Willingness to Pay for Improved Sanitation in Indonesia: Cross-Sectional Difference-in-Differences

Yasin, Mohammad Zeqi and Shahab, Hasyim Ali and Nuryitmawan, Tegar Rismanuar and Arini, Hesti Retno Budi and Rumayya, Rumayya

Research Institute of Socio-Economic Development (RISED)

31 December 2020

WILLINGNESS TO PAY FOR IMPROVED SANITATION IN INDONESIA: CROSS-SECTIONAL DIFFERENCE-IN-DIFFERENCES

Mohammad Zeqi Yasin[1]
Hasyim Ali Shahab[1]
Tegar Rismanuar Nuryitmawan[1]
Hesti Retno Budi Arini[1]
Rumayya[2] (Corresponding Author)

[1]Research Institute of Socio-Economic Development (RISED), Surabaya, Indonesia
[1]Department of Economics, Universitas Airlangga, Indonesia
Email: rumayya@feb.unair.ac.id

ABSTRACT

In the face of insufficient attempt by policy makers to develop improved sanitation apparently has captivated attention of market-based approach– a potential solution of appropriate and safe sanitation for low-income settings. However, to accommodate this approach, a study to assess willingness to pay (WTP) of people upon sanitation is necessitated. This study aims to investigate the effect of individual's knowledge upon the WTP of standardized latrine. This study employed primary data of 181 individuals spread in the three regencies and one municipality in the province of East Java, Indonesia. By using cross-sectional difference-in-differences, this study demonstrated a robust model revealing that the knowledge of individuals towards standardized latrine significantly brings positive impact on their WTP. This finding indicates that those who have known the standardized sanitation as well as its benefits tend to possess a higher WTP. Moreover, this study also discovered a significant effect of wife as decision marker in the family in allocating higher WTP to standardized latrine. This finding implies that women-led organizations (e.g. PKK or *Muslimatan*) can be an optimal media for socialization and marketing target of latrine products.

1. INTRODUCTION

The issue of sanitation remains becoming a pivotal concern on the Sustainable Development Goals (SDGs). The concern will be more likely to perpetuate as billions of people–mostly in rural areas–still encounter with the lack basic sanitation services. It is exacerbated by the evidence that one in three people has no access to potable water, two out of five people have no basic hand-washing facility with soap and water, and more than 15% population still use open defecation (Guiteras et al., 2015). The issue gets more urgent as some studies claimed that bad sanitation contributes widely to serious health problem such as stunting, morbidity, mortality, and tropical enteropathy (Dangour et al., 2013; Lin et al., 2013; Spears et al., 2013).

Despite the bad sanitation issue is still experienced by many developing countries, it seemingly does not show remarkable progress. Some plausible causes might be behind this argument such as lack of knowledge, ignorant behavior, as well as inadequate effort of policy makers (Acey et al., 2019; Gautam & Basnet, 2020). Amongst these three causes, inadequate effort of policy makers might be the primary cause that can significantly affect the sanitation issue as the first and second causes might be improved through the sufficient policy in dealing with sanitation.

However, in the face of insufficient attempt by policy makers to develop improved sanitation apparently has captivated attention of market-based approaches (Norman et al., 2012). The market-based approach demonstrates the potential solution of appropriate and safe sanitation for low-income settings. Market-based approach has been recognized as an effective solution to narrow the sanitation gap by generating demand for improved sanitation while ensuring that a sustainable supply of affordable and properly-designed products and services are provided to suit the demand. However, to accommodate this approach, a study to assess willingness to pay (WTP) of people upon sanitation is necessitated.

Earlier studies have conducted to scrutinize the individual WTP by employing difference-in-differences (DID) using panel data or repeated cross-section (see. Lee & Kang, 2006; Leer, 2016; Marta et al., 2020; Moeis et al., 2020). However, there are no many studies devoting effort to examine individual WTP using cross-sectional DID as suggested by Khandker et al. (2010). This approach may accommodate a single-period dataset to employ DID by comparing the targeted and non-targeted group in the observation, instead of comparing between periods as common DID models do.

Some studies have been conducted to examine the effect of knowledge towards individual WTP. By employing Contingent Valuation Method (CVM), Palanca-Tan (2015) discovered that the limited knowledge and appreciation on the appropriate sanitation facilities brings into lower WTP and suggested an extensive campaign to infiltrate the awareness of standardized sanitation programs. Likewise, another previous study, Minh et al. (2013), found that the level of WTP is strongly affected by the economic status and the health knowledge of the households. Our study aims to assess households' WTP towards sanitation, in this case latrine, and examine whether knowledge on the standardized sanitation affects WTP. Assessing WTP and its determinants are essential for planners and stakeholders because it can be used as consideration of projects' viability, setting affordable tariffs, evaluating policies, and designing socially equitable subsidies. Ultimately, our study will contribute to literature by delivering important implications to improve sanitation system in the object of interest.

2. SANITATION IN EAST JAVA – INDONESIA

Sanitation conditions in Indonesia, especially in East Java that become the scope of this study, still have many rooms for improvement. In 2019, Statistics Indonesia (BPS) recorded that almost 10% of households in East Java did not have toilet. This percentage is equivalent to 100 thousand families or 400 thousand people who do not have toilets. The same data also

shows that only 79% of households have their own toilet, and the rest are using public restroom for their daily needs. One of the districts which have the lowest rate is Bondowoso, where 38% of households there do not have any toilet and only 40% have their own toilet.

Besides the distribution of households with toilet ownership, it is also essential to look at the percentage of households with access to proper sanitation. In 2019, Statistics Indonesia noted that there were 79% of households with access to proper sanitation in East Java. The lowest percentage also fell to Bondowoso, with only 43% of households there having access to proper sanitation. It is also important to highlight the growth of households with access to proper sanitation. The growth of household with access to proper sanitation in the 2017-2018 and 2018-2019 period are only 0.3% and 4.5%, respectively.
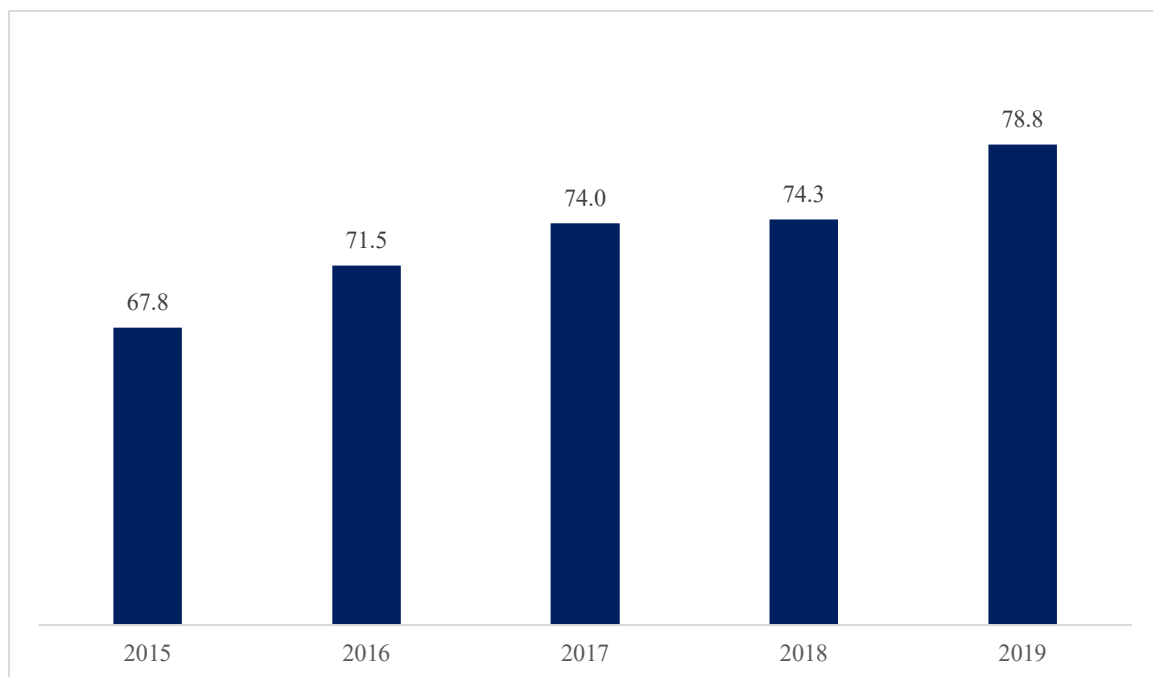
Source: Statistics Indonesia (2020), processed

Figure 1. Percentage of Households with Access to Proper Sanitation 2015-2019 (%)

In Figure 1, it can be seen the percentage growth of households with access to proper sanitation throughout 2015-2019. On average, households with access to proper sanitation is only grown by 2.7% annually. The smallest growth occurred in 2017-2018, where there was

only an increase of 0.3% of households who got access to proper sanitation. With such growth, some people in East Java still have to wait for another eight years to get access to proper sanitation. Along with the data, there should also be an observation of government attention related to sanitation at the national and provincial levels.

At the national level, there is GERMAS program or *Gerakan Masyarakat Hidup Sehat*. The national government proclaimed GERMAS as an effort to change people's lifestyles to be healthier. There are seven moves consistently promoted, one of which is "Using the latrine/toilet." This program has been running since 2015 to reduce both communicable and non-communicable diseases, and health-risky lifestyles. However, the Basic Health Research survey (RISKESDAS) 2018 by the Ministry of Health recently stated that the GERMAS movement was still ineffective. The ineffectiveness happens because the indicators of a healthy community targeted by GERMAS have not been achieved optimally.

There has also been a governor's policy at the provincial level in East Java to support improved access to sanitation. In 2018, the governor of East Java created a working group on sanitation and drinking water to achieve the target percentage of people with proper sanitation access. This policy is stated in the Surat Keputusan Gubernur Jawa Timur No. 188 Tahun 2018 about the Sanitation and Drinking Water Working Group. The working group is tasked with carrying out various supervisory, training, and evaluation duties related to the sanitation development program currently running in East Java.

In addition to coordinating and socializing, some programs are actually built access to proper sanitation. The program is under the East Java Directorate General of Human Settlements known as *Direktorat Jenderal Cipta Karya* (DJCK). DJCK in East Java has a SANIMAS or *Sanitasi Berbasis Masyarakat* (community-based sanitation) program to provide proper sanitation until sub-districts/village level. Accompanying the previous fact, the national target (RPJMN) in 2015-2019 stated that 100% of the household should have access to proper

sanitation by 2019. Thus, similar programs are also appearing at district/city levels. These programs are running simultaneously, and the overall province results can be seen again in Figure 1. Until 2019, there were only 79% of households that have access to proper sanitation.

3. DATA AND METHODOLOGY

3.1 Data Source and Sample Selection

We employed cross-sectional primary data collected using a survey questionnaire from 2-10 September 2020 in East Java. The contingent valuation method (CVM) is used in this study, which is a survey-based economic method in which individuals are questioned how much they are willing to pay for a change in quantity of quality (or both) of a particular commodity (Minh et al., 2013). We used the clustered random sampling to collect the observation. This method was used in the study through which enumerators were deployed to sub-districts that were included in the survey scope, then instructed to select respondents in the household level based on two main criteria: those who are in a better economic welfare and those who do not have private standardized latrine.

There were 247 respondents surveyed from the three regencies and one municipality in East Java: Lumajang regency, Probolinggo regency, Malang regency, and city of Probolinggo. The selection was based on the Statistics Indonesia stating that those area are the lowest ownership of sanitation facilities in East Java. This survey analysis can be used to describe the identity, behavior, and requests of potential community groups for assistance or sanitation products. Some respondents may leave blanks proposed questions which are employed in this study. In this case, we exclude the observations in the analysis. Ultimately, there are 181 samples that is furtherly analyzed in this study.

We took several steps to decide the sample selection. The first step is to determine the sample selection in each regencies/municipality based on the percentage of households that do

not possess latrines. In accordance with data from the Statistics Indonesia in 2018, the following is data on the percentage and number of households that do not possess private latrines:

Table 1. The Percentage and Number of Households Who Do Not Have Latrine

Regency/Municipality	(1)	(2)	Percentage of (2) to (1)
	Household Population	Number of Household Who Do Not Possess Private Latrines	
Lumajang	277,015	34,460	12.44%
Malang	611,500	28,923	4.73%
Probolinggo	287,903	96,389	33.48%
City of Probolinggo	58,827	3,894	6.62%
Total	1,235,245	163,666	12.25%

Source: Statistics Indonesia (2018)

The following process is to select the sample on the district level. The process is based on two criteria: the low poverty rate and the number of open defecation and shared latrines. The low poverty rate used the proxy of the percentage of poor households (B40) to the total households in each district and the distribution of rice for poor families (*Raskin*) to each district[1]. The first proxy is used for the regencies of Lumajang, Probolinggo, and Probolinggo city. Meanwhile, due to the absence of poor households' data in Malang Regency, the second proxy was deployed. The second criterion is the number of open defecation and shared latrines. The level of defecation and shared latrines is measured by the percentage of defecation and

---

[1] The data used for this calculation were obtained from the publication in numbers in 2019 from the Central Statistics Agency of each district and city.

shared latrines of the total access to sanitation in each district. The districts chosen were those with open defecation and shared latrines levels above the average in each district and city[2].

The final step is to calculate respondents in each regency by considering the relative contribution of households without private latrines in each district/city to the total of all households without private latrines in 4 regions with a maximum sample size limit of 250 households as follows.

Table 2. The Decision of Maximum Sample in Each Regency

Regency/City	Calculation	Number of Household Surveyed
Malang regency	(28,923/163,666) x 250	44
Lumajang regency	(34,460/163,666) x 250	53
Probolinggo regency	(96,389/163,666) x 250	147
Probolinggo city	(3,894/163,666) x 250	6

Based on the calculations above, it can be concluded that it takes 53 households to be surveyed in Lumajang Regency, 44 households in Malang Regency, 147 households in Probolinggo Regency, and 6 households in Probolinggo City. The distribution of respondents per district in each district / city is as follows:

Table 3. The Decision of Maximum Sample in Each District

Regency/City	District	Number of Household Surveyed
Malang regency	Sumberpucung	22
	Tumpang	22
Lumajang regency	Randuagung	27
	Tekung	26
Probolinggo regency	Tongas	25
	Maron	25
	Paiton	25
	Krejengan	24

---

[2] The data used for this calculation was obtained from the Progress Report on Sanitation Access from the Directorate General of Public Health, Directorate of Environmental Health, Ministry of Health of the Republic of Indonesia in 2020.

	Gending	24
	Dringu	24
Probolinggo city	Kanigaran	6

3.2 Empirical Strategy

We analyse the willingness-to-pay (WTP) in quantitative approach. The main WTP's determinants of the study are the knowledge of individual to the standardized sanitation and the availability of private latrine. Other determinants, such as level of education, decision maker, age, and gender, are also included for robustness check. Table 4 provides the detail explanation of these variables.

Table 4. Employed Variables in The Model

Variable	Notation	Definition
Willingness-to-pay	WTP_i	Ratio: how much individual will spend to buy sanitation facilities (latrines and septic tanks) that comply with certain standards such as Indonesian National Standard (SNI)
Knowledge	$KNOWLEDGE_i$	Dummy: Whether individual knows about sanitation products (latrines and septic tanks) with the Indonesian National Standard (SNI) AND Whether individual knows the benefits of sanitation products (latrines and septic tanks) with the Indonesian National Standard (SNI); D=1 if yes, 0 otherwise
Latrine Ownership	$PROGRAM_i$	Dummy: Whether individual possesses private latrine
Education	D_EDUC_i	Dummy: level of educations: 1) junior high school or less 2) graduated from senior high school; 3) graduated from university.
Decision Maker	D_DECIS_i	Dummy: the decision maker in the households: 1) head of household; 2) wife; 3) discussion of both head of household and wife
Age	AGE_i	The age of the individual
Gender	GEN_i	Dummy: 1 if male, 0 if female

This study uses difference-in-differences (DID) analysis to track the effect of knowledge to the WTP. Some studies have devoted effort to employ panel data or repeated cross-section to examine the effect of policy intervention (see. Lee & Kang, 2006; Leer, 2016; Marta et al.,

2020; Moeis et al., 2020). However, Khandker et al. (2010) suggested that it is possible to employ cross-section dataset in DID analysis through comparing the targeted and non-targeted group in the observation, instead of comparing between periods. Some studies have been conducted to adhere this notion (see Hermann et al. (2019).

The cross-sectional DID approach in this study takes some steps to identify the effect knowledge towards WTP. The first step is to create dummy variable called "target" for those who know about standardized sanitation as well as know the benefit of standardized sanitation. The second step is to create the program variable taken from whether the individual has possessed latrine. The third step is to generate the interaction variable between knowledge and program variable. The fourth step is to calculate the DD estimate by regressing log of WTP against program variable, knowledge, and their interaction using Ordinary-Least Square (OLS). The model is specified as follow.

$$lnWTP_i = \alpha_i + \beta_{prog}(PROGRAM_i) + \beta_{know}(KNOWLEDGE) + \beta_{treat}(TREATMENT_i) +$$
$$\beta_{educ}(D\_EDUC_i) + \beta_{age}(AGE_i) + \beta_{dec}(D\_DECIS_i) + \beta_{gen}(GEN_i) + \varepsilon_i$$

$$(1)$$

where i is the cross-sectional identity of individuals. $lnWTP_i$ is the willingness-to-pay in ratio and the form natural logarithm. $PROGRAM_i$ is the individual's latrine ownership. $KNOWLEDGE_i$ is the individual knowledge about standardized sanitation. $TREATMENT_i$ is the interaction term between $PROGRAM_i$ and $KNOWLEDGE_i$. D_EDUC_i refers to the set of dummy variables of education levels. D_DECIS_i denotes set of dummy variables of decision makers in the household. AGE_i is age of the individual. GEN_i refers to the gender of the individual. ε_i is error term. Robustness check is conducted through only keeping variable of $PROGRAM_i$, $KNOWLEDGE_i$, and $TREATMENT_i$ in the model and through employing a program-level fixed-effect regression (see Khandker et al., 2010). This study includes the

estimate of marginal effect to determine the impact of an explanatory variable's change towards WTP, assuming the other covariates are constant. The result will generate a robust analysis as the magnitude on the marginal effect will strengthen the direction and nature of the coefficients of the estimated differences after treatment (Greene, 2003).

To clarify and strengthen the analysis, qualitative approach is held through the focus group discussions amongst sanitation entrepreneurs in East Java. This approach attempts to identify phenomena experienced by the subject such as perception, behaviour, motivation, and action (Moleong, 2007). In this regard, qualitative approach is a method that employs elaborated words that are descriptive, use analysis, refer to data, utilize existing theories as supporting material, and establish a theory (Farhand et al., 2020). .

4. RESULTS AND DISCUSSION

Table 5 reports the regression result and the marginal effect estimate of the model. The robustness check of our model is also undertaken and reported in the table 7 Appendix. According to table 5, an intriguing result is emphasized on the treatment variable as an interacting term between the availability of latrine ($PROGRAM_i$) and the individual's knowledge about standardized latrine ($KNOWLEDGE_i$). The coefficient of the treatment variable indicates whether the availability of latrine goes together with the knowledge of individual towards standardized sanitation.

The results suggest that the presence of private latrine of individual lead to the lower WTP in average. In contrast, the knowledge of individuals towards standardized latrine significantly brings positive impact on their WTP. It suggests that those who have known the standardized sanitation as well as its benefits tend to possess a higher WTP by about 88.6%-99.5%. Meanwhile, negative coefficients of treatment variable indicate that those who have had private latrine and been well-insight about standardized sanitation tend to have lower WTP.

This finding is intriguing to elaborate further, notably by identifying the potential sociocultural factors that might affect the result of this study.

Table 5. Regression Results of Difference-in-Difference between Latrine Availability and Individual's Knowledge

VARIABLES	(1)	(2)	
	Simple DID	DID	Marginal Effect
$PROGRAM_i$	-0.584***	-0.337	-0.337
	(0.288)	(0.206)	(1.64)
$KNOWLEDGE_i$	0.995***	0.886***	0.886**
	(0.342)	(0.234)	(3.780)
$TREATMENT_i$	-1.659***	-0.909*	-0.909*
	(1.145)	(0.541)	(1.680)
$D\_EDUC_i 2$	-	0.370	3.700
		(0.306)	(1.200)
$D\_EDUC_i 3$	-	-0.445	-0.445
		(0.676)	(0.660)
AGE_i	-	-0.005	-0.006
		(0.008)	(0.640)
GEN_i	-	0.010	0.011
		(0.217)	(0.05)
$D\_DECIS_i 2$	-	1.020***	1.020**
		(0.250)	(4.09)
$D\_DECIS_i 3$	-	-0.526	-0.526
		(0.367)	(1.43)
$Constant$	12.76***	12.42***	-
	(0.158)	(0.448)	
Observations	181	181	181
R-squared	0.086	0.242	0.242

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

According to table 5, the negative effect of treatment to the WTP magnitude may stem from several plausible reasons. To clarify and strengthen the justification of this study's result, the qualitative analysis is held by identifying individual's perspective towards the standardized sanitation. The interviewees are sanitation entrepreneurs in the regencies. On average, the interviewee has more than one year of experience and understands the majority's mindset of people in their market. Apart from being routinely interacted within a business context, they are also a 'native' in their community.

We solve the distribution quadrant of the WTP group to examine robustness check. The result is reported in the Table 7 of Appendix. We found consistent effects between Table 5 and Table 7. The group with high WTP characteristics is not difficult to be given knowledge about

the health and goodness of latrines. Programs that are budgeted in the form of socialization or capacity building related to an understanding of good sanitation will be effective if carried out in groups with low to medium PAPs. This suggests the importance of taking into account the economic characteristics of the community when improve hygiene and sanitation practices of the community through behavior change intervention

According to the discussion conducted, there are primarily three main reasons why market-based approaches to sanitation products have experienced slow growth. The first reason is the economic factor. People who have had latrine are not willing to allocate more money to establish standardized sanitation, including standardized latrine. As long as they have private latrine, they did not perceive necessity to build the standardized one. The community finds it expensive to build latrines that meet appropriate standards. The people inside the community, and even the entrepreneurs themselves, expect that standardized latrine is only the branded ones (e.g., American Standard / TOTO). With the expectation of such a high price, they feel reluctant to build a latrine, moreover ones with a certain standard. In addition, most of the community considers toilets secondary goods, of which the purchase can be postponed. For instance, we identify that most of household expenditures for health, clean water, and defecation costs in our observations are in the last three ranks albeit they live in an environment with limited sanitation facilities. This indicates that the community has not prioritized health and sanitation as a primary issue. The latrine also includes goods that are perfectly elastic, where their demeanor will not affect the price of the goods.

The second reason is behavioral factor. There is a long-living habit amongst the people to defecate in the river. Some even claim that they cannot defecate in the toilet because their waist cannot feel the water. This habit is found in all observed regencies, as the sanitation entrepreneurs state that many people in their residential areas live nearby the river, and consequently they do not have toilets.

The third reason is the lack of socialization, particularly the relationship between sanitation and health, as well as the importance of using standardized sanitation products. There has not been a massive and continuous program to socialize the adverse effects of non-standard sanitation amongst society, which lead to people still lack knowledge about sanitation products. Ideally, in the context of a market-based approach, the public must know about the product and its benefits before being convinced to buy it. This understanding of the sanitation product and its function is also essential for public health promotion, particularly through good hygiene and sanitation practices. The relationship between socialization about sanitation and WTP strongly supports the results from Table 5, where the marginal effect of knowledge is 88.6%. These findings suggest the urgency to implement three stages of healthy sanitation development, namely pre-program in the form of socialisation/education/sanitation and hygiene promotion, main program which refers to both the sanitation infrastructure development and the improvement of socio-economic conditions, and post-program containing both the maintenance of standardised sanitation products and the continuous socialisation/education of the health benefits of good hygiene and sanitation practices.

This study highlights the potential relationship between the three reasons. Open defecation habit could be due to lack of education about hygiene and sanitation practices. It is also possible that sanitation education has been conducted frequently yet it is still insignificant to eliminate open defecation habit, but most importantly, both scenarios potentially influence the public's economic perspective towards sanitation products. In other words, both poor sanitation habit and lack of education about sanitation may lead to the opinion that having standardized sanitation products is unnecessary, so they will be reluctant to pay more for standardized latrines.

We associate the abovementioned statements of sanitation entrepreneurs to the demand-side data, notably about the ownership of latrines and septic tank at home (Figure 2).
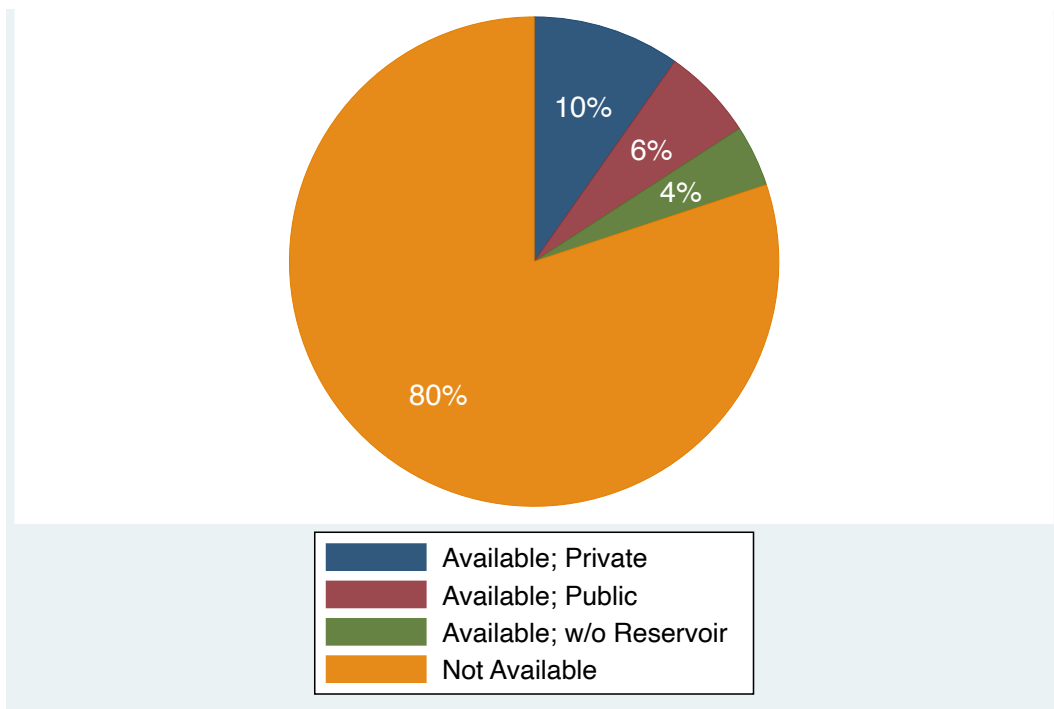
Figure 2. Latrines and Septic Tank Ownership at Home

Figure 2 illustrates 80% of the people stating that they do not have latrines and septic tanks. For those who did not have latrines, almost all of them defecated in the river. They are used to that and feel they do not need toilets, especially those with specific standards, and this lack of understanding leads to reluctance to pay. As seen in the regression results, understanding of the product is positively correlated with willingness to pay.

The regression results in Table 5 can be furtherly proved descriptively. According to Table 6, the average willingness to pay for respondents with good understanding about latrine products is almost 140% higher than those who do not know about latrine products.

Table 6. Knowledges towards Standardized Sanitation

| Product Knowledge	Average Willingness to Pay
Standardized Sanitation Product	
Knows about standardized product	Rp 1,696,429
Do not knows about standardized product	Rp 708,484

The result shows the importance of introducing latrine products and their health benefit for the community. Apart from being useful for supporting healthier communities, it turns out that socialization can also increase the average willingness to pay for sanitation products. This

socialization must be carried out massively and continuously through various channels, such as women-led organizations (e.g., PKK or *Muslimatan*), because open defecation has become a habit.

Other controlled variables, such as gender, age, and education levels, are not identified affecting individuals' WTP. Meanwhile, the only controlled variable showing significant effect is the decision maker. The result reveals that the decision in which wife has control leads to a higher WTP of individual by about 102% than the decision in which the head of family or the spouse's discussion are held.

An intriguing finding is the insignificant effect of education levels towards the WTP. We analyze this result by revealing the average WTP in each level of education (Figure 3).
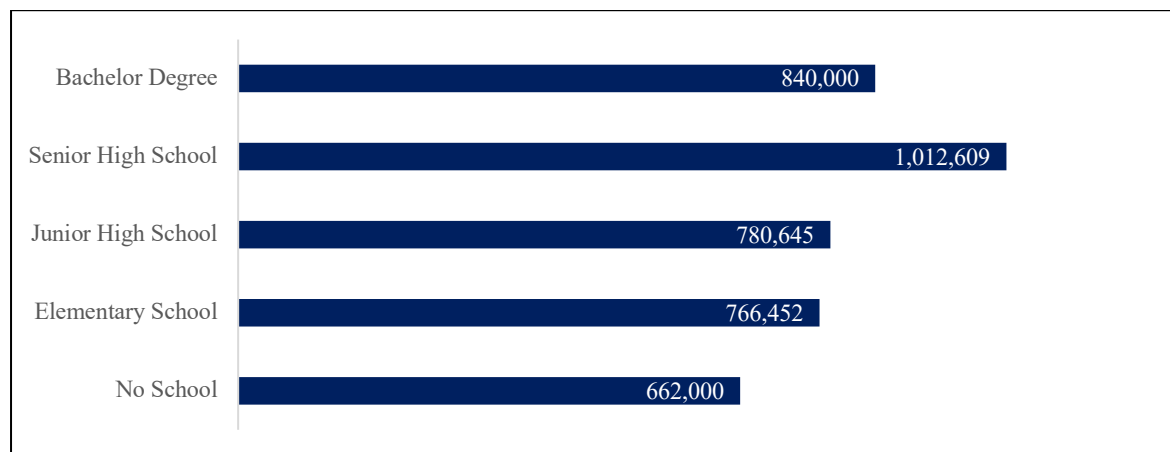
Figure 3. Average Willingness to Pay Based on Education Level

In the Figure 3, it can be seen that there is no significant difference in willingness to pay between education levels. A higher level of education does not necessarily translate to an awareness of buying a latrine that meets a standard. This is a further indicator of the importance of socializing healthy latrines. Socialization about open defecation as a poor behavior, especially by the government, can also be maximized through schools. In addition, considering that open defecation has become a habit, socialization needs to be carried out continuously at each level of education. If the socialization runs optimally, then there is the potential for

community groups with higher education to understand better and are willing to pay more for latrines.

5. CONCLUSION AND RECOMMENDATION

We have demonstrated that the individual's insight of standardized latrine has a significant impact to enlarge WTP. In this sense, this study delivers some essential implications for policymakers. The positive significance between product knowledge and WTP for latrines should be optimally utilized. The importance of standardized latrine to improves society's basic health indeed must be generally socialized. However, if there is an objective to increase sanitation access through a market-based approach, a more targeted socialization and marketing might be needed. Looking at observation results in this study, wives play an essential role in family consumption. Therefore, women-led organizations (e.g., PKK or *Muslimatan*) can be optimal for the socialization and the marketing target of latrine products.

REFERENCES

Acey, C., Kisiangani, J., Ronoh, P., Delaire, C., Makena, E., Norman, G., Levine, D., Khush, R., & Peletz, R. (2019). Cross-subsidies for improved sanitation in low income settlements : Assessing the willingness to pay of water utility customers in Kenyan cities. *World Development*, *115*, 160–177. https://doi.org/10.1016/j.worlddev.2018.11.006

Dangour, A., Watson, L., Cumming, O., Boisson, S., Che, Y., Velleman, Y., Cavill, S., Allen, E., & Uauy, R. (2013). *Interventions to improve water quality and supply , sanitation and hygiene practices , and their effects on the nutritional status of children* (Issue 8). John Wiley & Sons, Ltd.

Farhand, M. Z., Nurjanah, P. L., & Nurcholis, M. (2020). Islamic Finance in Sustainable Economy : Empowerment Of Sukuk Wakalah To Build Waste Industry. *Airlangga*

International Journal of Islamic Economics and Finance, *3*(1), 52–67.

Gautam, S., & Basnet, R. (2020). Demographic Profile and The Sanitation Problems of People Living in Slum Area in Kathmandu. *European Journal of Biomedical and Pharmaceutical Sciences*, *7*(3), 309–315.

Greene, W. H. (2003). *Econometric Analysis- Fifth Edition*. New Jersey, Prentice Hall.

Guiteras, R., Levinsohn, J., & Mobarak, A. M. (2015). Encouraging sanitation investment in the developing world: A cluster-randomized trial. *Sciencemag*, *348*(6237).

Hermann, Z., Kopasz, M., & Hermann, Z. (2019). Research Papers in Education Educational policies and the gender gap in test scores : a cross-country analysis cross-country analysis. *Research Papers in Education*, 1–22. https://doi.org/10.1080/02671522.2019.1678065

Khandker, S. R., Koolwal, F. G. B., & Samad, H. A. (2010). *Handbook on Impact Evaluation: Quantitative Methods and Practices*. World Bank.

Lee, M., & Kang, C. (2006). Identification for difference in differences with cross-section and panel data. *Economics Letters*, *92*, 270–276. https://doi.org/10.1016/j.econlet.2006.03.007

Leer, J. (2016). International Journal of Educational Development After the Big Bang : Estimating the effects of decentralization on educational outcomes in Indonesia through a difference-in-differences analysis. *International Journal of Educational Development*, *49*, 80–90. https://doi.org/10.1016/j.ijedudev.2016.02.005

Lin, A., Arnold, B. F., Afreen, S., Goto, R., Mohammad, T., Huda, N., Haque, R., Raqib, R., Unicomb, L., Ahmed, T., Jr, J. M. C., & Luby, S. P. (2013). Household Environmental Conditions Are Associated with Enteropathy and Impaired Growth in Rural Bangladesh. *The American Society of Tropical Medicine and Hygiene*, *89*(1), 130–137. https://doi.org/10.4269/ajtmh.12-0629

Marta, J., Fauzi, A., Juanda, B., Rustiadi, E., Marta, J., & Fauzi, A. (2020). Understanding

migration motives and its impact on household welfare : evidence from rural – urban migration in Indonesia. *Regional Studies*, *7*(1), 118–132. https://doi.org/10.1080/21681376.2020.1746194

Minh, H. Van, Nguyen-Viet, H., Thanh, N. H., & Yang, J.-C. (2013). Assessing willingness to pay for improved sanitation in rural Vietnam. *Environmental Health and Preventive Medicine*, *18*, 275–284. https://doi.org/10.1007/s12199-012-0317-3

Moeis, F. R., Dartanto, T., Prananta, J., & Ikhsan, M. (2020). A longitudinal study of agriculture households in Indonesia : The effect of land and labor mobility on welfare and poverty dynamics. *World Development Perspectives*, *20*, 1–17. https://doi.org/10.1016/j.wdp.2020.100261

Moleong, L. J. (2007). *Metode Penelitian Kualitatif Edisi Revisi*. PT. Remaja Rosdakarya 103.

Norman, G., Daryanani, A., & Peal, A. (2012). *Sanitation surcharges collected through water bills : a way forward for financing pro-poor sanitation ?* Water & Sanitation for the Urban Poor (WSUP).

Palanca-Tan, R. (2015). Knowledge , Attitudes , and Willingness to Pay For Sewerage and Sanitation Services : A Contingent Valuation Survey in Metro Manila, Philippines. *Journal of Environmental Scienece and Management*, *18*(2), 44–52.

Spears, D., Ghosh, A., & Cumming, O. (2013). Open Defecation and Childhood Stunting in India: An Ecological Analysis of New Data from 112 Districts. *PLos One*, *8*(9).

APPENDIX

Table 7. Willingness to Pay in Quadrant

VARIABLES	Willingness to Pay			
	<20%	40%-60%	60%-80%	>80%
$PROGRAM_i$	-0.031	-0.511	-0.827**	-1.204***
	(0.481)	(0.348)	(0.346)	(0.226)
$KNOWLEDGE_i$	0.962*	1.099***	0.748*	0.182
	(0.559)	(0.404)	(0.402)	(0.263)
$TREATMENT_i$	-0.452	-1.281	-0.424	-0.231
	(1.919)	(1.387)	(1.379)	(0.902)
D_EDUC_i 2	0.186	0.693*	0.488	-0.000
	(0.565)	(0.408)	(0.406)	(0.266)
D_EDUC_i 3	-1.340	0.288	0.000	-0.182
	(1.438)	(1.039)	(1.034)	(0.676)
AGE_i	-0.0105	0.000	0.004	-0.000
	(0.014)	(0.010)	(0.010)	(0.006)
GEN_i	0.322	-0.000	-0.147	0.000
	(0.371)	(0.268)	(0.267)	(0.174)
D_DECIS_i 2	1.036**	1.322***	0.603**	0.693***
	(0.405)	(0.292)	(0.291)	(0.190)
D_DECIS_i 3	-0.725	-0.288	-0.859*	-0.357
	(0.618)	(0.447)	(0.444)	(0.291)
$Constant$	11.610***	11.800***	12.980***	13.820***
	(0.778)	(0.563)	(0.560)	(0.366)
Observations	181	181	181	181

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 8. Different and Different Estimation Result

VARIABLES	Willingness to Pay
Before	
Control	12.631
Treated	10.387
Diff (T-C)	-2.244**(0.046)
After	
Control	13.757
Treated	11.513
Diff (T-C)	-2.224**(0.046)
Diff-in-Diff	0.000
Observations	181
R-squared	0.07

Note: Means and Standard Errors are estimated by linear regression. Inference: *** $p<0.01$; ** $p<0.05$; * $p<0.10$

Table 9. Descriptive Statistics

VARIABLES	Units	N	Mean	SD	Min	Max
Willingness to Pay (WTP)	Rupiah	181	779,835	881,199	50	5,000,000
Knowledge	Binary Dummy	181	0.178	0.383	0	1
Latrine Ownership	Binary Dummy	181	0.198	0.400	0	1
Treatment	Binary Dummy	181	0.048	0.215	0	1
Gender	Binary Dummy	181	0.429	0.496	0	1
Age	Ratio	181	42.60	12.68	14	82
Level of Education:						
1. Junior high school or less	Binary Dummy	181	0.856	0.351	0	1
2. Graduated from senior high school	Binary Dummy	181	0.127	0.333	0	1
3. Graduated from university	Binary Dummy	181	0.016	0.128	0	1
Decision Maker:						
1. Head of household	Binary Dummy	181	0.320	0.467	0	1
2. Wife	Binary Dummy	181	0.552	0.498	0	1
3. Both head of household and wife	Binary Dummy	181	0.127	0.333	0	1

Note: N denotes number of observations, Mean is arithmetic average, SD refers to standard deviation, Min is the minimum value, Max is the maximum value.