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Consumers' Perception of Piped Water Supply and Willingness to Pay for Improvements in Trinidad

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Abstract

Piped water is the main source of household water in Trinidad, yet service problems are widely reported while the national utility is under financial strain. Additionally, very little survey evidence exists on how consumers rate the service or whether they would pay more for improvements. This study used an online questionnaire, distributed through email, social media and mobile messaging, to which 107 adults aged 18–60 responded (a convenience sample); perceptions, coping behavior and willingness to pay (WTP) were examined with descriptive statistics, chi-square tests, rank correlations and logistic regression. Whilst all respondents were on a piped water supply, only 26.2% of respondents were on a scheduled supply. Low pressure (35.0% of reported problems), discoloured water (28.2%) and supply interruptions (16.9%) were the most frequently reported problems, while odour was rarely cited (4.0%). Satisfaction with water quality was moderate (44.9% satisfied, 41.1% neutral, 14.0% dissatisfied), and 38.3% of households treated water at home. Only 22.4% (95% CI 15.6–31.2%) were definitely willing to pay a higher monthly fee for improved water quality, 35.5% were unsure and 42.1% were not; among the 60 respondents who indicated an amount, 70.0% would accept an increase of no more than 5%, although only 39.1% of the 23 respondents who were definitely willing and gave an amount chose 5% or less. The most frequently cited reasons for declining were the belief that quality should improve at no extra cost (58.2%) and lack of trust in the water authority (55.7%), rather than inability to pay (16.5%). WTP rose with household income, from 0% in the lowest band to 50.0% above TT$20,000 per month, but was not significantly associated with residence, household size, satisfaction or home treatment in unadjusted tests. An ordinal logistic regression adjusted for these characteristics, income remained associated with WTP after adjustment for the other included characteristics (odds ratio 1.93 per income band, 95% CI 1.28–2.91), and no other included characteristic showed a statistically significant association with WTP. In this sample, willingness to pay for better piped water was therefore limited and concentrated among higher-income households, and lack of trust in the provider was among the most frequently cited reasons for reluctance. As hypotheses for further testing rather than firm recommendations, visible service improvements, transparent accountability and income-sensitive tariff design may be important for price-based funding of upgrades.

Keywords: willingness to pay; piped water supply; consumer perception; water utility; Trinidad; small island developing states

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1. Introduction

1.1. Background and Context

Reliable, safe piped water is a basic requirement for public health and economic activity. Access to safe drinking water is monitored globally by the WHO/UNICEF Joint Monitoring Programme [1], the United Nations General Assembly has recognised safe and clean drinking water as a human right [2], and the links between water supply and health are well established [3]. Beyond health, the quality of the service people receive at the tap shapes their daily routines and their trust in public institutions. Water security and service delivery in the Caribbean have been reviewed at the regional level [4], and benchmarking of state-owned water utilities in several Caribbean countries has examined service quality, financial performance, tariff affordability and governance [5].

In Trinidad, pipe-borne water supplied by the Water and Sewerage Authority (WASA) is the primary source for households, businesses and agriculture. The island receives substantial rainfall, but inefficient distribution, ageing infrastructure and non-revenue water losses mean that supply is uneven and service quality is inconsistent. Households respond by relying on alternatives such as rainwater harvesting, trucked water and point-of-use treatment, which impose private costs and tend to favour wealthier households. Because upgrading treatment and distribution infrastructure is costly, and because the utility faces operational and financial constraints, policymakers must decide not only what to improve but also who should pay and how. Answering these questions requires evidence on how consumers experience the existing service and on what they would be prepared to contribute.

1.2. Consumer Perceptions of Water Quality and Service

Consumers form judgements about piped water from a mix of direct sensory experience, the information they receive and their trust in the supplier. Cross-national work in the United Kingdom and Portugal found that estimates of water quality were influenced mostly by satisfaction with organoleptic properties, especially flavour, together with risk perception and contextual cues from the supply system, while risk perception was itself influenced by organoleptic properties, external information, past health problems and trust in water suppliers [6,7]. Trust and confidence in suppliers have accordingly become a recurring theme in the literature on consumer attitudes to drinking water [8]. However, perceptions also do not necessarily track measured quality. A community-based study in Newfoundland, Canada, found no association between public satisfaction with drinking water and the actual quality of the supplies concerned [9]. Perceptions nonetheless matter in their own right because they drive behavior as households that doubt their tap water may buy bottled water, install filters or boil water, and may withdraw support for the utility and its investment plans. Understanding which aspects of service consumers notice, and how they rate them, is therefore a prerequisite for prioritising improvements.

Evidence from Trinidad itself points to the importance of trust. A survey of public perception of treated wastewater reuse found that perceptions were shaped mainly by public mistrust of the local water authorities to deliver safe and good-quality water, together with limited knowledge of treatment processes and perceived health risks, and the authors recommended that efforts to build trust and acceptance be strengthened through improved services and public awareness programmes [10]. Although that study addressed a different question, it suggests that consumers' attitudes towards any new initiative of the water utility, including price changes, are likely to be conditioned by their confidence in the utility's performance.

Safe drinking water is a public-health requirement, and international guidance sets out the health-based framework within which drinking-water quality is assessed [11].

Consumers, however, respond to the risks they perceive, which may differ from measured quality, and perceived risk can shape both the use of alternatives to tap water and support for improvement [6]. Contingent valuation studies in middle-income settings have shown that households place a measurable value on safer drinking water. For example, in Parral, Mexico, households' WTP for safe drinking water was estimated using a survey approach [12]. Where perceived risk is high, demand for improvement may therefore be strong, but this demand will translate into support for price-based funding only if consumers believe that the improvements will materialise.

1.3. Willingness to Pay

Willingness to pay (WTP) is the usual measure of consumers' valuation of an improved service. In stated-preference surveys, households are asked whether they would accept a higher charge, or how much more they would pay, for a described improvement. The best-known approach, contingent valuation, elicits values by asking people directly in a survey [13], and it has been the subject of considerable debate among economists [14]. In developing-country settings, contingent valuation surveys have been used to estimate households' WTP for water services since at least the early 1990s [15], and practical guidance exists on administering such surveys where literacy, language and survey experience differ from those in industrialised countries [16]. Reviews of household water demand in developing countries show that a better understanding of how households use and value water is needed to manage and expand water systems more effectively [17]. Because stated responses are hypothetical, they are best read as indicators of attitudes and relative support rather than as forecasts of actual payment.

Income is the characteristic most consistently associated with WTP for improved water services. A ten-country study of tap water quality found that WTP increased with income, education, environmental concern, and health and taste concerns [18], and work in Mexico City reported that wealthier households were willing to pay higher amounts to avoid deterioration of service, while poorer households were primarily concerned with securing reliable service [19]. The latter finding links WTP to reliability, where supply is intermittent or pressure is low, the improvement that matters most to households may be continuity rather than water quality as such, and the capacity to pay for it differs by income. Other characteristics, including household size, education and place of residence, are commonly examined as well, since larger households use more water and urban and rural consumers may face different service problems, but whether they influence WTP appears to depend on context. Much of the evidence comes from other regions, and its applicability to Trinidad has not been established.

1.4. Pricing, Trust and Governance

WTP depends not only on ability to pay but also on whether consumers believe that additional payments will translate into better service. Mycoo [20] analysed Trinidad's flat water charge, which is based on property values, and concluded that it is economically inefficient, that its equity objective is compromised in practice, and that good water pricing and governance are needed; the same author has traced the shifting paradigms in Trinidad's water-provisioning policies [21]. Benchmarking of Caribbean utilities treats governance and tariff affordability as central issues [5]. Because WTP varies with income, tariff design involves trade-offs between equity, economic efficiency and cost recovery [22], and equity-based tariff structures that reflect the income distribution have been proposed as a means of raising revenue while targeting subsidies on lower-income households [19]. Where confidence in the provider is low, however, even well-designed pricing reforms may meet

resistance, which makes it important to measure not only how much consumers would pay but also why some are unwilling to do so.

1.5. Research Gap, Aim and Objectives

Most published evidence on perception and WTP comes from outside the Caribbean, and survey evidence from Trinidad that links consumers' experience of the service to their willingness to fund improvements remains limited. The aim of this study was to investigate consumer perceptions of piped water supply in Trinidad and to evaluate the factors associated with willingness to pay for improvements. The objectives were to (i) assess perceptions of supply and quality; (ii) identify the problems, perceived causes and household impacts reported; (iii) estimate WTP and the size of acceptable increases; and (iv) examine how WTP varies with demographic, geographic and experiential characteristics. Because service conditions in a piped network vary in space, the paper also considers the geographical dimension of the findings, as far as the data allow, and identifies how future work could address it more directly.

2. Methods

2.1. Study Design and Setting

A cross-sectional household survey was used to examine consumers' perceptions of piped water supply in Trinidad and their willingness to pay for improvements. A cross-sectional design was chosen because the aim was to describe perceptions and attitudes at a single point in time and to examine their association with respondent characteristics, rather than to follow households over time. Respondents classified their own community as urban or rural, a distinction explained in the questionnaire with relevant localized examples (San Fernando for urban, Barrackpore for rural). Respondents also chose the community in which they live from a list of 33 communities across Trinidad. The target population was adult residents of Trinidad who receive piped water from the Water and Sewerage Authority (WASA) and who could be reached online; the questionnaire offered age groups up to 50–60 years, so residents older than 60 were not captured. The questionnaire was titled and introduced as a survey of piped water supply and asked about "the piped water you receive at home" and was given only to households with a piped connection from WASA, so all respondents had a piped supply. The form itself contained no screening question on connection and offered no option to report having none. The issue examined is therefore the reliability and frequency of the supply rather than access to it. Because respondents were recruited by convenience sampling, the sample is not a probability sample of this target population; its profile is compared with national statistics.

2.2. Questionnaire Design

A structured questionnaire of 22 items in five sections was built in Google Forms (Supplementary Material). It covered six groups of items: (i) respondent characteristics (gender, age group, education, community of residence (33 listed communities), urban or rural residence, household size and monthly household income bracket, in four TTD bands); (ii) supply arrangements (whether the household was on a scheduled supply and, if so, the days of delivery); (iii) perceived quality of the piped water and satisfaction with it; (iv) problems experienced, their perceived causes and their impacts on the household; (v) home water treatment, concern about pollution, the importance of six improvement attributes and preferred improvement strategies; and (vi) WTP for improved water quality, including the acceptable increase as a percentage of the current bill and the reasons given for not paying. Ordinal items used a five-point Likert scale (1–5), with 1 the most favourable, most important or highest-concern response. The overall-quality and satisfaction items

were presented as grids with a check-all-that-apply instruction, so 7 respondents ticked two adjacent options for quality and 6 for satisfaction (12 respondents in all); the less favourable of the two was analysed. The six improvement attributes were each rated separately from 1 (most important) to 5 (least important) and were not forced into a ranking, so several attributes could receive the same rating. Only four items were optional (days of delivery, reasons for not paying, acceptable increase and home treatment methods); all others were compulsory. Willingness to pay was elicited with three linked items. First, respondents were asked whether they would be willing to pay a higher monthly water fee for improved water quality (yes, not sure or no). The two follow-up items were worded for respondents who were willing and not willing: those willing to pay were asked what additional amount, as a percentage of their current bill, they would consider reasonable (up to 5%, up to 10%, up to 20% or more than 20%), and those not willing were asked for their reasons. Both follow-up items were optional and the printed form shows no compulsory routing between them, so respondents who answered not sure could answer either or both, and the analysis uses all responses received (60 acceptable-increase responses and 79 sets of reasons); of the 60 acceptable-increase responses, 23 came from respondents who answered yes, 21 from those who were not sure and 16 from those who answered no, and of the 79 sets of reasons, 42 came from those who answered no, 35 from those who were not sure and 2 from those who answered yes, which confirms that the follow-up items were not routed. In welfare-economic terms, the measure is a compensating surplus for an improvement: the largest increase in the household's bill that would leave it no worse off than at the current service and the current bill [23,24]. It is not an equivalent surplus, which would measure the amount a household would need to be paid to forgo the improvement. The yes, not sure and no responses measure acceptance of a higher charge, whereas the percentage categories measure the size of the increase regarded as reasonable; the two are analysed separately and are referred to below as the WTP response and the acceptable increase.

2.3. Data Collection and Sample Size

The questionnaire was distributed online through email, social media and mobile messaging between 10 February and 3 April 2026. Respondents were recruited by non-probability (convenience) sampling, and participation was voluntary. Responses were exported to Excel and then imported into IBM SPSS Statistics Version 29 for cleaning and analysis. Because the number of people who saw the invitation is unknown, a response rate cannot be calculated.

The required sample size for estimating a proportion was calculated with Cochran's formula [25]:

$$n_0 = \frac{z^2\, p\,(1-p)}{e^2}$$

where z is the standard normal value for the chosen confidence level ($z = 1.96$ for 95% confidence), p is the expected proportion ($p = 0.5$, which gives maximum variability) and e is the acceptable margin of error ($e = 0.05$). Substituting these values gives

$$n_0 = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2} \approx 385.$$

The 107 responses obtained correspond to a margin of error of

$$e = z\sqrt{\frac{p\,(1-p)}{n}} = 1.96\sqrt{\frac{0.25}{107}} \approx 0.095,$$

that is, ±9.5% at 95% confidence for a simple random sample of this size. Because convenience sampling was used, this figure and the confidence intervals reported below should

not be interpreted in the conventional probability-sampling sense. It describes only the sampling variability that would apply if respondents had been selected at random, and they do not account for selection bias. Results should therefore be read as indicative of this sample rather than as population estimates.

2.4. Data Analysis

Descriptive statistics (frequencies, percentages, means and standard deviations) were computed for all items, and 95% confidence intervals for proportions are Wilson intervals. Multi-response items (problems, causes, impacts, reasons, treatment methods and improvement strategies) are reported as shares of mentions or of respondents answering, as stated in the text. Mentions are the options ticked plus any substantive free-text "other" answer; answers such as "none" or "no issues" were not counted as mentions. WTP was recorded as yes, not sure or no and the acceptable increase in four ordered percentage categories. Because the 107 respondents were spread across 33 listed communities, most communities had very few respondents; communities were therefore grouped into broader areas and the WTP response, satisfaction and the problems reported were compared across areas descriptively and with Monte Carlo permutation tests of the chi-square statistic (20,000 permutations).

Associations between WTP and respondent characteristics (income, residence, household size, satisfaction with water quality and home treatment) were tested using Pearson's chi-square test, Cramér's V as a measure of effect size, Fisher's exact test for 2 × 2 comparisons, and Spearman's rank correlation for ordered categories ($\alpha = 0.05$). Because some cells had expected counts below five, asymptotic p-values are approximate; for the income association, a Monte Carlo permutation test gave the same conclusion ($p = 0.013$).

Because tests of single characteristics cannot show whether income remains associated with WTP after other characteristics are taken into account, multivariable models were also fitted. The primary model was an ordinal (proportional-odds) logistic regression of the three-level WTP response (no, not sure, yes) on household income band (as an ordered score), residence (urban, rural or not sure), household size (1–4 or 5 or more persons), satisfaction with water quality (satisfied or neutral/dissatisfied) and home treatment (yes or planning, or no). The proportional-odds assumption was checked with the test of parallel lines and multicollinearity with variance inflation factors. Sensitivity analyses repeated the ordinal model after resolving double-ticked satisfaction answers in the other direction, after excluding respondents unsure of their residence, with income entered as a categorical variable, after adding age and education, and after adding area of residence. As a sensitivity analysis, a binary logistic regression of a yes response against not sure or no was fitted with the same predictors; because only 24 respondents answered yes, which limits the number of predictors that can be estimated reliably [26,27], Firth's penalised-likelihood estimation was used [28]. Results are reported as odds ratios with 95% confidence intervals. Given the small, non-random sample, the models are exploratory: they are used to examine whether the unadjusted income association persists, not to produce population estimates. Finally, among respondents who gave an acceptable increase, the association between the size of the increase (ordered categories) and household income was examined with Spearman's rank correlation, so that the amount of WTP is analysed separately from the yes, not sure or no response. The multivariable models and the permutation tests were computed in Python 3.13 (statsmodels and SciPy); Firth's regression, with profile penalised-likelihood confidence intervals, was implemented directly.

3. Results

3.1. Respondent Profile

The sample (N = 107) was young, with 61.7% aged 18–30 and none older than 60 (Table 1). It was balanced by gender (51.4% male, 44.9% female, 3.7% other) and well educated: 43.9% held secondary qualifications and 35.5% a bachelor's degree, with the remaining 20.6% reporting primary-level or postgraduate qualifications. Urban residents made up 54.2% and rural residents 39.3%; 6.5% were unsure how to classify their community. By community, respondents lived in 29 of the 33 listed communities, the largest numbers being in Princes Town (n = 11) and Barrackpore (n = 9), while 13 communities contributed only one or two respondents each. Half of households (50.5%) had three or four members, and 65.4% reported monthly household incomes of TT$5000–20,000.

Table 1. Respondent characteristics (N = 107).

Characteristic	Category	n	%
Gender	Male	55	51.4
	Female	48	44.9
	Other	4	3.7
Age (years)	18–30	66	61.7
	31–39	16	15.0
	40–49	17	15.9
	50–60	8	7.5
Residence	Urban	58	54.2
	Rural	42	39.3
	Not sure	7	6.5
Household size	1–2	24	22.4
	3–4	54	50.5
	5–6	19	17.8
	More than 6	10	9.3
Monthly household income (TT$)	Less than 5000	13	12.1
	5000–10,000	37	34.6
	10,000–20,000	33	30.8
	More than 20,000	24	22.4

Compared with the 2011 Population and Housing Census [29], the sample over-represents younger and better-educated people. Persons aged 20–29 years made up about 31% of the population aged 20–59 years, against 61.7% of respondents aged 18–30 (the age bands are only approximately aligned), while those aged 50–59 years made up about 21% of the national group against 7.5% of respondents aged 50–60. The gender split was close to the national balance (50.2% male nationally against 51.4% here). A bachelor's or master's degree was the highest qualification of about 5% of persons aged 15 years and over nationally, against 45.8% of respondents holding a bachelor's or master's degree (51.4% including doctorates). The education item offered only primary, secondary, bachelor's, master's and PhD categories, with no category for diploma, technical or vocational qualifications, so the comparison with census categories is approximate. Households of one or two persons were under-represented (about 38% of households nationally against 22.4% here) and households of three or four persons over-represented (about 39% against 50.5%), while households of five or more persons were similar (about 23% against 27.1%). No national benchmark was available for the income bands used or for the urban–rural classification, which respondents assigned themselves. The sample therefore does not represent the target population, and the results describe this sample. Post-stratification weights were not

applied because several cells, such as respondents aged 50–60 (n = 8), are too small for stable weights.

3.2. Supply and Perceived Quality

Only 28 respondents (26.2%) reported being on a scheduled supply; the remaining respondents received water without a schedule. All respondents were households with a piped connection from WASA, to whom the questionnaire was given, and every respondent rated the piped water received at home (a compulsory item); the problem in this sample was therefore the reliability and frequency of supply, not access. The 30 respondents who answered the optional follow-up item on delivery days (25 of the 28 respondents reporting a schedule and, because the item was not restricted to them, five who had answered no, four of whom ticked all seven days) received water on about 4.2 days a week on average (3.8 days among the 25 on a schedule), most often on Sundays (66.7%) and least often on Fridays (50.0%); these percentages are the shares of respondents who reported receiving water on each day, not measures of supply disruption, and they were not verified against supplier records. Overall quality was rated moderately (mean 2.56, SD 0.92; 1 = excellent): "good" was the most common rating, followed by "fair", and fewer than one in six respondents rated quality poor or very poor. For satisfaction with water quality, four respondents (3.7%) were very satisfied, 44 (41.1%) satisfied, 44 (41.1%) neutral, 10 (9.3%) dissatisfied and five (4.7%) very dissatisfied (mean 2.70, SD 0.87).

Respondents reported 177 problem mentions (Figure 1; four respondents reported no problem and are not counted). Low pressure and discoloured or cloudy water dominated, while pungent odour was rarely cited. Pressure and interruptions together accounted for 52.0% of mentions, against 28.2% for appearance and 18.1% for taste and smell combined. Respondents attributed problems mainly to institutional and infrastructure factors (65.9% of 270 mentions): poor management by the water authority (20.4%), old or damaged pipelines (20.0%), inadequate treatment facilities (13.0%) and pipeline breakage or construction works (12.6%). High demand relative to supply (18.1%), seasonal or drought conditions (9.3%) and industrial or agricultural pollution (6.3%) were mentioned less often.

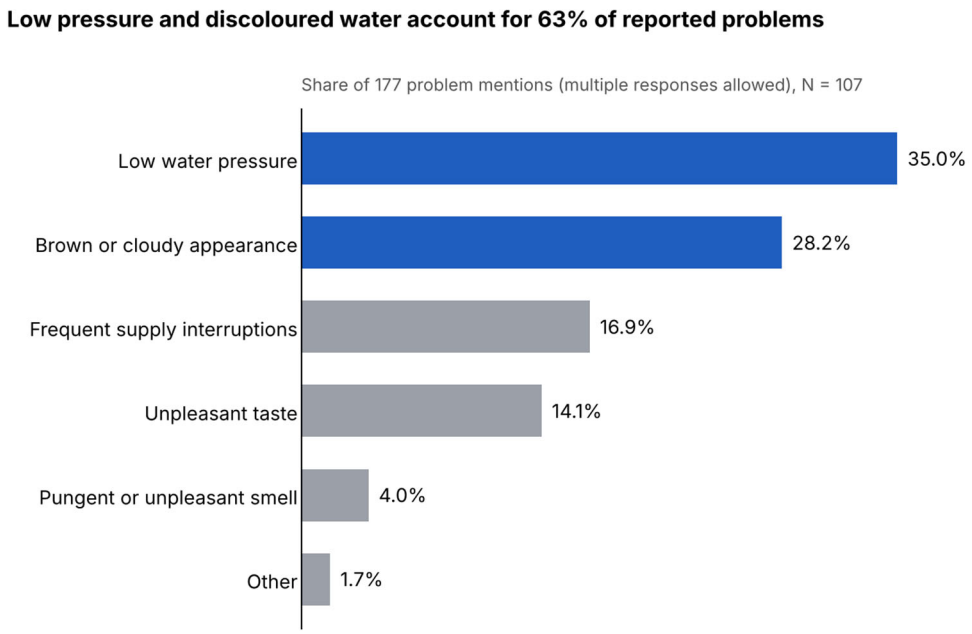


Figure 1. Problems reported with piped water supply.

3.3. Household Impacts and Improvement Priorities

Of 218 impact mentions (answers stating that there was no impact were not counted), the most common were a higher cost of living from buying bottled or filtered water (27.1%), inability to wash clothes (24.3%), inability to cook (13.8%), inability to shower or maintain hygiene (12.8%), increased health concerns (12.4%) and damage to appliances (7.8%), while inability to attend school or work made up the remaining 1.8%. In total, 41 respondents (38.3%; 95% CI 29.7–47.8%) used additional treatment at home and a further 15 (14.0%) planned to install it. Among the 66 respondents who named at least one method, filters (74.2%), boiling (30.3%) and rainwater harvesting (27.3%) were the most common; distillation (7.6%), chemical disinfection (4.5%) and reverse osmosis (1.5%, written in under "Other") were rare. The methods item was optional and not restricted to those answering yes: all 41 who reported using additional treatment named a method, but so did 11 of the 15 who planned to install treatment and 14 of the 51 who answered no, who may have listed practices such as boiling or rainwater harvesting that they did not regard as additional treatment (three further respondents wrote that they used none).

Concern about pollution and water quality in Trinidad was substantial: 56 respondents (52.3%) gave one of the two highest concern ratings (mean 2.47, SD 1.28). When asked what matters most when paying for an improved supply, all six attributes were rated highly and differed little (Table 2); reduced turbidity had the lowest mean rating (most important) and better taste the highest. Preferred improvement strategies were upgrading or replacing old infrastructure (22.5%), increasing storage and supply resources (18.1%), improving management and efficiency of local authorities (16.5%), advanced treatment technologies (15.7%), stricter pollution controls (13.6%) and public awareness of conservation (13.4%).

Table 2. Ordinal survey items (N = 107; 1 = most favourable, most important or highest concern).

Item	Mean	SD
Overall quality of piped water	2.56	0.92
Satisfaction with water quality	2.70	0.87
Concern about pollution and water quality	2.47	1.28
Importance: reduced turbidity (clearer water)	1.76	1.31
Importance: fewer supply interruptions	1.79	1.21
Importance: removal of contaminants	1.81	1.33
Importance: better smell	1.89	1.29
Importance: higher water pressure	1.96	1.27
Importance: better taste	2.03	1.39

3.4. Willingness to Pay

Only 24 respondents (22.4%; 95% CI 15.6–31.2%) were willing to pay a higher monthly fee for improved water quality; 38 (35.5%; 27.1–44.9%) were not sure and 45 (42.1%; 33.1–51.5%) were unwilling. Of the 60 respondents who indicated a reasonable additional amount (as a percentage of the current bill), 70.0% chose up to 5%, 21.7% up to 10%, about 7% up to 20% and about 2% more than 20%. Of these 60, 23 had answered yes to the first item, 21 not sure and 16 no, and the amount differed accordingly: all 16 of those who answered no and 17 of the 21 (81.0%) who were not sure chose up to 5%, compared with 9 of the 23 (39.1%) who answered yes, of whom 10 (43.5%) chose up to 10% and four (17.4%) up to 20%. The overall figure of 70.0% therefore largely reflects respondents who were not definitely willing to pay, and some respondents who answered no may have read the item as the smallest increase they could tolerate rather than as an amount they were willing to pay. Because the amount was recorded in percentage bands without a bid design,

these figures describe the size of increase respondents regarded as reasonable and are not estimates of monetary WTP.

Referring to Figure 2, among the 79 respondents who gave reasons for not paying (percentages are shares of these respondents), the leading reasons were the belief that quality should improve without extra cost (58.2%) and lack of trust that the water authority would deliver real improvements (55.7%). Already paying too much (31.6%) and financial constraints (16.5%) were less common, and 11.4% were satisfied with current quality.

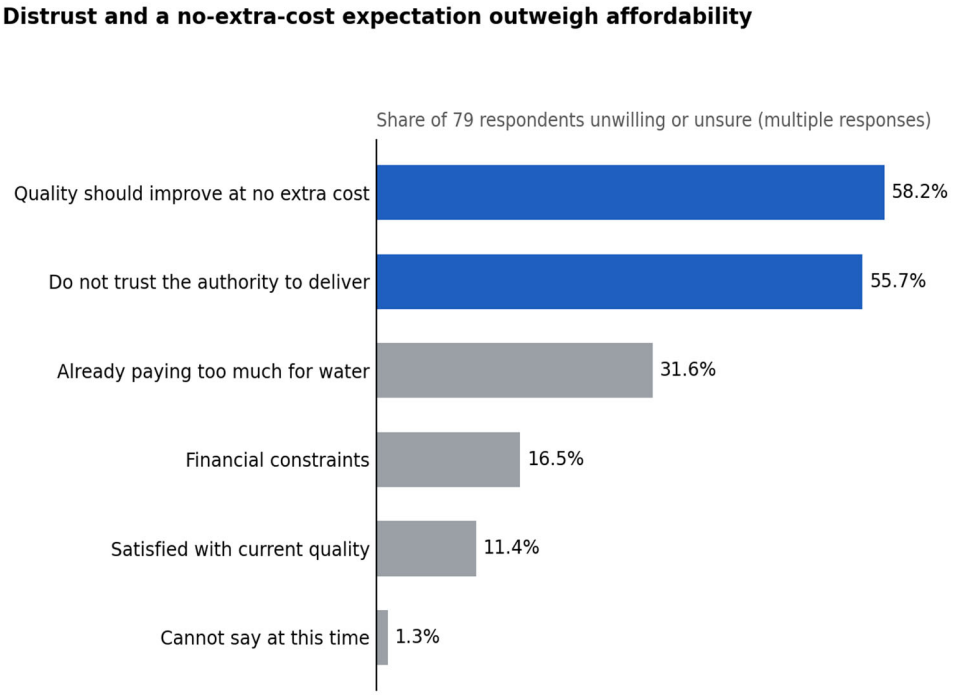


Figure 2. Reasons for being unwilling or unsure about paying a higher monthly fee.

The WTP response differed significantly by household income in unadjusted tests ($\chi^2(6) = 16.16$, $p = 0.013$, Cramér's V = 0.27; Table 3, Figure 3). No respondent in the lowest income band said yes, whereas half of those above TT$20,000 did; the latter group had almost six times the odds of answering yes of all other respondents (12/24 vs. 12/83; odds ratio 5.9, Fisher's exact $p < 0.001$), and income band was positively correlated with a yes response (Spearman $\rho = 0.36$, $p < 0.001$).

Table 3. WTP response (willingness to pay a higher monthly fee: yes, not sure or no), by respondent characteristic (row percentages).

Characteristic	Category	n	Yes, n (%)	Not Sure, n (%)	No, n (%)	Test
Household income (TT$)	<5000	13	0 (0.0)	6 (46.2)	7 (53.8)	$\chi^2(6) = 16.16$, $p = 0.013$
	5000–10,000	37	5 (13.5)	15 (40.5)	17 (45.9)	
	10,000–20,000	33	7 (21.2)	11 (33.3)	15 (45.5)	
	>20,000	24	12 (50.0)	6 (25.0)	6 (25.0)	
Residence	Urban	58	15 (25.9)	17 (29.3)	26 (44.8)	$\chi^2(4) = 4.28$, $p = 0.369$
	Rural	42	7 (16.7)	17 (40.5)	18 (42.9)	
	Not sure	7	2 (28.6)	4 (57.1)	1 (14.3)	
Household size	1–2	24	9 (37.5)	7 (29.2)	8 (33.3)	$\chi^2(6) = 6.96$, $p = 0.325$
	3–4	54	10 (18.5)	21 (38.9)	23 (42.6)	

Table 3. *Cont.*

Characteristic	Category	n	Yes, n (%)	Not Sure, n (%)	No, n (%)	Test
	5–6	19	5 (26.3)	6 (31.6)	8 (42.1)	
	>6	10	0 (0.0)	4 (40.0)	6 (60.0)	
Satisfaction with quality	Very satisfied	4	0 (0.0)	1 (25.0)	3 (75.0)	$\chi^2(8) = 7.32$, $p = 0.503$
	Satisfied	44	10 (22.7)	17 (38.6)	17 (38.6)	
	Neutral	44	10 (22.7)	18 (40.9)	16 (36.4)	
	Dissatisfied	10	2 (20.0)	2 (20.0)	6 (60.0)	
	Very dissatisfied	5	2 (40.0)	0 (0.0)	3 (60.0)	
Home treatment	Yes	41	9 (22.0)	14 (34.1)	18 (43.9)	$\chi^2(4) = 0.90$, $p = 0.925$
	No	51	11 (21.6)	20 (39.2)	20 (39.2)	
	Planning to install	15	4 (26.7)	4 (26.7)	7 (46.7)	

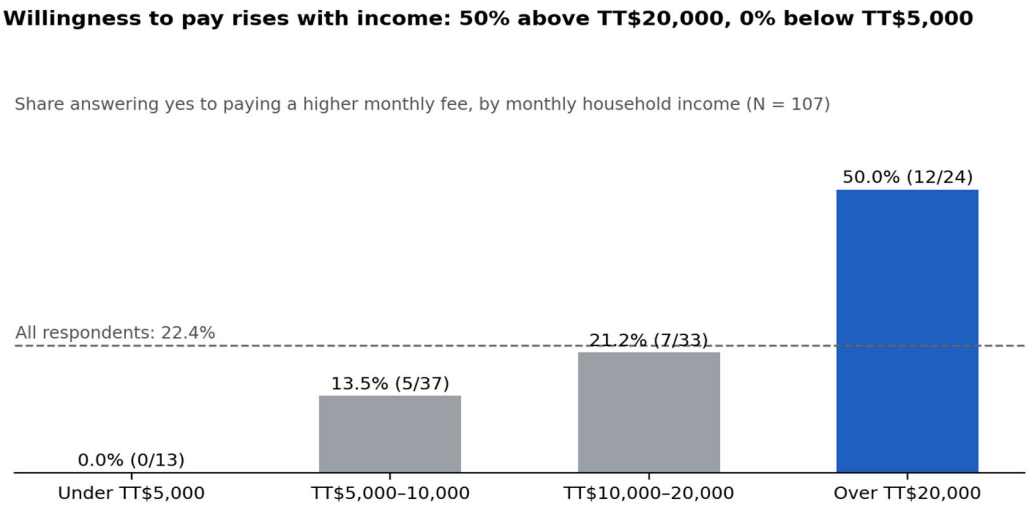


Figure 3. Share answering yes to paying a higher monthly fee (the WTP response, not the amount of WTP), by household income band.

WTP was not significantly associated with residence ($\chi^2(4) = 4.28$, $p = 0.37$), household size ($\chi^2(6) = 6.96$, $p = 0.33$), satisfaction with water quality ($\chi^2(8) = 7.32$, $p = 0.50$; $\rho = 0.06$, $p = 0.53$) or home treatment ($\chi^2(4) = 0.90$, $p = 0.93$). Rural respondents were, if anything, less likely than urban respondents to say yes (16.7% vs. 25.9%; Fisher's exact $p = 0.33$), and no respondent in households of more than six people said yes (0/10), although households of five or more did not differ significantly from smaller ones (17.2% vs. 24.4%; $p = 0.60$).

3.5. Multivariable Analysis and Acceptable Increase by Income

The multivariable models used all 107 respondents, because no item had missing data. In the ordinal logistic regression of the WTP response, household income remained positively associated with a more favourable response after adjustment for residence, household size, satisfaction with water quality and home treatment: each step up the four income bands was associated with 1.93 times the odds of a response in a higher WTP category (95% CI 1.28–2.91, $p = 0.002$; Table 4, Figure 4), compared with an unadjusted odds ratio of 1.78 (95% CI 1.21–2.62, $p = 0.003$). None of the other predictors was associated with the WTP response: the odds ratios for rural residence (1.12), a household of five or more (0.62), neutral or dissatisfied rather than satisfied (1.03) and home treatment (0.79) were close to one, with wide confidence intervals that include effects in either direction. Respondents who were unsure how to classify their community had higher but imprecisely estimated odds

(OR 2.84, 95% CI 0.65–12.38; only seven respondents). The model was significant overall (likelihood-ratio $\chi^2(6) = 12.99$, $p = 0.043$; Nagelkerke $R^2 = 0.13$). The test of parallel lines did not reject the proportional-odds assumption ($\chi^2(6) = 8.76$, $p = 0.19$), and all variance inflation factors were below 1.2 (maximum 1.16). The Firth binary logistic regression of yes against not sure or no gave consistent results: income was again the only associated predictor (odds ratio per band 2.84, 95% CI 1.61–5.46, $p < 0.001$) and the confidence intervals of all other predictors included one. The larger odds ratio in the binary model reflects its focus on a definite yes: in separate binary comparisons the odds ratio for income was 1.59 for a response of not sure or yes versus no, and 3.16 for yes versus not sure or no.

Table 4. Multivariable models of the WTP response (odds ratios with 95% confidence intervals).

Predictor	Ordinal Model OR (95% CI)	*p*	Firth Binary Model OR (95% CI)	*p*
Household income (per band)	1.93 (1.28–2.91)	0.002	2.84 (1.61–5.46)	<0.001
Residence: rural vs. urban	1.12 (0.51–2.47)	0.78	0.83 (0.27–2.47)	0.73
Residence: not sure vs. urban	2.84 (0.65–12.38)	0.17	2.34 (0.35–13.60)	0.36
Household size: 5 or more vs. 1–4	0.62 (0.27–1.43)	0.26	0.55 (0.16–1.62)	0.28
Satisfaction: neutral/dissatisfied vs. satisfied	1.03 (0.47–2.23)	0.95	1.21 (0.44–3.47)	0.71
Home treatment: yes/planning vs. no	0.79 (0.36–1.73)	0.55	0.82 (0.29–2.25)	0.69

Note: n = 107 for both models. OR above 1 indicates higher odds of a more favourable WTP response (ordinal model: a response in a higher category; Firth model: a yes). Income is scored 1–4 across the four bands. Reference categories: urban, household of 1–4 persons, satisfied, no home treatment. Ordinal model: proportional-odds logistic regression with Wald 95% confidence intervals; likelihood-ratio $\chi^2(6) = 12.99$, $p = 0.043$; test of parallel lines $\chi^2(6) = 8.76$, $p = 0.19$. Firth model: penalised-likelihood estimation with profile-likelihood 95% confidence intervals and likelihood-ratio *p*-values (24 yes responses).

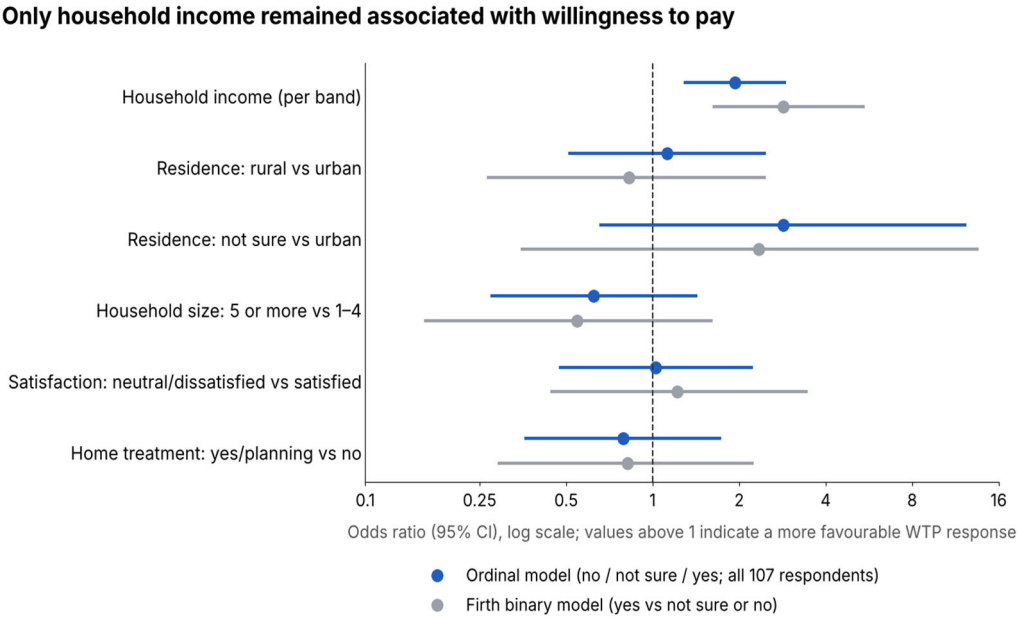


Figure 4. Adjusted odds ratios (95% confidence intervals) for the WTP response from the ordinal logistic regression and the Firth binary logistic regression (Table 4).

Sensitivity analyses did not change the conclusion. The income odds ratio in the ordinal model was 1.94 when double-ticked satisfaction answers were resolved in the favourable direction, 1.97 when the seven respondents unsure of their residence were excluded, 1.87 (95% CI 1.23–2.85) when age (18–30 years or older) and degree-level education were added, neither of which was associated with WTP, and 2.01 (95% CI 1.31–3.07) when area of

residence was added. A model with income as categories did not fit significantly better than the linear score (likelihood-ratio $\chi^2(2) = 2.62$, $p = 0.27$), although the contrast was driven by the highest band: above TT$20,000 against below TT$5000, OR 8.3 (95% CI 2.1–33.0).

Among the 60 respondents who gave an acceptable increase, the size of the increase rose significantly with household income (Spearman $\rho = 0.63$, $p < 0.001$; Kruskal–Wallis $p < 0.001$). All seven respondents in the lowest income band and 21 of 22 (95.5%) in the TT$5000–10,000 band chose up to 5%, compared with 10 of 15 (66.7%) in the TT$10,000–20,000 band and 4 of 16 (25.0%) above TT$20,000, where eight chose up to 10%, three up to 20% and one more than 20%. The association was weaker but still significant among the 23 respondents who had answered yes ($\rho = 0.50$, $p = 0.015$), so it is not an artefact of including respondents who were unsure or unwilling. Because the amount was recorded in four broad categories and most respondents chose the lowest, the correlation indicates the direction of the relationship rather than its size, and it does not estimate monetary WTP.

3.6. Variation by Area of Residence

Respondents were grouped into six areas (Table 5), with 7 to 33 respondents per area. The WTP response did not differ significantly by area (Monte Carlo exact test $p = 0.16$), nor did satisfaction with water quality (satisfied versus neutral or dissatisfied, $p = 0.67$) or the shares reporting low pressure ($p = 0.27$) or frequent supply interruptions ($p = 0.94$). The share answering yes ranged from 0% (0/7) in the south-west and 9.1% (3/33) in the south and south-east to 35.5% (11/31) in the East–West Corridor, and the contrast between a definite yes and other responses was borderline ($p = 0.07$). The south and south-east is also the area with the most rural respondents (25 of the 42 rural respondents), and the area was strongly associated with the urban–rural classification ($p < 0.001$). The share reporting low pressure was lowest in the East–West Corridor (41.9%) and highest in the north-east (6/7). When area was added to the ordinal model, the income odds ratio was unchanged (2.01), and the south and south-east had lower odds of a favourable WTP response than the East–West Corridor (OR 0.24, 95% CI 0.07–0.78, $p = 0.017$); this contrast is one of five area comparisons in a model with eleven predictors and should be treated as a hypothesis. Because the areas contain few respondents, these comparisons are descriptive.

Table 5. WTP response, satisfaction and reported problems by area of residence (n and row percentages).

Area	n	Rural, n	Yes to WTP, n (%)	Neutral or Dissatisfied, n (%)	Low Pressure, n (%)	Interruption, n (%)
Port of Spain and north-west	9	0	3 (33.3)	3 (33.3)	6 (66.7)	3 (33.3)
East–West Corridor	31	3	11 (35.5)	17 (54.8)	13 (41.9)	8 (25.8)
Central	20	8	6 (30.0)	11 (55.0)	12 (60.0)	7 (35.0)
South and south-east	33	25	3 (9.1)	20 (60.6)	20 (60.6)	9 (27.3)
South-west	7	2	0 (0.0)	5 (71.4)	5 (71.4)	1 (14.3)
North-east	7	4	1 (14.3)	3 (42.9)	6 (85.7)	2 (28.6)
All respondents	107	42	24 (22.4)	59 (55.1)	62 (57.9)	30 (28.0)

Note: Areas (communities): Port of Spain and north-west (Port of Spain, Diego Martin, Westmoorings); East–West Corridor (Aranguez, Arima, Bamboo/Valsayn, Curepe, El Dorado, San Juan, St. Augustine, Trincity, Tunapuna); Central (Chaguanas, Cunupia, Couva, Claxton Bay, Freeport, Gasparillo); South and south-east (Princes Town, Barrackpore, Penal, Debe, Moruga, Rio Claro); South-west (San Fernando, Fyzabad, Point Fortin); North-east (Sangre Grande, Toco). No respondent lived in Guayaguayare, La Brea, Mayaro or Piarco. Percentages are shares of respondents in each area; interruptions and low pressure were reported as problems in the question on problems noticed.

4. Discussion

This study examined how consumers in Trinidad perceive their piped water supply and what they would be willing to pay to improve it. Satisfaction was moderate, the most frequently reported problems concerned pressure, interruptions and discolouration, and only a minority of respondents were definitely willing to pay more. The sections below interpret these findings in relation to the existing literature, consider their implications and set out the limitations of the study.

4.1. Perceptions of Supply and Quality

Perceptions are moderate, and reliability matters as much as quality. Satisfaction was neither uniformly low nor high: 44.9% were satisfied, 41.1% neutral and 14.0% dissatisfied, and most respondents were not on a supply schedule. The problems reported were as much about delivery as about water quality: low pressure and interruptions made up just over half of all problem mentions, and discolouration was the leading quality complaint, while odour was seldom raised. This is broadly consistent with literature showing that perceptions of water quality rest heavily on sensory properties and on contextual cues from the supply system [6,7], but it does not support a picture of widespread dissatisfaction with water quality. Peters and Goberdhan [10] reported that most participants in their Trinidad survey, conducted in 2014, were dissatisfied with the current water service, a considerably higher level than found here; differences in sampling, timing and the wording of the question may account for this, and the comparison should be treated cautiously. Respondents rated pressure as a frequent problem yet rated it as less important than turbidity, contaminant removal and interruptions when asked what they would pay for, which suggests, tentatively, that visible water quality and supply continuity are the attributes respondents regard as most important when considering payment. This interpretation rests on the mean ratings of stated priorities (each attribute was rated separately, not ranked), which differed little between attributes (Table 2), and not on a direct analysis of how attributes affect WTP, for which a choice experiment would be needed.

4.2. Household Costs and Coping

Households already bear private costs. More than a third of respondents treated water at home and a further 14.0% planned to, and the single most common household impact was the extra expense of bottled or filtered water. These costs mean that a tariff increase would be layered on top of existing outlays, which may partly explain the reluctance to pay more observed here, and they fall hardest on lower-income households.

4.3. Willingness to Pay

Willingness to pay was limited and appeared to be linked to trust. Fewer than one in four respondents were definitely willing to pay more, and those who were favoured modest increases: of the 23 who said yes and gave an amount, 39.1% chose up to 5% and 82.6% up to 10% of the current bill. The reasons most often given for declining (respondents could select more than one) were expectation and trust rather than affordability: 58.2% felt quality should improve at no extra cost and 55.7% doubted that the authority would deliver, whereas only 16.5% cited financial constraints. This echoes the view that WTP reflects confidence in institutional performance as much as ability to pay [6,8,10], and it suggests that proposals for price increases without demonstrated service gains may meet resistance. The 35.5% who were unsure may be persuadable if improvements are visible and credibly tied to revenue.

In this sample, income, but not location or household size, was associated with willingness to pay. The strong income gradient agrees with the wider literature [18,19]. By

contrast, the expectation that rural consumers, who may face greater reliability problems, and larger households, which use more water, would be more willing to pay was not borne out; if anything, the observed direction was the opposite, though neither difference was statistically significant. With only 107 respondents, a modest effect cannot be ruled out, and the multivariable models adjust for correlation between these characteristics (variance inflation factors were all below 1.2) but are exploratory, with only 24 yes responses. The absence of an association between satisfaction and WTP in the unadjusted tests does not show that personal experience of service quality is less influential than income, because the tests examine each characteristic separately and have limited power in a sample of this size. In the multivariable models, income remained associated with WTP after adjustment (odds ratio 1.93 per income band), whereas satisfaction was not (odds ratio 1.03 for neutral or dissatisfied versus satisfied; 95% CI 0.47–2.23), which gives some support to the view that income was more closely related to WTP than satisfaction was in this sample. The satisfaction estimate is imprecise, however, and the two variables are measured on different scales, so the data do not allow a formal comparison of their relative importance. Attitudes towards the provider were not measured for the whole sample (trust was recorded only as a reason given by respondents who were unwilling or unsure), so their contribution cannot be compared with that of income here.

The multivariable analysis addresses the main weakness of the unadjusted tests. The association between income and WTP was not explained by residence, household size, satisfaction or home treatment: the odds ratio per income band was 1.93 after adjustment, against 1.78 before, and it was similar in the Firth binary model and across the sensitivity analyses, including when age, education and area of residence were added. The effect is substantial: the proportional-odds model implies that, other things equal, a household in the highest income band had about seven times the odds of a more favourable WTP response than one in the lowest ($1.93^3 \approx 7.2$), although the categorical model shows that the contrast came mainly from the highest band (above TT$20,000) and the estimate is imprecise. The amount that respondents regarded as reasonable rose with income in the same way, so income was associated both with whether respondents would accept an increase and with how large an increase they would accept. None of the other characteristics was associated with WTP after adjustment, including satisfaction and home treatment, which suggests that personal experience of service quality and existing private spending did not translate into a greater readiness to pay in this sample. These null findings should be read cautiously: the confidence intervals are wide (for example, 0.47–2.23 for satisfaction in the ordinal model), and with only 24 yes responses there are about four events per predictor, which is why Firth's method was used for the binary model [26,27]. Age and education were not included in the main models to preserve degrees of freedom; adding them did not alter the income result. The models cannot adjust for factors that were not measured, such as the size of the household's current bill, trust in the provider or the quality of service actually received, and income may partly stand in for these, so residual confounding and selection into an online sample remain plausible. The results are best treated as hypotheses about which households a price-based funding model is most likely to reach.

The WTP item described the improvement only as improved water quality and did not specify a common level of service. The item also referred to improved "water quality", whereas the problems reported most often concerned pressure and interruptions, so respondents may have read "quality" narrowly (appearance, taste and smell) or broadly (the whole service). Respondents may therefore have had different improvements in mind, and those with low trust in the provider may have expected a smaller improvement than other respondents, which would lower their stated WTP independently of the value they place on a given improvement. The results are therefore best read as the propensity to accept a

price increase for an improvement as each respondent imagined it, not as the benefit of one standardised upgrade. Future contingent valuation studies or choice experiments should present all respondents with the same, clearly described service scenario (for example, specified pressure, hours of supply and water-quality standards).

4.4. Implications for Policy and Practice

Three implications follow, offered as hypotheses for policy testing rather than firm recommendations. First, because lack of trust was one of the two most frequently cited reasons for reluctance to pay, utilities may need to demonstrate measurable improvements (pressure, continuity, clarity) and publish performance information before seeking price-based funding. Second, the income gradient in this sample (which persisted after adjustment for other characteristics), together with the reported burden of existing private costs, points to tariff structures that protect lower-income households, such as tiered or usage-based tariffs with a lifeline block, as proposed for other settings [19], as one possible policy direction; household water consumption was not measured here, so the study provides no direct evidence on the design or effect of such tariffs. Third, respondents' own improvement priorities (infrastructure renewal, supply resources and better management) could offer a basis for sequencing capital works and public communication.

4.5. Geographical Dimension and Spatial Variation

Piped water service is inherently spatial: pressure, continuity and quality depend on where a household sits within the distribution network, its elevation and distance from the treatment works, and the supply schedule applied to its service area. This study captured geography through the community in which respondents live (33 communities were listed) and a self-reported urban or rural classification, but not through the WASA supply area or distribution zone, so it cannot show whether the problems reported or the willingness to pay differ between supply areas. With 107 respondents spread across 33 communities, most communities contributed only a few respondents, so community-level comparison is not possible and communities were grouped into broader areas (six areas formed from the municipalities and regional corporations in which the communities lie, as defined for census reporting [29]). The weak association between residence and WTP should therefore not be read as evidence that location does not matter: urban and rural labels are a coarse proxy, and seven respondents could not classify their community. Spatial variation in service quality is one of the most important questions that these results leave open. Future surveys should record the WASA supply area or service zone, where respondents can identify it, as well as the community, so that responses can be mapped, compared with utility records on outages, schedules and pressure, and analysed with spatial or multilevel methods. In the descriptive comparison, differences between the six areas in WTP, satisfaction and reported problems were not statistically significant, although the share answering yes was lowest in the south and south-east (9.1%), where most rural respondents lived, and highest in the East–West Corridor (35.5%), and the share reporting low pressure ranged from 42% to 86% across areas. With 7 to 33 respondents per area, and with area closely tied to the urban–rural classification, these patterns cannot be separated from differences in income or settlement type; they are pointers for future surveys with area-level sampling rather than findings.

4.6. Limitations and Future Research

The sample was a small, non-random, online convenience sample, strongly skewed to ages 18–30 and excluding anyone older than 60, so results cannot be generalised to all Trinidadian households; comparison with the 2011 census shows that the sample over-

represents younger and better-educated people. Selection into online convenience samples is not random, and the resulting bias cannot be corrected without information on non-respondents [30]; the direction of any bias in WTP is uncertain, because younger and better-educated people may be more or less willing to pay than older or less-educated households. The margin of error and the confidence intervals are random-sampling quantities and should not be interpreted in the conventional probability-sampling sense, as they do not capture selection bias. Perceptions and WTP were self-reported and hypothetical, and stated intentions to pay often overstate actual payment; the WTP item did not use a bid design, so monetary WTP was not estimated, and it described the improvement only as improved water quality, so respondents may have had different improvements and service levels in mind. Income was collected in broad bands, and the multivariable models are exploratory because only 24 respondents answered yes. Several items allowed multiple responses, and perceived quality was not compared with measured water quality. The questionnaire also had design limitations: it contained no screening question on piped connection (respondents were selected as households with a WASA connection, which the form itself did not check); the question on problems had no "no problems" option, which may inflate problem counts; the education item had no diploma or technical category; the quality and satisfaction grids allowed more than one answer, which 12 respondents used (the less favourable answer was analysed); the income bands overlapped at their boundaries (for example, $10,000 appeared in two bands); the optional follow-up items on reasons, acceptable increases and treatment methods were not restricted to the respondents for whom they were worded, so that the 60 acceptable-increase responses include 37 from respondents who were unsure or unwilling; the current bill was not recorded, so percentage increases cannot be converted to money; and the introduction described communities as struggling with the quality and availability of piped water and referred to policy and investment decisions, which may have primed respondents or encouraged strategic answers. Responses were not corroborated with records from the water supplier (for example, delivery schedules, outage logs or pressure data), so the reported supply days and problems could not be checked against the utility's own information. Finally, the WASA supply area was not recorded, and although the community of residence was, most of the 33 communities had very few respondents, which limits regional analysis to broad groupings; this is an important limitation for a geographical study because spatial variation in service quality may be central to the topic. Future work should use probability sampling, include older and lower-income households, record location and link responses to utility records, apply contingent valuation or choice experiments with a common, clearly described service scenario, and fit multivariable models (for example, ordered logistic regression) on larger samples to separate the effects of income, household size and location.

5. Conclusions

This survey of 107 Trinidadian consumers found moderate satisfaction with piped water, with supply pressure, interruptions and discoloured water the principal problems and a substantial minority bearing the cost of home treatment. Willingness to pay for improvement was limited: 22.4% were definitely willing, most of those who gave an amount (70.0%) favoured increases of 5% or less, although this reflects respondents who were unsure or unwilling, and 82.6% of the definitely willing who gave an amount chose up to 10%, and the reasons most often given for reluctance were expectations of free improvement and distrust of the authority rather than affordability. In this sample, income was the only characteristic significantly associated with willingness to pay, both in unadjusted tests and in a multivariable model adjusted for residence, household size, satisfaction and home treatment (odds ratio 1.93 per income band, 95% CI 1.28–2.91), and the acceptable

increase also rose with income. These findings suggest, as hypotheses to be tested in larger, probability-based samples, that improving reliability and building credible accountability may help to gain acceptance of price-based funding of upgrades and that tariff design could consider protecting lower-income households.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/geographies6040114/s1.

Author Contributions: P.B.: Methodology, Formal Analysis, Investigation, Data Curation, Writing (Original Draft). N.S.: Methodology, Formal Analysis, Investigation, Data Curation, Writing (Original Draft). H.M.A.: Conceptualization, Writing (Review and Editing), Supervision. M.S.: Data Curation, Writing (Review and Editing). V.Y.: Software, Validation, Formal Analysis, Writing (Review and Editing). All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study. Before completing the online questionnaire, respondents were informed of the purpose of the survey and that their responses would be used solely for research, would remain confidential and would not require personal information such as a name; respondents confirmed that they had read and understood this information and voluntarily consented to take part by completing and submitting the questionnaire, as stated in the form's introduction.

Data Availability Statement: The original contributions presented in this study are included in the article/Supplementary Material. Further inquiries can be directed to the corresponding authors.

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Conflicts of Interest: The authors declare no conflicts of interest.

References

1. WHO; UNICEF. *Progress on Household Drinking Water, Sanitation and Hygiene 2000–2022: Special Focus on Gender*; World Health Organization and United Nations Children's Fund: Geneva, Switzerland, 2023.
2. United Nations General Assembly. *The Human Right to Water and Sanitation*; (Resolution 64/292); United Nations: New York, NY, USA, 2010.
3. Hunter, P.R.; Macdonald, A.M.; Carter, R.C. Water supply and health. *PLoS Med*. **2010**, *7*, e1000361. [CrossRef] [PubMed]
4. Cashman, A. Water security and services in the Caribbean. *Water* **2014**, *6*, 1187–1203. [CrossRef]
5. World Bank. *A Benchmark for the Performance of State-Owned Water Utilities in the Caribbean*; World Bank: Washington, DC, USA, 2020.
6. Doria, M.d.F.; Pidgeon, N.; Hunter, P.R. Perceptions of drinking water quality and risk and its effect on behaviour: A cross-national study. *Sci. Total Environ*. **2009**, *407*, 5455–5464. [CrossRef] [PubMed]
7. Doria, M.d.F. Factors influencing public perception of drinking water quality. *Water Policy* **2010**, *12*, 1–19. [CrossRef]
8. Fife-Schaw, C.; Barnett, J.; Chenoweth, J.; Morrison, G.M.; Lundéhn, C. Consumer trust and confidence: Some recent ideas in the literature. *Water Sci. Technol. Water Supply* **2008**, *8*, 43–48. [CrossRef]
9. Ochoo, B.; Valcour, J.; Sarkar, A. Association between perceptions of public drinking water quality and actual drinking water quality: A community-based exploratory study in Newfoundland (Canada). *Environ. Res*. **2017**, *159*, 435–443. [CrossRef] [PubMed]
10. Peters, E.J.; Goberdhan, L. Potential consumers' perception of treated wastewater reuse in Trinidad. *West Indian J. Eng*. **2016**, *38*, 33–43.
11. WHO. *Guidelines for Drinking-Water Quality: Fourth Edition Incorporating the First and Second Addenda*; World Health Organization: Geneva, Switzerland, 2022.
12. Vasquez, W.F.; Mozumder, P.; Hernandez-Arce, J.; Berrens, R.P. Willingness to pay for safe drinking water: Evidence from Parral, Mexico. *J. Environ. Manag*. **2009**, *90*, 3391–3400. [CrossRef] [PubMed]
13. Hanemann, W.M. Valuing the environment through contingent valuation. *J. Econ. Perspect*. **1994**, *8*, 19–43. [CrossRef]

14. Portney, P.R. The contingent valuation debate: Why economists should care. *J. Econ. Perspect.* **1994**, *8*, 3–17. [CrossRef]
15. Whittington, D.; Briscoe, J.; Mu, X.; Barron, W. Estimating the willingness to pay for water services in developing countries: A case study of the use of contingent valuation surveys in southern Haiti. *Econ. Dev. Cult. Change* **1990**, *38*, 293–311. [CrossRef]
16. Whittington, D. Administering contingent valuation surveys in developing countries. *World Dev.* **1998**, *26*, 21–30. [CrossRef]
17. Nauges, C.; Whittington, D. Estimation of water demand in developing countries: An overview. *World Bank Res. Obs.* **2010**, *25*, 263–294. [CrossRef]
18. Beaumais, O.; Briand, A.; Millock, K.; Nauges, C. *What are Households Willing to Pay for Better Tap Water Quality? A Cross-Country Valuation Study*; (Nota di Lavoro 24.2014); Fondazione Eni Enrico Mattei: Milan, Italy, 2014.
19. De Oca, G.S.M.; Bateman, I.J.; Tinch, R.; Moffatt, P.G. *Assessing the Willingness to Pay for Maintained and Improved Water Supplies in Mexico City*; (Working Paper); Centre for Social and Economic Research on the Global Environment (CSERGE), University of East Anglia: Norwich, UK, 2003.
20. Mycoo, M. Conflicting objectives of Trinidad's water pricing policy: A need for good water pricing and governance. *Int. J. Water Resour. Dev.* **2011**, *27*, 723–736. [CrossRef]
21. Mycoo, M. Shifting paradigms in water provisioning policies: A Trinidad case study. *Int. J. Water Resour. Dev.* **2005**, *21*, 509–523. [CrossRef]
22. Nauges, C.; Whittington, D. Evaluating the performance of alternative municipal water tariff designs: Quantifying the trade-offs between equity, economic efficiency, and cost recovery. *World Dev.* **2017**, *91*, 125–143. [CrossRef]
23. Hanemann, W.M. Willingness to pay and willingness to accept: How much can they differ? *Am. Econ. Rev.* **1991**, *81*, 635–647.
24. Freeman, A.M.; Herriges, J.A.; Kling, C.L. *The Measurement of Environmental and Resource Values: Theory and Methods*, 3rd ed.; Resources for the Future: Washington, DC, USA, 2014.
25. Cochran, W.G. *Sampling Techniques*, 3rd ed.; Wiley: New York, NY, USA, 1977.
26. Peduzzi, P.; Concato, J.; Kemper, E.; Holford, T.R.; Feinstein, A.R. A simulation study of the number of events per variable in logistic regression analysis. *J. Clin. Epidemiol.* **1996**, *49*, 1373–1379. [CrossRef] [PubMed]
27. Vittinghoff, E.; McCulloch, C.E. Relaxing the rule of ten events per variable in logistic and Cox regression. *Am. J. Epidemiol.* **2007**, *165*, 710–718. [CrossRef] [PubMed]
28. Firth, D. Bias reduction of maximum likelihood estimates. *Biometrika* **1993**, *80*, 27–38. [CrossRef]
29. Central Statistical Office. *Trinidad and Tobago 2011 Population and Housing Census Demographic Report*; Central Statistical Office, Ministry of Planning and Sustainable Development: Port of Spain, Trinidad and Tobago, 2012.
30. Bethlehem, J. Selection bias in web surveys. *Int. Stat. Rev.* **2010**, *78*, 161–188. [CrossRef]

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