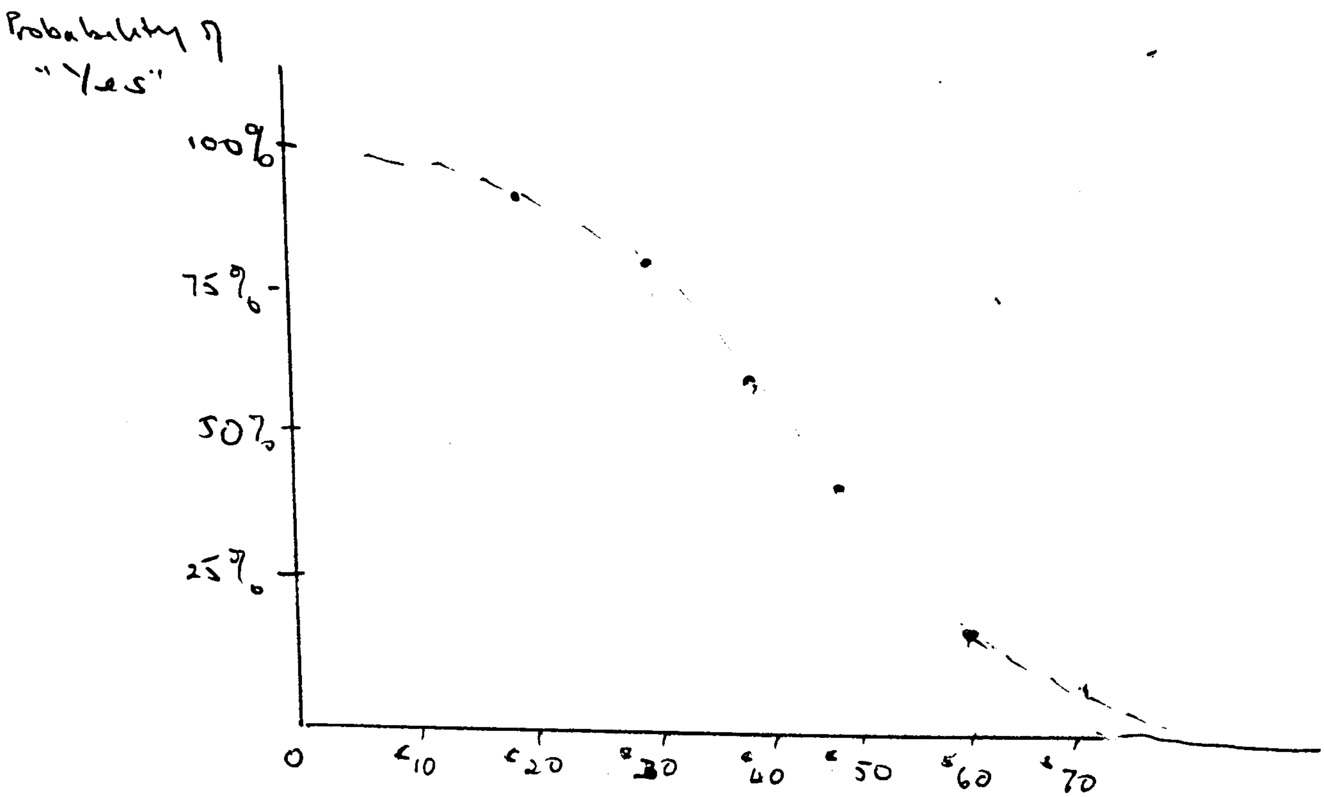
  "If it cost $x in higher taxes each year for a household like yours, would you vote for it or against ?"

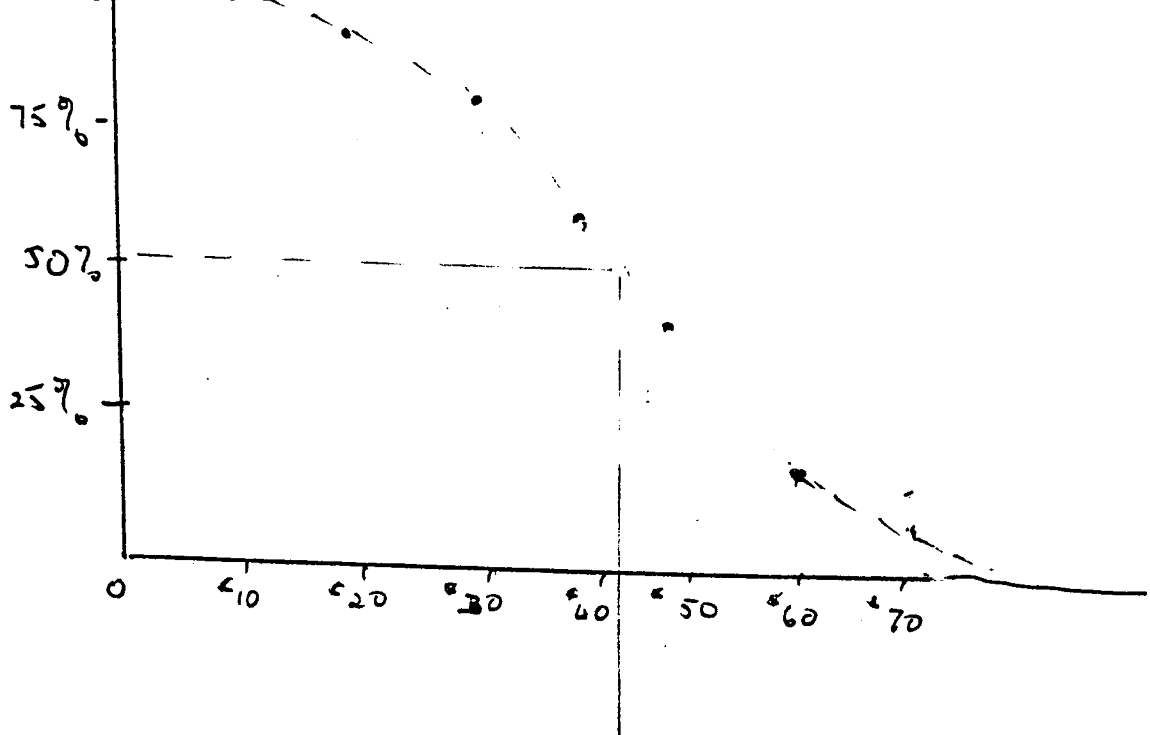
1. Plot the percent of "yes" responses against the dollar amount that was asked.

2. Fit a response curve to these points.

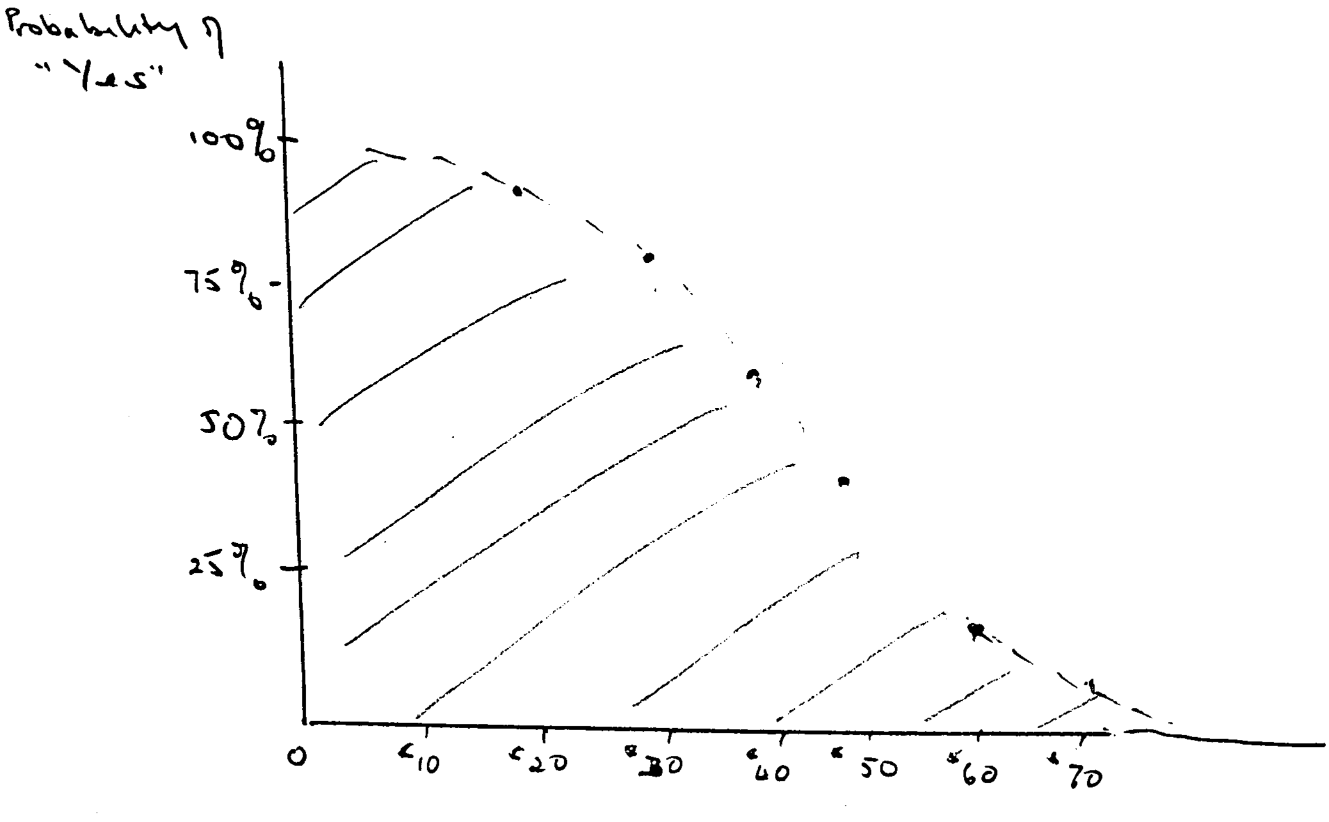
3. The "median WTP" is the dollar amount that has a 50% probability of a "yes"

4. The mean WTP is given by the area under the "yes" probability curve.





MEDIAN WTP = $42



MEAN WTP = $78

WTP to Avoid a Current Shortfall

A representative sample of the thirty-six editions of the current shortfall WTP question is as follows:

> Suppose that a community in which you live is facing an immediate and known shortfall of 10% that is expected to last for the next 14 *summer* days. This means that water supply is 10% less than demand. To correct this shortfall, the community is planning to restrict outdoor water use until the problem has passed. The Survey Residence can get a one-time exception from these water-use restrictions if you pay a one-time fee of $10.00.

Would you pay this one-time fee for this one-time exemption at the Survey Residence?

☐ Yes ☐ No ☐ Don't Know

Over all thirty-six scenarios, 437 respondents indicated they would be willing to pay the fee, whereas 1,595 indicated they would not be willing to pay the additional fee or did not know. Of these 1,595 respondents, 171 constituted nonprotest bids.

WTP/WTA to Modify Future Reliability

An example of the thirty-six future shortfall WTP questions is as follows:

> *Current*: For your community, suppose that water demand will exceed supply once every 10 years. This shortfall will have an average length of 14 days. Typically, water restrictions will be used in the years of shortfall to decrease demand 20% as needed to manage this shortfall.
>
> *Future*: Suppose that your community is considering an expansion of its water supply system to improve reliability. Subsequently, water demand will exceed supply once every 15 years. This shortfall will have an average length of 14 days. Typically, water restrictions will be used in times of shortfall to decrease demand 20% as needed to manage this shortfall.

To Summarize:	*Current*	*Future*	
Shortfall Frequency is once every	*10*	*15*	years.
Shortfall Length will average	*14*	*14*	days.
Shortfall Amount is	*20*	*20*	% of the city's demand.

> Please consider the next questions carefully.

What is the largest increase in your average water bill of $___ per month that you would be willing to pay each and every month to obtain this reliability improvement at the Survey Residence?

$___ per month

Households receiving a future shortfall WTA survey encountered a boxed summary nearly identical to that above followed by this question:

What reduction in your average water bill of $___ per month is the minimum you would be willing to accept each and every month in exchange for this reliability reduction at the Survey Residence?

I. Recap of the 1988 Study

The 1988 study of the willingness to pay for water in villages in northern areas of the Indian state of Kerala was part of a multicountry study of willingness to pay for water in rural areas of developing countries (World Bank Water Demand Research Team 1993). Singh and others (1993) reported the results of the 1988 contingent valuation study. The original study conducted contingent valuation surveys among families living in three types of traditional drinking water environments—abundant water, scarce water, and salt-water intrusion (the latter is referred to as saline water in text). Pairs of communities were selected within each of the three water environments. Each pair included a site-A community and a site-B community.

Households in the site-A communities had piped water service already available. Within the site-A communities, two types of households were surveyed: those who had already decided to connect at the existing connection costs and tariffs and those who had decided not to connect. Connectors were asked whether they would continue to connect, for a range of hypothetical tariffs higher than the current tariff. Nonconnectors were asked whether they would connect, for a range of hypothetical tariffs and connection costs.

Households in the site-B communities had no piped system but could expect to have one installed soon. Families were asked whether they would connect for a variety of hypothetical connection costs and monthly charges. All households in both sites in each type of water environment were asked about their willingness to pay if the reliability of the water system were improved.[1]

1. Reliability was characterized as follows: "Now I would like you to tell me what you would do if the service through the piped water system was greatly improved. Imagine that the water supply was available every day for most of the day, that the flow in the taps was always good, and that the water was clean."

Table 2. Comparison of National Oceanic and Atmospheric Administration (NOAA) Guidelines for Contingent Valuation Surveys with Guidelines Used in the Kerala 1988 Survey

NOAA guidelines	*Procedures used in the Kerala survey*
1. Interview in person rather than on the telephone.	Interviewed household head personally.
2. Question about a future, hypothetical occurrence rather than a historical event.	Survey asked about willingness to pay for a new or improved water system or a change in tariff policy, not for an existing service.
3. Referendum format in which respondent "votes" on a benefit with a known price (as opposed to open-ended questions).	Bidding game format used: interviewer suggested prices for monthly tariff or connection cost; respondent answered yes or no to each quote.
4. Interviewer begins with a scenario accurately describing the benefit or program.	Interviewer described the exact nature of the good or service to be provided: existing quality of piped water services into the home at various monthly tariffs and connection charges, plus improved quality of service at various monthly tariffs.
5. Survey reminds that payment for the new benefit reduces other consumption.	Survey had no reminders, but questions about other consumption and assets preceded the contingent valuation questions.
6. Survey reminds that substitutes exist for the hypothetical benefit in question.	In-depth questioning about cost, distance, and other characteristics of the household's sources of water (and volume of consumption) preceded the contingent valuation questions. No specific reminder was given during the contingent valuation questions, but it was clear to the respondent that the context of the survey was general use of various sources of water.
7. Follow-up questions to make sure respondent understands the choices made.	No follow-up questions, but interviewer evaluated the quality of response. There was a follow-up survey to ascertain actual behavior after the water system was put in place, and respondents were asked to explain divergence between hypothetical (1988) and actual behavior (1991).

survey there were 1,150 households distributed approximately evenly across the three types of water environments, including the entire population of connectors in the three A sites, a sample of nonconnectors in the A sites, and a sample of potential connectors in the B sites. Table 1 provides some basic information about the survey sites and shows how willingness to pay varied across connectors and nonconnectors in the A sites and overall for the B sites.

Table 1. *Location and Types of Survey Sites, with Sample Size and Maximum Willingness to Pay, Kerala, India*

Site characteristic	*A sites: improved water source available*		*B sites: no improved water source available*
	Connectors	*Nonconnectors*	
Water abundant			
Location	Ezhuvathuruthy	Ezhuvathuruthy	Nannamukku
All households	66	819	1,497
Household sample	66	100	200
Water scarce			
Location	Elapully	Elapully	Elapully
All households	86	723	876
Household sample	86	100	200
Water abundant but with saline intrusion			
Location	Ezhuvathuruthy	Ezhuvathuruthy	Vallikkunnu
All households	98	768	1,313
Household sample	98	100	200
Total household sample	250	300	600
Average maximum monthly tariff bid (rupees)	19.3	8.7	5.5
Average maximum connection charge bid (rupees)	n.a.	355	267
Average maximum bid for improved service (rupees)	25.0	9.7	n.a.

n.a. Not applicable because the bidding game was not conducted in that site.
Note: The exchange rate in 1988 was about 14 rupees per U.S. dollar.
Source: Authors' calculations.

In the period following the 1988 contingent valuation study, improved water services were made available in the scarce- and saline-water areas. Site-B households in these two areas had to decide whether to connect to the improved system. The original site-B families in these two water environments were resurveyed in 1991 to determine whether they had connected.

Table 4. *Comparison of Actual and Predicted Behavior of B-Site Households in Water-Scarce Areas*
(number of households)

Predicted behavior	*Actual behavior* *Did connect*	*Did not connect*	*Total*
Benefit revelation[a]			
Will connect	15	6	21
Will not connect	7	120	127
Total	22	126	148
Benefit transfer, all A sites[b]			
Will connect	27	76	103
Will not connect	1	65	66
Total	28	141	169
Benefit transfer, scarce-water A site[c]			
Will connect	28	100	128
Will not connect	0	41	41
Total	28	141	169
Behavioral modeling[d]			
Will connect	10	13	23
Will not connect	18	128	146
Total	28	141	169

a. Prediction based on 1988 survey of B-site households in the scarce-water area.
b. Prediction based on 1988 survey of A-site households in all three water areas.
c. Prediction based on 1988 survey of A-site households in the scarce-water area.
d. Prediction based on probit model of 1988 B-site households in the scarce-water area.
Source: Authors' calculations.

survey asked why. A variety of responses were given during these open-ended discussions. Only one emerged with any consistency—three of the thirteen respondents whose behavior was inconsistent with their 1988 response cited "changed economic circumstances." Two of the seven "unpredicted connectors" fell into this group, as did one of the six "unpredicted nonconnectors." For the nonconnectors, more than 75 percent indicated that "inability to pay the connection cost" was the primary reason for not connecting to the system, just as we had predicted from the analysis of the 1988 data.

Did reliability affect connection decisions in the sample in 1991? We predicted, on the basis of the 1988 results, that households already connected were concerned with reliability, but it was not an important consideration for those who were not already connected to a water system. The results of the ex post investigations confirm this finding. Only a small proportion of nonconnectors (13 percent) replied that an inadequate quantity of water from the system was the main reason for not connecting, and no respondents mentioned service quality as a decisive reason for not connecting. However, those who had connected in 1991 unanimously expressed dissatisfaction with the reliability of the system. Every connector complained about the quantity of water available from the system during the dry season, and all but one of the connectors found the quantity inadequate even in the monsoon season.