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# Water Security and Gender Disparity: Indian Scenario[1]

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## Abstract

**Introduction:** The UN SDGs are a collection of 17 global goals set in 2015 by the United Nations General Assembly intended to be achieved by 2030. Ensuring universal and equitable access to safe and affordable drinking water for all by 2030 is the target outlined by SDG 6.1. The indicator for measuring the same is the proportion of population using safely managed drinking water services. In 2017, only 71 per cent of the global population used safely managed drinking water, an increase from 61% in 2000, leaving 2.2 billion people without safely managed drinking water, including 785 million without even basic drinking water. Also, in 2017, 90% of the world's population (6.8 billion people) used at least basic drinking water services, rising from 82% (5 billion people) in 2000. It is estimated that at this rate, global coverage would be around 96% still following short of the universal access. This goal is far from being realized in the case of the Indian subcontinent which accounts for approximately 17.8% of the world population. As per international standards, a country with per-capita water availability less than 1700 $m^3$ is categorized as water stressed. According to the 2011 census India had a per capita water availability of 1543$m^3$ which is projected to further decline to 1401$m^3$ by 2025. Also India has a water stress score of 4.12 on a scale of 0-5 provided by the World Resources Institute. Moreover, there exists huge inequality in the distribution of access to water across states as well as difference strata of the population.

**Materials and Methods:** This paper uses household survey data from India to determine factors which outline the choice of drinking water source. We use the definitions from the World Health Organization (WHO) and divide the water sources into 3 broad categories:

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piped, improved and unimproved. It is a large-scale, multi-round survey conducted in a representative sample of households throughout India. The dataset comprises of 601, 509 households with around 699, 686 individuals. The survey has detailed information on various indicators like child mortality, nutrition indicators as well as characteristics of household members, household wealth and assets, location of source of water, person collecting water et cetera.

**Results and Discussion:** The results highlight that household income is an important determinant and positively affects the choice of a better water source. Other significant factors include gender and schooling of household head. While for number of women of age group 15-49, there is clear trend throughout, having positive association with choosing an improved water source and negative association with choosing an unimproved water source, the number of men in the age group 15-59 is negatively associated with choosing an improved water source in rural areas but not significant for any water source when looked at urban India. Policies that augment household income could provide for a better source of drinking water. The wealth effect appears to be larger for urban India. The majority of water collection is done by women and girl child and thus any benefits from investments in such policies will be greatest for this segment of the population. Since the data shows around 10% of the households to be still using unimproved drinking water sources, India as a long way to go so that it is able to achieve the target of safe drinking water for all by 2030.

**Conclusions:** Education of household head is seen to be positive and significant with using a piped water connection when looking at India as a whole. Higher educational attainment means more empowerment and knowledge of the best health practices. Individuals feel powerless when they have limited opportunity to bargain owing to low levels of education. Educated heads realise the potential health benefits of improved quality of water, especially for women and girls. It also plays important role in children's school performance as fewer illnesses mean reduced absenteeism and dropout rates.

**Keywords:** Water source, Improved, India, Rural, Urban.

## 1. Introduction

Water serves as an integral part of the daily life. From basic activities such as drinking, bathing to the more sophisticated ones, we need it in every sphere on our existence. The 1977 Mar Del Plata Action Plan adopted by the UN General Assembly sets down access to water as an essential human right. As per UN – Water, water security is defined to be "The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability". Since it's such a vital resource, access to clean and safe drinking water is a part of the United Nations Sustainable Development Goals (UN SDGs).

The UN SDGs are a collection of 17 global goals set in 2015 by the United Nations General Assembly intended to be achieved by 2030. Ensuring universal and equitable access to safe and affordable drinking water for all by 2030 is the target outlined by SDG 6.1. The indicator for measuring the same is the proportion of population using safely managed drinking water services. In 2017, only 71 per cent of the global population used safely managed drinking water, an increase from 61% in 2000, leaving 2.2 billion people without safely managed drinking water, including 785 million without even basic drinking water.

Also, in 2017, 90% of the world's population (6.8 billion people) used at least basic drinking water services, rising from 82% (5 billion people) in 2000. It is estimated that at this rate, global coverage would be around 96% still following short of the universal access. This goal is far from being realized in the case of the Indian subcontinent which accounts for approximately 17.8% of the world population. As per international standards, a country with per-capita water availability less than $1700m^3$ is categorized as water stressed. According to the 2011 census India had a per capita water availability of $1543m^3$ which is projected to further decline to $1401m^3$ by 2025. Also, India has a water stress score of 4.12 on a scale of 0-5 provided by the World Resources Institute. Moreover, there exists huge inequality in the distribution of access to water across states as well as difference strata of the population.

The cultural constructs around gender roles and responsibilities place household maintenance tasks in women's domain (Mitra & Rao, 2019). Women and children are at the forefront of hauling water from nearby water

sources such as tube wells/piped water or public taps et cetera. The time spent in water collection places huge burden on the wellbeing of these groups of the society as well as reduces the time available for other productive activities. Howard and Bartram suggested that the total water collection time should be less than 30 minutes for basic access levels. 263 million people spent over 30 minutes per round trip to collect water from an improved source (WHO, 2003).

In the 2019 Independence Day speech, the Indian Prime Minister announced the Jal Jeevan mission scheme and aimed to provide 55 litres per day per person to every rural Indian household by 2024. Ensuring drinking water to every household is quintessential to ensuring universal access to safe drinking water in India. According to the NGO WaterAid, 163 million Indians could not get clean water in the year 2015, the highest for any country.

In lieu of the importance of the safe access to improved water resources, we aim to carry out a

comprehensive study for the Indian subcontinent while trying to answer the following questions:

- How does the water collection vary across different composition of household?
- How is it different for Urban and Rural India, can we say that the scenario across the entire nation remains unchanged?
- How do socioeconomic factors affect the choice of the water source from which the households collect water? Factors here include gender of the household head, years of education of household head, wealth index of the household et cetera.

Such an analysis would help to suggest the underlying differences in the access to water resources and explore if there exists urban-rural divide with respect to gender disparity that is observed as women are expected to carry out the domestic water fetching activities in the household. Improved access to protected water sources directly affects the health and wellbeing of the household members and in turn has numerous positive spill overs for the community growth and development.

## 2. Literature Review

In a survey conducted in 366 households in rural South Africa for children in the age range 5-17, it was found that those collecting for longer hours than the average complained of often being late for school, being unable to concentrate

in class, having poor morale, and needing to leave school as early as possible to collect water. On average, children spend two-thirds of the time collecting water out of the total time doing household chores in a week (Hemson, 2007).

Another study investigates water supply choice and time spent in water collection in Madagascar (Boone & et al., 2011). They employ the conditional logit model and use household level variables such as age and number of years of education of household head; a dummy for whether the household head is female; variables describing the size and composition of the household. Since distance to water source and type of source are correlated variables, they emit these endogenous variables. The results show that time spent in water collection is subjective on the person's age and gender. On average, adult women spend the most time in water collection, followed by girls, boys, and then adult men. Also, controlling for distance, wealth, and other factors, years of education of the household head is positively associated with choosing a public tap, and negatively associated with choosing a well.

A household level study was conducted in Urban Philippines in which data was collected from 396 household surveys and 18 in-depth interviews regarding reported consumption, perceived cleanliness, perceived ease, and affordability with the explanatory variables being measures of the financial, physical, and social resources that theoretically affect household water security such as education level, savings, household characteristics, gender etc. Multiple regression technique showed income is positively related with reported consumption and affordability of water; water storage capacity negatively affects affordability; and having a household connection to the municipal utility positively affects reported consumption, perceived cleanliness, perceived ease, and affordability. Also, qualitative results obtained from carrying out logistic regression suggest that households with their own municipal water connection are more likely to ease in accessing water than households without it (Mason, 2014).

(Mahama & et al., 2014) analysed data from the Fourth Round Accra Multiple Indicator Cluster Survey (FRAMICS) of 1500 households to assess the socio-economic characteristics influencing likelihood of household having access to improved water. The factors taken into account were wealth index of household, education achievement and gender of the respondent et cetera. They found that most of the variables were statistically insignificant. However, education, location and income of household are important when considering access to improved water for other domestic uses. Also, the WHO definition for improved water was way too broad when looked at a larger set

of countries, primarily the developing third world nations.

Graham & et al. (2016) describes gender difference in water collection labor in adults and children for Sub Saharan African countries using data from the Demographic Health Survey (DHS) and the Multiple Indicator Cluster Survey (MICS). Since water collection labor negatively affects children schooling, their results highlight that in urban areas, there were four countries that had greater than 30% of water collection performed by children. Also, they're existed substantial variability in the gender ratio (i.e., percent female's/percent males) of adults who performed water collection across countries with all the nations having gender ratios above one, implying that adult women, more than men, shouldered the responsibility for water collection.

Gomez & et al. (2019) determine the effect of various socioeconomic factors on the access to improved water sources in the rural areas of developing countries. They classify the countries on the per capita income level of the countries. Results from a fixed effects model conclude that for women's primary completion rate, higher the number of females entering the last course of primary school, the higher the expected access to water is. This finding is especially true for lower-middle- and low-income countries Also, countries with a lower rule of law, voice, accountability, and stability have lower access to improved sources. Poorer countries have access to water from unsafe sources while richer countries have access to water from pipes.

Irianti & et al. (2019) also conduct an analysis similar to that done in Madagascar. They use a multivariable multinomial logit model to study relation between the water fetcher in a household and various spatial, environmental, and socio-demographic characteristics such as marital status, place of residence et cetera. It was found that 40% of the housdeholds delegate women household members to carry water. In rural and less affluent households, women and children are more likely to take the role of water fetcher. Lastly, the finding that longer the duration it takes to collect the water, the less likely women are the primary water collector in the household is in contrast to what has been observed in previous studies.

## 3. Data and Methodology

The data comes from the National Family Health Survey (NFHS). The NFHS-4 was conducted in 2015-16 under the stewardship of Ministry of Health and Family Welfare along with coordination from the International Institute for Population Sciences, Mumbai. It is a large-scale, multi-round survey

conducted in a representative sample of households throughout India. The dataset comprises of 601, 509 households with around 699, 686 individuals. The survey has detailed information on various indicators like child mortality, nutrition indicators as well as characteristics of household members, household wealth and assets, location of source of water, person collecting water et cetera.

Dependent variable for the study is choice of drinking water source. The survey dataset enlists 15 categories of water sources which are piped into dwelling, piped into plot, public tap, tube well, protected well, un protected well, protected spring, unprotected spring, rainwater, tanker truck, cart with small tank, surface water, bottled water, community RO plant and other. We club the given categories into 3 kinds i.e., Piped water, Improved or Unimproved water source, according to the definition provided by the World Health Organization (WHO).

Piped water includes piped household water connection inside the dwelling, plot or yard. Improved water sources are those that by nature of their construction or through active intervention, are protected from outside contamination, particularly faecal matter. They include public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs and rainwater collection. Unimproved water sources are namely unprotected dug well, unprotected spring, cart with small tank/drum, tanker truck, and surface water (river, dam, lake, pond, stream, canal, irrigation channels), bottled water.

Explanatory variables. These include important socio-economic characteristics such as type of place of residence, composition of the household; age, gender and education of the household head, wealth index of the household and lastly the time spent in water collection.

- Type of place of residence – This is a binary variable with categories urban and rural, with urban being the base category.
- Household composition:
  - Number of eligible women in the household aged 15-49
  - Number of eligible men in the household aged 15-59
  - Number of children 5 and under in the household
- Age of head of household – Age of household head in years
- Sex of head of household – Gender of the household head i.e. either male or female. Male is taken as the reference category.
- Number of years of education attained by household head.
- Wealth index of the household – This index is calculated based on a

variety of assets owned. The index is characterized as poorest, poorer, middle, richer and richest. Poorest is taken as the reference category here. In the study we use the urban and rural wealth indexes within each state for each household.

● Time to get water source – This has data for time spent in getting water in minutes. When water is available at premises, there is no data for this variable.

Figure 1 shows the choice of drinking water source by type of place of residence. We observe that 52% of households in urban India have a piped water connection compared to just 18.3% in rural India. Overall, over 60% of the Indian households have Improved drinking water source. The share of households having unimproved water source is 9% in urban India and around 10.7% in Rural India.

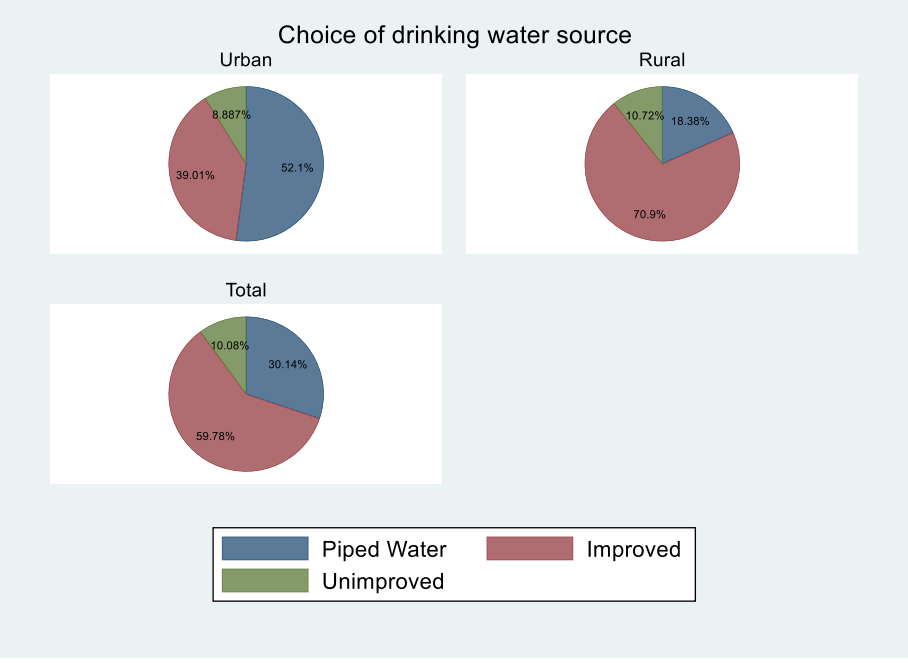


**Fig. 1.** Choice of water source by type of residence

Figure 2 shows the gender of household head by type of place of residence. We observe that only 14% of households in urban India are female headed compared to around 15% in rural India. Overall, over 14.6% of the Indian households are female headed. The share remains almost equal irrespective of place of residence, with rural India performing marginally better.

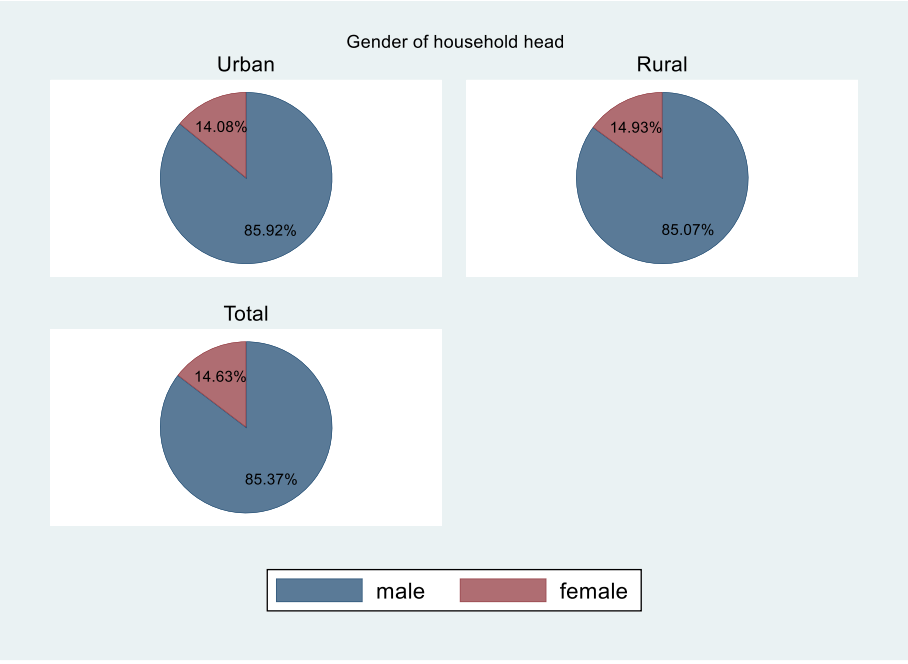


**Fig. 2.** Gender of household head by type of residence

Figure 3 shows the person fetching water by type of place of residence. As suggested in the theory, we observe that majorly women are the water fetchers in the household, followed by men and then by girl child younger than 15 years and lastly male child under 15 years of age. A staggering 82% of the women in rural India bring water compared to around 72% in urban India. Overall, in over 16% of the Indian households, men fetch water. It is seen that the trend is same in both rural and urban India with the former having more burden on the women. Male children contribute to water fetching activity in only 1% of households in urban India.

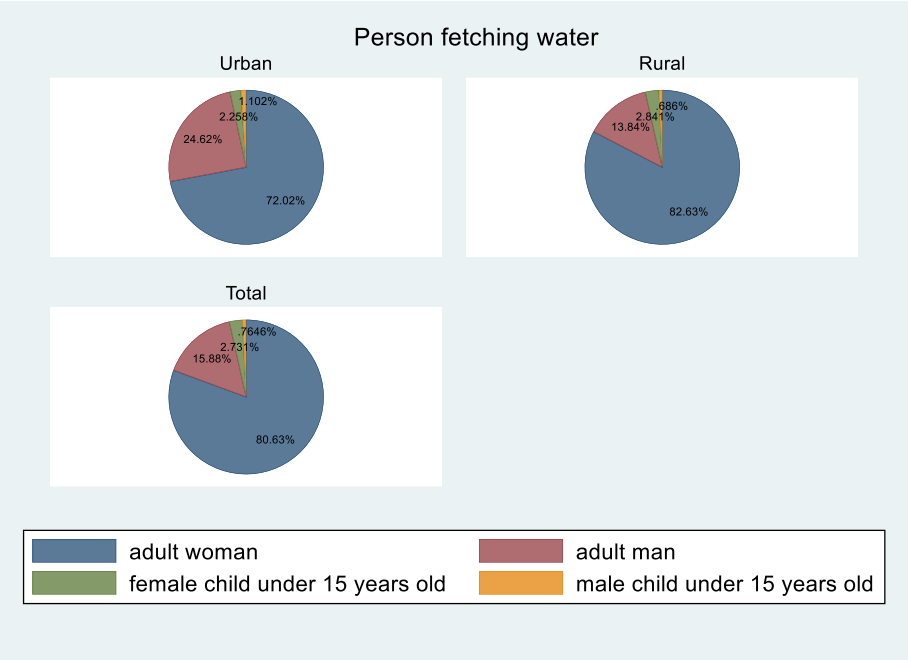


**Fig. 3.** Person fetching water by type of residence

While the dataset has detailed information on the time spent in water collection, a limitation arises in the quality of water sources which might be important when considering choice of water source. The study relies on the self report and recall of household water data which could have some respondent errors. Also, lot of household in rural India us multiple sources for water collection which is not accounted for in the dataset as we look at only single/primary source of water collection. Lastly, number of trips made to collect water are also not taken into consideration since distance to a water source does influence the choice of water source.

$$\Pr(Y_i = j) = \frac{\exp(z'_{ij\theta})}{\sum_{k=1}^{J} \exp(z'_{ik}\theta)}$$

A multinomial logit model is used to assess the choice of water source as a function of various household and household head characteristics. The multinomial logit(MNL) model draws from random utility theory to analyse choice behaviour formulated by McFadden (1973). With one choice situation, the choice-probability P for decision-maker to choose alternative j out of J becomes

where j = 1, 2…., J

In our model, we have J=3 water source alternatives: piped, improved and unimproved water sources. The household is taken as the unit of analysis. The results are presented in the next section.

## 4. Results and Discussion

Table 1-3 in the appendix show the regression results in the form of average marginal effects, which are easier to interpret and are computed by taking the average of marginal effects for each individual observation, keeping all but one predictors value unchanged and then taking the difference between the two different categories of the remaining independent variable. For continuous regressors, the marginal effects represent the change in probability of choosing each source type given a unit change in the regressor. For discrete variables, the effect is the change in probability of choosing each type given a change in the regressor from 0 to 1.

Table (1) shows the average marginal effect for Urban India. Age and the education of the household head variables are statically significant for piped water and unimproved water sources. As age of household head increases by 1 year, the probability of choosing a piped water source goes down by 0.09 percentage and that of Unimproved water source by 0.06 percentage points. As years of education increase the probability of having a piped water connection goes down by 0.1 percentage points and that of an unimproved water source increases by 0.01 percentage points. Female headed households have 1.4 percentage point's higher chance of having improved water source as compared to households which have male person as a head. It is also observed that household wealth index is highly significant for all wealth categories. As the wealth index improves the probability of having piped water connection increases and the probability of having an improved water source decreases as compared to the belonging to the poorest households in the state. Belonging to the richest household category improves the probability of piped connection by 16 percentage points when compared with the poorest households. Similarly, the probability of choosing improved water source goes down by 10% for middle wealth households vis-à-vis poorest households.

Table (2) shows the marginal effects for Rural India. Female headed household have a 3.5% higher probability of having improved water source as compared to a male headed household. Also, this probability reduces by 1.4% in choosing an unimproved water source. As age of household head increases by 1 year, probability of having piped water connection goes up by 0.05%

points. The household composition also plays important role in decided the water source. More number of children below the age of 5 reduce the probability of having piped connection whereas as number of men increase this probability increase by 1%. Richer households have a 5% higher chance of having piped water source when compared with poorest households. Similarly, the poorer households have a 2.5% increased chance of the same. Time spent in collecting water is significant and has a positive effect on choosing piped water as the time increases and a negative 0.1%-point decrease in choosing improved water source as time collection increases by 1 minute.

Table (3) shows the average marginal effects for India as a whole. This table has an added variable which specifies the type of place of residence i.e., urban or rural. Female headed households have a 2.9% more chance of having improved water source as compared to male headed household and a 1.1% lesser probability of having unimproved water source. As the number of women in the household increase, the probability of having improved water source goes up by 1.2% and as the number of men increase the probability of having a piped water connection goes up by 1%. Richer households are more likely to have to have piped water source than poorest households by 3.6% points. Also, there is a 19% decrease in probability of having a piped water connection when residing in the rural parts as compared to the urban areas. However, probability of having improved water source increases by 20% points when living in rural areas vis-à-vis urban India and decreases by 1% of opting an unimproved water source.

Table (4) in the appendix shows the log odds for each of the 3 models i.e. India, Urban and Rural. Since they are not very suitable for interpretation they haven't been discussed in the results section.

Household wealth is positively associated with using a piped water connection in urban as well as rural areas and negatively associated with using improved water sources. This finding is supported by (Bosch & et al., 2001) that higher income groups can afford to have private alternatives in order to compensate for in times of shortage as compared to publicly available resources such as protected wells, springs or dug well. There are few household characteristics such as household composition variables for which the marginal effects are either statistically insignificant or do not follow any defined pattern in the water source choice models in rural India. For example, the number of men in the age group 15-59 is negatively associated with choosing an improved water source in rural areas but not significant for any

water source when looked at urban India. While for number of women of age group 15-49, there is clear trend throughout, having positive association with choosing an improved water source and negative association with choosing an unimproved water source. These results seem to explain the benefit that would arise when a gender perspective is applied into water policies and programmes as suggested in previous literature (Ivens, 2008).

Education of household head is seen to be positive and significant with using a piped water connection when looking at India as a whole. Higher educational attainment means more empowerment and knowledge of the best health practices. Individuals feel powerless when they have limited opportunity to bargain owing to low levels of education (Bosch & et al., 2001). Educated heads realise the potential health benefits of improved quality of water, especially for women and girls. It also plays important role in children's school performance as fewer illnesses mean reduced absenteeism and dropout rates. Reither & et al. (2007) estimated that about 16% of deaths in children younger than 5 years are directly attributable to diarrhoeal diseases in Africa. Female headed households are positively related to choosing improved water sources, meaning that since they have a greater say in decision-making than in male-headed households, they choose safer water sources.

## 5. Conclusion

This study analysed the householder's access to various water sources and how specific household level attributes affect this choice. We use data from the 4$^{th}$ round of NHFS survey which offers variety of information crucial for carrying out this study. This assists in estimating a discrete model of drinking water source. The results of show that 52% and 18.3% households have piped water connections in urban and rural India respectively. In accordance with earlier literature, a key finding is that household wealth plays a major role in ensuring quality water access in form of piped connection or improved water sources which are protected from contamination. Policies that augment household income could provide for a better source of drinking water. The income effect appears to be larger for urban India. The majority of water collection is done by women and girl child and thus any benefits from investments in such policies will be greatest for this segment of the population.

Another factor in choice of drinking water access is the education of household head. The average years of education is 8.27 years for urban areas and 5 years for rural areas. Schooling is associated with an increased use of

piped water connection as proportion of households having piped water connections is higher in urban India. Likewise, female headed households are shown to have increased choice of improved water sources as their primary source of drinking water in rural and urban areas both. Further research and impact studies would shed light on the impact of policy and structural changes on women's empowerment, and how it contributes to a more holistic development of the entire household. As the data shows, even today approximately 10% of the households in India use unimproved water sources which is way behind the target of achieving the United Nations Sustainable Development Goal 6.1 that aims to provide safe and secure drinking water to all. In lieu of this and the factors that affect the choice of drinking water source, policies and awareness campaigns that aim to educate the women population would help in driving India towards the target by 2030 by narrowing the rural urban divide. Further research is needed to assess the impact of such policies that aim to increase access to safe and affordable water sources.

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# Appendix

**Table 1.** Average marginal effects for Urban india

| Variables | Piped water | Improved | Unimproved |
|---|---|---|---|
| Household head gender | | | |
| female | -0.0100<br>(-1.93) | 0.0141*<br>(2.57) | -0.00412<br>(-0.98) |
| age of head of household | -0.000968***<br>(-5.97) | 0.00165***<br>(9.57) | -0.000679***<br>(-7.10) |
| Household wealth index | | | |
| poorer | 0.0459***<br>(6.42) | -0.0603***<br>(-8.45) | 0.0145***<br>(4.43) |
| middle | 0.0737***<br>(8.99) | -0.107***<br>(-12.74) | 0.0335***<br>(8.53) |
| richer | 0.117***<br>(12.57) | -0.160***<br>(-16.90) | 0.0424***<br>(6.35) |
| richest | 0.160***<br>(16.55) | -0.224***<br>(-21.39) | 0.0643***<br>(7.97) |
| number of eligible women in household | -0.0102***<br>(-5.35) | 0.0144***<br>(6.69) | -0.00416**<br>(-2.91) |
| number of eligible men in household | 0.00669<br>(1.57) | -0.00468<br>(-1.02) | -0.00201<br>(-0.62) |
| number of children 5 and under (de jure) | -0.00757***<br>(-3.46) | 0.00547*<br>(2.19) | 0.00210<br>(1.31) |
| time to get to water source (minutes) | 0.00288<br>(1.78) | -0.00241<br>(-1.72) | -0.000465*<br>(-2.16) |
| Years of Education | -0.00165***<br>(-4.42) | 0.000119<br>(0.30) | 0.00153***<br>(8.60) |

$t$ statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Table 2.** Average marginal effects for Rural india

| Variables | Piped water | Improved | Unimproved |
|---|---|---|---|
| Household head gender | | | |
| female | -0.0187*** | 0.0335*** | -0.0148*** |
| | (-8.32) | (11.89) | (-8.05) |
| age of head of household | 0.000593*** | -0.000493*** | -0.0000996 |
| | (9.68) | (-6.36) | (-1.91) |
| Household wealth index | | | |
| poorer | 0.0250*** | -0.0131*** | -0.0119*** |
| | (9.80) | (-4.10) | (-5.46) |
| middle | 0.0402*** | -0.0298*** | -0.0103*** |
| | (14.43) | (-8.33) | (-4.00) |
| richer | 0.0533*** | -0.0502*** | -0.00311 |
| | (17.95) | (-12.64) | (-1.07) |
| richest | 0.0735*** | -0.0974*** | 0.0240*** |
| | (21.20) | (-19.49) | (6.27) |
| number of eligible women in household | -0.0126*** | 0.0154*** | -0.00279** |
| | (-13.68) | (12.73) | (-3.27) |
| number of eligible men in household | 0.0105*** | -0.0107*** | 0.000166 |
| | (4.86) | (-3.80) | (0.09) |
| number of children 5 and under (de jure) | -0.0226*** | 0.0228*** | -0.000175 |
| | (-23.38) | (18.98) | (-0.23) |
| time to get to water source (minutes) | 0.00191*** | -0.00167*** | -0.000246*** |
| | (10.19) | (-9.69) | (-15.33) |
| Years of Education | 0.000152 | -0.000235 | 0.0000830 |
| | (0.90) | (-1.11) | (0.59) |

$t$ statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Table 3.** Average marginal effects for india

| | Piped water | Improved | Unimproved |
|---|---|---|---|
| Household head gender | | | |
| female | -0.0177*** | 0.0295*** | -0.0118*** |
| | (-7.56) | (11.08) | (-6.37) |
| age of head of household | 0.000410*** | -0.000201* | -0.000209*** |
| | (5.94) | (-2.56) | (-4.49) |
| Household wealth index | | | |
| poorer | 0.0284*** | -0.0185*** | -0.00989*** |
| | (9.32) | (-5.82) | (-4.81) |
| middle | 0.0325*** | -0.0276*** | -0.00494* |
| | (9.20) | (-7.32) | (-2.00) |
| richer | 0.0360*** | -0.0389*** | 0.00290 |
| | (8.71) | (-8.03) | (0.62) |
| richest | 0.0535*** | -0.0830*** | 0.0295*** |
| | (10.87) | (-12.40) | (4.20) |
| number of eligible women in household | -0.00946*** | 0.0126*** | -0.00317*** |
| | (-10.36) | (10.92) | (-3.72) |
| number of eligible men in household | 0.0101*** | -0.00959*** | -0.000553 |
| | (4.81) | (-3.81) | (-0.33) |
| number of children 5 and under (de jure) | -0.0196*** | 0.0192*** | 0.000342 |
| | (-20.50) | (17.11) | (0.49) |
| Type of residence | | | |
| rural | -0.194*** | 0.205*** | -0.0108 |
| | (-52.87) | (34.69) | (-1.70) |
| time to get to water source (minutes) | 0.00224*** | -0.00192*** | -0.000316*** |
| | (3.55) | (-3.40) | (-4.84) |
| Years of Education | 0.00110*** | -0.00206*** | 0.000958*** |
| | (6.11) | (-10.26) | (8.61) |

$t$ statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**Table 4.** logodds

| Piped Water | India | Urban | Rural |
|---|---|---|---|
| Household head gender | | | |
| female | 0.0270 | 0.0137 | 0.0154 |
| | (0.323) | (0.828) | (0.573) |
| age of head of household | 0.00464*** | 0.00480** | 0.00535*** |
| | (0.000) | (0.001) | (0.000) |
| Household wealth index | | | |
| poorer | 0.280*** | -0.0420 | 0.328*** |
| | (0.000) | (0.527) | (0.000) |
| middle | 0.247*** | -0.175* | 0.426*** |
| | (0.000) | (0.017) | (0.000) |
| richer | 0.182** | -0.0984 | 0.445*** |
| | (0.004) | (0.405) | (0.000) |
| richest | 0.0305 | -0.137 | 0.335*** |
| | (0.711) | (0.284) | (0.000) |
| number of eligible women in household | -0.0215 | 0.0126 | -0.0644*** |
| | (0.057) | (0.566) | (0.000) |
| number of eligible men in household | 0.0654** | 0.0517 | 0.0756** |
| | (0.004) | (0.282) | (0.002) |
| number of children 5 and under (de jure) | -0.118*** | -0.0563* | -0.164*** |
| | (0.000) | (0.014) | (0.000) |
| Type of residence | | | |
| rural | -0.928*** | | |
| | (0.000) | | |
| time to get to water source (minutes) | 0.0165*** | 0.0172 | 0.0165*** |
| | (0.000) | (0.060) | (0.000) |
| Years of Education | -0.00381* | -0.0258*** | 0.000281 |
| | (0.021) | (0.000) | (0.886) |
| Constant | -14.04** | -14.32 | -15.12*** |
| | (0.001) | (0.114) | (0.000) |
| Improved Water | | | |

| | | | |
|---|---|---|---|
| Household head gender | | | |
| female | 0.168*** | 0.0802 | 0.186*** |
| | (0.000) | (0.173) | (0.000) |
| age of head of household | 0.00199*** | 0.0118*** | 0.000549 |
| | (0.000) | (0.000) | (0.337) |
| Household wealth index | | | |
| poorer | 0.0909*** | -0.303*** | 0.112*** |
| | (0.000) | (0.000) | (0.000) |
| middle | 0.0232 | -0.620*** | 0.0815** |
| | (0.410) | (0.000) | (0.004) |
| richer | -0.0754 | -0.817*** | -0.0123 |
| | (0.151) | (0.000) | (0.694) |
| richest | -0.381*** | -1.185*** | -0.304*** |
| | (0.000) | (0.000) | (0.000) |
| number of eligible women in household | 0.0497*** | 0.0809*** | 0.0423*** |
| | (0.000) | (0.000) | (0.000) |
| number of eligible men in household | -0.00607 | 0.0163 | -0.0115 |
| | (0.756) | (0.721) | (0.561) |
| number of children 5 and under (de jure) | 0.0203* | -0.0159 | 0.0227** |
| | (0.014) | (0.486) | (0.007) |
| Type of residence | | | |
| rural | 0.354*** | | |
| | (0.000) | | |
| time to get to water source (minutes) | 0.000971*** | 0.00116*** | 0.000940*** |
| | (0.000) | (0.000) | (0.000) |
| Years of Education | -0.0128*** | -0.0191*** | -0.00105 |
| | (0.000) | (0.000) | (0.496) |
| Constant | 1.029*** | 0.883*** | 1.414*** |
| | (0.000) | (0.000) | (0.000) |
| Observations | 599479 | 175360 | 424119 |

*p*-values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Data Source: NHFS 2015-16