Uncovering the Impact of Improved Access to Safe Drinking Water and Sanitation on Gendered Subjective Wellbeing in Punjab, Pakistan

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Abstract

Urban development including water and sanitation infrastructure is critical for mental health. Globally, around 2.2 billion people lack access to safe drinking water and over half of the world's population lacks access to safe sanitation. Majority of these are residing in developing countries including Pakistan. Lack of access to water supply and sanitation can provoke unrest and conflict among the households, however, extant literature has not paid much attention to such association. This study uncovers the impact of improved access to safe drinking water and sanitation on the subjective wellbeing of men and women of the same households in the most populous province, Punjab, of Pakistan. The study extracted data from the latest multiple indicator cluster survey of Punjab and employed two-level mixed effects logistic regression method due to data hierarchy. The results revealed a positive relationship between piped and bottled water access with the subjective wellbeing of adult men (OR=1.113 and OR=1.274, respectively) and women (OR=1.092 and OR=1.416, respectively). However, improved sanitation was found to have a positive association with the subjective wellbeing of just women (OR=1.169) , implying that poor sanitation infrastructure is a particular source of mental stress for women. At the community level, however, improved sanitation was associated with higher self-reported life satisfaction among both men and women (OR=1.194 and OR=1.156 respectively). Our findings provide avenues for policymakers to intervene

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to improve household water and sanitation infrastructure, which has far-reaching impacts on the life satisfaction for the majority of Punjab's residents.

1. Introduction

In the era of rising global temperatures and accelerated environmental degradation, Environmental quality and its impact on the lives of individuals, has now become a cornerstone of international public policy. What was once considered a luxury, is now regarded by many, as a public good, which must not only be protected but guaranteed to citizens regardless of race and socio-economic background.

Perhaps, the most alarming aspect of environmental neglect, however, is the possibility of a world without clean water access, a reality taken into consideration with the inclusion of goal 6 in the UNs SDGs. While the issue has been given serious attention in the developed world, a large portion of the world's population residing in 3rd world nation's still lack access to safe and clean drinking water. In fact, according to UN estimates the number of people falling into this category amounts to roughly 2.2 billion (UNICEF, 2019). The issue is further compounded with the lack of access to safely managed sanitation services, which is still a rarity for an estimated 4.2 billion people worldwide. The lack of access to such basic human necessities is a major contributor to poor health outcomes, both physically and mentally.

Numerous studies have focused on the relationship between water related issues and physical health. Inadequate sanitation and contaminated water supply is the primary cause of illness in developing countries. However, given that health is defined as a state of total physical, social and mental wellbeing and not simply the absence of disease (WHO, 1948), ignoring the psychological impact of inadequate water and sanitation access on the lives of individuals has significantly understated the severity of the issue and the true health costs incurred. Indicators such as subjective wellbeing are a good way to assess general mental health. Stress and anxiety are determinants of life satisfaction and can thus contribute to low subjective wellbeing. Subjective wellbeing has been used in relation to water and sanitation issues before. A study investigating the determinants of subjective wellbeing in rural communities of Ghana found water to be a significant variable of impact. Lack of piped water access among households in Nepal, was indicated to contribute to low subjective wellbeing if not counteracted through alterative water management techniques (Chindarkar et al., 2019). Similarly, a study, based in

rural India, found that sanitation experiences may indeed impact mental health and that access to functional household latrine was associated with higher wellbeing scores (Caruso et al., 2018)

Pakistan is still a long way off from achieving its sustainable development target of providing clean water and sanitation for all. According to UNICEF Pakistan, up to 17 million people in the country lack access to clean and safe drinking water, and an estimated 2 in 5 people lack access to hygienic sanitation infrastructure. Water quality and its physical health repercussions have been studied extensively in Pakistan. However, the mental health repercussions of water related issues in the country have been given little attention. One of the few papers exploring the issue with respect to subjective wellbeing include a study by Nadeem et al. (2018) in which , irrigation water scarcity was discovered to adversely impact the subjective wellbeing of farmers and their families in rural Punjab

This study aims to explore the impact of water access and sanitation on the subjective wellbeing of adults in Pakistan's most populous province, Punjab. The methodology involves a multilevel analysis to study the relationship with subjective wellbeing at the individual, household and community levels. Furthermore, the study incorporates gender differences by examining men and women separately. This will allow policymakers to design more effective strategies, prioritizing those most vulnerable to the issue of water access and sanitation.

2. Methodology

2.1 Data collection

The data used in the study was sourced from the Multiple Indicator Cluster Survey (MICS) for the year 2017-2018. The MICS, which is funded through UNICEF, is the largest source of data on well-being indicators relating to women and children across the globe. The survey aims to facilitate policy makers and researchers in improving the livelihood and wellbeing of those most vulnerable, while enabling nations to meet the goals set forth by the 2030 sustainable development agenda.

The 2017-2018 MICS conducted in Punjab, Pakistan, covered 36 districts, with urban and rural areas defined as primary sampling strata within each district. Probability proportional to size was used within each stratum to decide upon a specific number of census enumeration areas (20 households). Data was gathered from 53,840 households through the aid of 2,692 sample

clusters, with 799 being urban observations and 1893 being rural. The MICS (2017-2018) consists of 6 questionnaires in total. For our study, we utilized 2 of these questionnaires, one referring to households and the other to women aged between 15 and 49. Sample collection for the questionnaires were gathered through multi-stage stratified cluster sampling.

2.2 Construction of variables

2.2.1 Dependent variable

Subjective well being

Since our study's objective is to examine the impact of water access and sanitation on the subjective well-being of women and men, subjective well-being is our primary dependent variable employed in the model. From the MICS men and women questionnaires, we chose the variable that asked the individuals to rank their life satisfaction on a ladder scale of 0 to 10 with 0 being the worst and 10 being the highest life satisfaction also known as the Cantril ladder. From this information, we constructed a binary variable where values ranging from 0 to 5 were classified as low life satisfaction and thus represented by 0, while all observations from 6-10 were classified as high life satisfaction and were denoted by 1. This SWB variable was prepared for both men and women analyses.

2.2.2 Independent variables

Individual characteristics

SWB is impacted by more than just resource availability which is why certain socioeconomic variables of men and women have also been included in the model to provide balanced results. Three individual level variables included in our study are age, marital status and level of education. Age was recorded as number of years completed. To record marital status, we created a dummy variable, in which married was coded as 1 while not married or previously married were coded as 0. Similarly, dummies were also used to record level of education with 4 levels of education (primary, secondary, higher secondary and intermediate) coded as 1, with the rest coded as 0.

2.2.3 Household characteristics

Variables sourced from the household questionnaire used in the model include, family size, access to various sources of water and improved access to sanitation infrastructure. Family size was recorded as the number of members in a household. Water access was broken down into 4 dummy variables, with each dummy coding access as 1 and lack of access as 0. The four sources include: piped water, borewell water, bottled water and rain/spring water. Households were also studied in regards to their income levels, with 2 dummy variables created to indicate their position according to wealth quantiles. Households belonging to the upper wealth quantile was included in the rich dummy variable, while those belonging to the middle wealth quantile were recorded in the middle dummy variable. Households of the lowest quantile (poor) was considered as a control variable.

2.2.4 Community characteristics

This study covers the province of Punjab, which we have divided into three regions: south, central and north Punjab. North Punjab which includes the district of Rawalpindi was allocated as a control variable. Higher education and improved sanitation have also been taken as variables at the community level along with place of residence

2.3 Multi-level Mixed Effects Regression Analysis

The MICS data has a hierarchical structure in which individuals are nested within households and households are nested within clusters or communities. In such a data set, individuals may be more similar within the same community rather than with other individuals in the rest of the country, that belong to a different community. For this reason, a flat or one-level model can underestimate the coefficients and provide imprecise standard errors. This in turn, may affect the decision regarding the null hypothesis. Flat models also assume the independence of observations and equal variances across communities, which are assumptions that don't hold true when using MICS data.

Hierarchical structures are best utilized in Multi-level models, which take into account the lack of independence between cases (Kamanda et al., 2016). For this reason, the use of a two-level mixed-effects logistic regression model is best suited to estimate the effects of individual, household and community factors on individual's subjective well-being. Mixed-effects models

estimate both fixed and random effects. The fixed effects are estimated directly and are similar to typical regression coefficients. Random effects on the other hand, are estimated indirectly and are usually presented according to estimate variances and covariances. Moreover, the random-effects take into account the grouped nature of the dataset. Multi-level mixed effect logistic regression is used if the dependent variable is binary (Williams, 2018).

2 models were fitted for this study. In the first model, the subjective well-being of women was taken as the dependent variable, while in the second model the dependent variable used was the subjective well-being of men. SWB was measured through life satisfaction which is a binary variable. We created a dummy variable in which 1 was coded as high satisfaction and 0 as low satisfaction. The independent variables incorporated in both models were the same. They included individual, household and community characteristics.

The data was fitted into two level model expressed below:

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_1 I_{1ij} + \beta_2 I + \cdots + \beta_k H_{kij} + \alpha_1 H_{1ij} + \alpha_2 H_{2ij} + \cdots + \alpha_L H_{Lij} +$$

$$\gamma_1 C_{1ij} + \qquad\qquad \gamma_2 C_{2ij} + \cdots + \gamma_m C_{mij} \,(1)$$

$$\beta_{oij} = \beta_o + v_{ok} + e_{oij} \qquad (2)$$

where,

Individual-level variables: $I_1, I_2,\ldots, I_L$

Household-level variables: $H_1, H_2,\ldots, H_m$

Community-level variables: $CC_1, CC_2,\ldots, CC_n$

In equation 1, Individuals (man/women) are depicted by i and the clusters are represented by j. The response $\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right)$ is for women i in cluster j. I represents the individual-level predictor and its coefficient is represented by β. The level predictors are indicated by H and its coefficients by α. CC is a household-level predictor and its associated coefficient is γ. Equation 2 shows the random effects estimation. v_{ok} is the random intercept at the cluster level and shows the variability of school attendance between individuals belonging to different clusters? v_{ok} is normally distributed with a mean of zero and variance equal to σ2. Furthermore, e_{oij} shows the

variance. Intra-Class Correlation was calculated using, between cluster and within cluster variances in the formula i.e. ICC = [σu2/(σu2 + π2 /3)]. Equation 1 estimates fixed effects and equation 2 measures random effects. All the fixed effect sizes of all the predictors are expressed in Odds Ratio (OR). Moreover, to identify the joint significance of the group variable (cluster), the Likelihood Ratio Test was done. It helped us to make a selection between a flat model and a multi-level model. It al.so helped ascertaining the contribution of random and contextual factors.

2.4 Empirical model

This study aims to determine the impact of water access and sanitation on individuals in Punjab at the individual, household and community levels, respectively. The dependent variable used to achieve these objectives was subjective well-being (swb) which was measured using Life satisfaction (coded 1 for high satisfaction and 0 for low satisfaction). All the analyses were conducted in STATA 16.0.

2.4.1 Impact of water access and sanitation on the subjective wellbeing of women.

The study objectives were evaluated with the subjective well-being of women being the primary focus. The dependent variable used is subjective wellbeing (SWB). To obtain results, a multi-level mixed-effects logistic regression is applied to the data set containing 74,010 observations of women aged 15 to 49 years.

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_1 W_{1ij} + \beta_2 W_{2ij} + \cdots + \beta_k W_{kij} + \alpha_1 H_{1ij} + \alpha_2 H_{2ij} + \cdots + \alpha_L H_{Lij} +$$

$$\gamma_1 CC_{1ij} + \gamma_2 CC_{2ij} + \cdots + \gamma_m CC_{mij} \ (3)$$

$$\beta_{oij} = \beta_o + v_{ok} + e_{oij} \qquad (4)$$

where

i = from 1 to 74,010 women in the sample

j = from 1 to 2692 clusters in the sample

π_{ij} = probability of being satisfied of women i in cluster j

W = (1, 2, 3) women's characteristics

H = (1, 2,3,4,5,6,7) household characteristics

$CC = (1, 2, \ldots, 5)$ Community characteristics

$v_{ok} =$ random intercept at the cluster level

$e_{oij} =$ variance at the cluster level

2.4.2 Impact of water access and sanitation on the subjective wellbeing of men

In the second model, the dependent variable is al.so subjective wellbeing. Subjective wellbeing (SWB) measured through life satisfaction is binary in nature, and is coded 1 indicating high satisfaction and 0 indicating low satisfaction. Multi-level mixed-effects logistic regression is applied to the data set containing 27,094 observations of men aged 15 to 49 years.

$$\log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + \beta_1 M_{1ij} + \beta_2 M_{2ij} + \cdots + \beta_k M_{kij} + \alpha_1 H_{1ij} + \alpha_2 H_{2ij} + \cdots + \alpha_L H_{Lij} +$$

$$\gamma_1 CC + \gamma_2 CC_{2ij} + \cdots + \gamma_m CC_{mij} \qquad (5)$$

$$\beta_{oij} = \beta_o + v_{ok} + e_{oij} \qquad (6)$$

where

$i =$ from 1 to 27,094 men in the sample

$j =$ from 1 to 2692 clusters in the sample

$\pi_{ij} =$ life satisfaction of men i in cluster j

$M = (1, 2, 3)$ Men's characteristics

$H = (1, 2,3,4,5,6,7)$ household characteristics

$CC = (1, 2, \ldots, 5)$ Community characteristics

$v_{ok} =$ random intercept at the cluster level

$e_{oij} =$ variance at the cluster level

3. Regression results and discussion

3.1 Results for the subjective wellbeing of women

Table 3 shows the results of our regression with the dependent variable being subjective wellbeing of women (model 1). The age, education level and marital status of women in the study were all found to significantly impact their subjective wellbeing. Age was observed to have an inverse impact on subjective wellbeing. As seen in the table, if a woman's age increases by 1 year, the likelihood of her reporting high subjective wellbeing decreases by 0.98 times (OR=0.979). Education and marital status on the other hand, were seen to promote high SWB. Education at primary level and above was observed to increase the likelihood of high SWB by 1.4 times. Although less impactful than education, being married was also found to contribute to a greater likelihood of high SWB, by increasing the odds by roughly 1.1 times. Interestingly, household size, although significant, was not found to substantially impact subjective well-being (OR=1.028). All four of the individual characteristics discussed above, were significant at 1% level of significance.

In terms of access to water and improved sanitation, the results are as follows. From among the four water sources included in the study, access to piped and bottled water were the only ones found to be significant (at 5% level of significance). Access to bottled water was especially impactful in determining wellbeing, as having access increases the probability of reporting high SWB by 1.4 times. With an odds ratio of roughly 1.1, piped water access indicates a similar probability but to a lesser extent. With piped water through much of the province being of sub-optimal quality (Aziz, 2005), it's not surprising that bottled water is more heavily linked to greater levels of happiness and relied upon for drinking purposes. Access to Improved sanitation is highly significant at 1% level of significance, and was found to raise the likelihood of women reporting high satisfaction by 1.2 times. Research has shown that lack of access to clean and safe sanitation infrastructure, results in lower health outcomes for women, putting them at risk of developing disease and being subject to harassment (Lal, 2013). Research such as that conducted by Caruso et.al (2018), has also highlighted the direct relationship between women's sanitation experiences and their mental health. The results from their study showed that Functional household latrine access was linked with higher wellbeing scores.

The wealth quantile from which the women in the sample belonged to was also found to

Women Characteristics	Model 1	Empty model

be a significant factor in determining their subjective wellbeing. Being from a middle-income family was found to increase the likelihood of women reporting higher subjective wellbeing by 1.6 times. The impact was found to be even greater when studying women from the wealthiest economic class, as results show that being among the richest, increased the probability of reporting higher life satisfaction by 2.5 times. Both variables are significant at 1% level of significance adding greater validity to these findings. This does not come as a surprise as there is a plethora of research pointing to a positive correlation between income and happiness (Headey & Wooden, 2004).

The urban rural divide is another factor that plays into the SWB determination of women in the province. As per the results in the table, women living in cities or towns were 0.7 times less likely to report high SWB. Research conducted by Rao et al.,(2003) provides further insight into this phenomenon. Their study, based in India, showed that an urban lifestyle for women was associated with reduced wellbeing. The reason for this being was that many women in urban areas struggled to maintain their household duties while managing a job. An urban lifestyle also tended to include a reduced sense of community as individuals primarily relied on themselves and their immediate family instead.

At the community level, regional variation was found to play a role in impacting women's subjective wellbeing in Punjab. While the results for central Punjab were insignificant, women from south Punjab were found to be 1.1 times more likely to report greater subjective wellbeing. This is evident from the odds ratio of 1.103 and a significance level at 10%. Improved sanitation and higher education were also associated with higher reported SWB with an odds ratio of 2.339 and 1.156 respectively. This supports the results at the individual level stated earlier.

The intra cluster correlation of the women's model is 14%. This means that 14% of the variation amongst women in the clusters is defined by the inclusion of individual, household and community characteristics.

Age (years)	0.979*** (0.001)	-
Educational level	1.388*** (0.031)	-
Marital status	1.135*** (0.029)	-
Household characteristics		
Number of household members (No.)	1.028*** (0.003)	-
Piped water access	1.092** (0.041)	-
Bore well water access	0.990 (0.032)	-
Bottled water access	1.416** (0.241)	-
Drain/spring water access	1.167 (0.265)	-
Improved sanitation	1.169*** (0.029)	-
Rich	2.517*** (0.080)	-
Middle	1.629*** (0.044)	-
urban	0.740*** (0.032)	-
Community Characteristic		
South Punjab	1.103* (0.065)	-
Central Punjab	1.019 (0.054)	-
Higher education	2.339*** (0.621)	-
Improved sanitation	1.156*** (0.049)	-
Random effects		
Cluster level	0.536	0.636
Variance (SE)	0.022	0.025

Chi-square test	2848.91	-
Residual intra-cluster correlation	0.140	0.162

Table 1: regression results (women)

3.2 Results for the subjective wellbeing of men

Table 4 shows the results of our regression with the dependent variable being subjective wellbeing of men (model 2). The four socio-economic variables age, education level, marital status and family size were found to be significant at 1% level.

As seen in the table, age was found not to have a substantial impact on SWB as the variable has a recorded odds ratio of approximately 1. Education and marital status on the other hand, were seen to promote high SWB. Education at primary level and above was observed to increase the likelihood of high SWB by 1.4 times. Since education is linked to improved job prospects and higher income such findings were expected (Nikolaev & Rusakov, 2016). Although less impactful than education, being married was also found to contribute to a greater likelihood of high SWB, by increasing the odds by roughly 1.2 times. Household size, although significant, was not found to substantially impact subjective wellbeing (OR=1.020).

From among the four water sources included in the study, access to piped and bottled water were the only ones found to be significant, at 10% and 1% level of significance respectively. Access to bottled water had the greatest impact in determining SWB, as having access increased the probability of reporting high satisfaction by 1.3 times. With an odds ratio of roughly 1.1, piped water access indicates a similar probability but to a lesser extent. With piped water through much of the province being of sub-optimal quality (Aziz, 2005), it's not surprising that bottled water is more heavily linked to greater levels of happiness and relied upon for drinking purposes. Access to Improved sanitation is an insignificant factor in relation to the subjective wellbeing of men. This may be due to men having greater freedom in regards to open defecation or urination in comparison to women as referenced in the works of Sweetman &

Men Characteristics	Model 1	Empty model

Medland,(2017) Economic class or the wealth quantiles from which the men in the sample belonged to, was found to be a significant factor in determining their subjective wellbeing.

Age (years)	0.990*** (0.002)	-
Educational level	1.422*** (0.60)	-
Marital status	1.170*** (0.052)	-
Household Characteristics		
Number of household members (No.)	1.020*** (0.005)	-
Piped water access	1.113* (0.068)	-
Bore well water access	0.934 (0.050)	-
Bottled water access	1.274*** (0.088)	-
Drain/spring water access	0.860 (0.20)	-
Improved sanitation	1.039 (0.045)	-
Rich	2.272 *** (0.20)	-
Middle	1.548*** (0.071)	-
urban	0.813*** (0.071)	-
Community Characteristics		
South Punjab	0.682*** (0.064)	-
Central Punjab	1.064 (0.075)	-
Higher education	0.849* (0.082)	-
Improved sanitation	1.194*** (0.073)	-
Random effects		
Cluster level	0.996	1.089
Variance (SE)	0.052	0.055

Chi-square test	705.35	-
Residual intra-cluster correlation	0.232	0.249
ICC (SE)	0.009	0.009

Table 2: regression results (men)

Being from a middle-income family was found to increase the likelihood of men reporting higher subjective wellbeing by 1.5 times. The impact was found to be even greater when studying men from the wealthiest economic class, as results show that being among the richest, increased the probability of reporting higher life satisfaction by 2.3 times. Both variables were significant at 1% level of significance adding greater validity to these findings. This does not come as a surprise as there is a plethora of research pointing to a positive correlation between wealth and happiness (Headey & Wooden, 2004).

At the community level, location of household was found to have an impact on men's subjective wellbeing. The results in the table indicate that men from urban areas were 0.8 times less likely to report high SWB. Regional variation in subjective wellbeing was also observed. While the results for central Punjab were insignificant, men from south Punjab were found to be 0.7 times more likely to report greater subjective wellbeing, at 1% level of significance.

Furthermore, the intra cluster correlation of the men's model is 23%. This means that 23% of the variation amongst men in the clusters is defined by the inclusion of individual, household and community characteristics.

4. Conclusion

Goal 6 of the UNs sustainable development goals, access to water and sanitation for all, is highly unlikely to be achieved by the target year of 2030. While access to clean water and secure sanitation facilities is universally recognized as a fundamental human right, it is still not a priority among leaders of many developing nations. In Pakistan, the reasons for a lack of clear commitment towards achieving this goal are many, but one in particular is general unawareness regarding the far-reaching impacts of water and sanitation issues. The physical health costs related to unsatisfactory water supply and unhygienic sanitation facilities have been widely

studied across the world and in Pakistan, however the negative mental repercussions have never been given much thought. By assessing the impact of water and sanitation access on the subjective wellbeing of adults in Punjab, this study aims to change this.

The goal of this study was to uncover the link between water and sanitation access and overall life satisfaction among the adult population of Punjab. To the best of our knowledge, no previous study in the context Pakistan has examined how water and sanitation affects an individual's outlook on life. By studying the impact on men and women individually, the analysis al.so revealed the gender disparity among those affected.

Using data sourced from the multiple indicator cluster survey 2017-2018, the study applied a multi-level mixed regression model and uncovered a positive relationship between piped and bottled water access and the subjective wellbeing of women. A similar relationship was discovered in the case of men, with an increase in piped and bottled water access having been found to increase the likelihood of them reporting higher subjective wellbeing. The impact of improved sanitation on self-reported life satisfaction was found to follow a similar trend. However, the subjective wellbeing of women was discovered to have been more greatly impacted. The findings at the community level hold consistent with that of the household analysis, confirming our hypotheses that improved sanitation has a significant impact on the subjective wellbeing on men and women.

Since one's life satisfaction is influenced by more than just their access to water or sanitation, the study incorporated a series of socio-economic characteristics at individual and community levels as well. The inclusion of such variables in the study added greater depth to the research and provided further insights into the factors that shape the lives of adults in Punjab. The results of the analysis found that wealth played a crucial role in determining life satisfaction, as men and women from middle- and rich-income backgrounds reported higher subjective wellbeing. Education at both the individual and community levels was also found to be highly significant, holding a positive relationship with the subjective wellbeing of adults in the province for both genders.

The findings of this study establish a clear connection between water and sanitation access and subjective wellbeing. The negative impact of the crisis on citizens' perception of life is no longer an assumption, but a fact that must be acknowledged. The study also sheds light on

the disproportionate effect of inadequate sanitation on the lives of women, signaling the need for targeted gender-based policies. Furthermore, the multi-level analysis can help garner support for water and sanitation-based infrastructure projects, as it can now be proven that doing so will benefit not just individuals but communities as a whole.

4.1 Policy Implications

Inadequate water and sanitation in Pakistan, has for the most part, been seen as an infrastructure problem. Analyzing the topic with respect to subjective wellbeing, however, shows that it is one that relates to mental health, women empowerment and wider societal progress. Given that water and sanitation access is now undoubtedly linked to the life satisfaction of adults in Punjab, there are a few key details policymakers in the regions must keep in mind when tackling the issue.

Since access to piped water was associated with higher subjective wellbeing among both men and women, the installation and maintenance of water pipes should be among the key infrastructure projects prioritized in the province. Increasing dissatisfaction in urban areas, also points to a failure to provide for a booming population. Ensuring that municipal funds are channeled towards the provision of basic water and sanitation facilities for the most vulnerable city residents, must be given importance.

Sub-optimal and inaccessible sanitation facilities was found to disproportionally affect the livelihood of women in Punjab. This fact must be taken into consideration when designing policies aimed at providing improved sanitation. Lack of access to secure sanitation facilities at home push many girls to drop out of school, thus limiting their potential and affecting mental health. Providing sanitation facilities in schools, particularly middle and secondary schools for girls, may help alleviate the burden of this issue. The particular struggles that young women face must also be front and center in all awareness campaigns regarding improving sanitation facilities in the country.

At the community level, improved sanitation was found to be a determinant of subjective wellbeing for both genders. Targeting individual households can be difficult since the presence of sanitation infrastructure is largely dependent on socio-economic class. For this reason, policies focusing on sanitation must broaden their reach and be designed to scale out. Sanitation

infrastructure must be installed, repaired and monitored in areas most frequented by the provincial populous. This includes areas of employment and public spaces such as parks and community centers

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