

## The Households Characteristics of Sufficient Water in Kyrgyzstan: An Analysis of The Multiple Indicator Cluster Survey (MICS)

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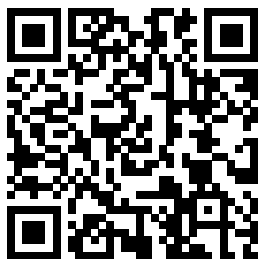
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### ABSTRACT

This study investigates the relationship between household characteristics and access to sufficient water in Kyrgyzstan, utilizing secondary data from the 2023 Multiple Indicator Cluster Survey (MICS). Employing a quantitative approach with a cross-sectional design, the analysis encompassed univariate, bivariate (Chi-square test), and multivariate (binary logistic regression) methods. The sample comprised 6,615 households, with findings indicating that most households are of productive age, possess secondnoary to higher education, reside in rural areas, and have access to sufficient water. Economic and regional distributions within the sample are relatively balanced, reflecting the broader population's diversity. Multivariate analysis revealed that access to sufficient water is significantly influenced by regional location, household welfare level, and ethnicity; regions such as Issyk-Kul, Bishkek, and Jalal-Abad exhibit higher access, while Talas and Chui show lower access. Demographic factors like gender, age, and place of residence did not significantly affect water access. These findings underscore the necessity for targeted policies that address disparities in water access, focusing on disadvantaged regions and low-income households to promote equitable access to sufficient water.

### Key Messages:

- Region, wealth index, and ethnicity have a significant influence on household sufficient water.
- Issyk-Kul, Bishkek and Jalal-Abad regions have a higher chance of getting enough water, while Talas and Chui have a lower chance.
- Gender, age, and place of residence do not have a significant effect on sufficient water.

## GRAPHICAL ABSTRACT

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Source: <https://www.nationsonline.org/oneworld/map/kyrgyzstan> -administrative-map.htm

## INTRODUCTION

Sufficient water is a basic human right and is a top priority in the Sustainable Development Goals (SDGs), especially target 6.1, which emphasises universal and equitable access to safe and affordable drinking water by 2030 (1). However, globally, millions of people still face challenges in obtaining sufficient water for their daily needs, both in terms of quantity and quality (2). More than 2 billion people still live without access to safe drinking water services (3). This inequality of access not only impacts public health, but also hampers social and economic development in many countries, especially developing countries (4).

Amid the importance of clean water for survival, various countries including Kyrgyzstan still face challenges in equalizing access to clean water at the household level (5). Although the majority of the population has been reported to have access to water sources, not all households have sufficient water to meet their basic daily needs (6). The problem of limited water is often influenced by differences in region, level of welfare, and infrastructure conditions (5).

Lack of adequate water availability in households cannot be separated from a number of multidimensional factors. Household characteristics such as socio-economic status, education level, geographic location (region and rural-urban), and demographic factors such as age and gender of the head of the household can affect access to water (7,8). In addition, ethnic background can also play a role, given the potential for marginalisation in the public service system. The disparity in infrastructure development between regions, especially between urban and rural areas, exacerbates disparities in sufficient water (9,10).

Based on the theory of social determinants of health which explains that social and structural conditions greatly influence people's access to basic services, including sufficient water (11). According to this theory, a person's economic status, education, and place of residence are key determinants that influence health and well-being outcomes. In this context, households with better socioeconomic characteristics tend to have better access to adequate water, because they have the resources and capacity to obtain such services. This theory helps in identifying and understanding the relationship between household social factors and access to essential resources such as sufficient water. Although several studies have addressed access to safe drinking water in Kyrgyzstan, most have focused on water quality and availability of water sources, rather than on the adequacy of water available at the household level (12,13).

In Kyrgyzstan, while significant progress has been made, challenges persist. According to the 2023 Multiple Indicator Cluster Survey, approximately 4% of the population lacks access to safe drinking water,

relying instead on hazardous open water sources. Access is notably better in urban areas (100%) compared to rural regions, where only 94% have safe drinking water access. The Batken region faces the most significant challenges, with only 82% of its population having access to safe drinking water (14). Therefore, the purpose of this study is to analyze the relationship between household characteristics and household sufficient water based on Kyrgyzstan MICS 2023 data.

## METHOD

This study used the secondary data from The Kyrgyzstan 2023 Multiple Indicator Cluster Survey (MICS). The survey is country representative covering the topics of health, education, and living conditions. The primary objectives of the Kyrgyzstan MICS 2023 were to assess the situation of children, adolescents, women, and households while generating high-quality, disaggregated data to inform policies promoting social inclusion of vulnerable groups. Additionally, the survey aimed to provide data for monitoring national and global SDG indicators, validate existing data, and generate internationally comparable statistics. This collaborative effort was made possible through partnerships between the National Statistical Committee of the Kyrgyz Republic, UNICEF, USAID, the Government of Switzerland, and the United Nations Population Fund (UNFPA). National Statistical Committee of the Kyrgyz Republic and UNICEF. 2023 Kyrgyzstan Multiple Indicator Cluster Survey, Snapshots of Key Findings. Bishkek, Kyrgyzstan: National Statistical Committee of the Kyrgyz Republic and UNICEF, 2024, Kyrgyzstan. The dataset is open to public upon registered, that can be assessed through the website <https://mics.unicef.org/news/just-released-kyrgyzstan-2023-mics-survey-findings-snapshots-and-datasets>.

This study is cross-sectional time frame with quantitative approach. The unit of analysis of this study is household. The original survey of MICS involved 6,615 households. This current study used all households samples into the analysis. The dependent variable is sufficient water which derived from question: There been any time in the last month without sufficient water? (yes, at least once/ no, always sufficient). The independent variables are including sociodemographic characteristics of head of households. There are sex (male/female), age (working age (15 – 64 years old) /not working age (older than 64 years old), ethnicity (Kyrgyz/ Russian/ Uzbek/ Others), educational level (pre-school or none or primary/ basic secondary/ complete secondary/ professional primary or middle/ higher), wealth index (poorest/ second/ middle/ fourth/ richest), region (Batken/ Jalal-Abad/ Issyk-kul/ Naryn/ Osh/ Talas/ Chui/Bishkek c/ Osh c), and place of residence (urban/rural). In the regression analysis, the reference categories for categorical variables were: sex (male), age (working age: 15–64 years), ethnicity (Kyrgyz), educational level (pre-school or none), wealth index (poorest), region (Batken), and place of residence (urban).

The analysis was done using univariate, bivariate, and multivariate. The univariate was tested to explore the frequency and percentage of each variables of interest. The bivariate analysis was tested using Chi-square in order to explore the correlation of each predictor and outcome. The multivariate analysis was tested using binary logistic regression to identify adjusted odd ratios of each predictors on association with sufficient water in the household. All statistical test was utilized STATA software version 18.

## CODE OF HEALTH ETHICS

UNICEF approved the procedure and tools of all MICS surveys. As the study utilized anonymized data ethical approval for secondary data was not required.

## RESULTS

Out of the 6,615 households surveyed, the majority had access to adequate water (79.15%) and lived in rural areas (59.44%). The proportion of males was higher (72.02%) than females (27.98%), and the majority of the population was of working age (78.96%). The dominant ethnicity was Kyrgyz (77.31%), followed by Uzbek (11.26%) and Russian (7.20%). In terms of education, the majority of respondents had completed secondary education (45.52%), while 24.35% had tertiary education. Economic distribution was fairly even, with the richest group accounting for 26.27% and the poorest group 14.56%. In terms of

territory, the population was fairly evenly distributed across nine regions, each ranging from 9% to 12% of the total respondents. These data indicate that the majority of households were classified as having secondary to tertiary education, were of working age, lived in rural areas, and had access to adequate water.

**Table 1. The general characteristics of households**

<b>Household characteristics (n=6,615)</b>	<b>n</b>	<b>%</b>
<b>Sufficient water</b>		
No	1,379	20.85
Yes	5,236	79.15
<b>Sex</b>		
Male	4,764	72.02
Female	1,851	27.98
<b>Age</b>		
Not working age	1,392	21.04
Working age	5,223	78.96
<b>Ethnicity</b>		
Kyrgyz	5,114	77.31
Russian	476	7.20
Uzbek	745	11.26
Others	280	4.23
<b>Education level</b>		
Pre-school or none/Primary	75	1.13
Basic secondary	451	6.82
Complete secondary	3,011	45.52
Professional primary/middle	1,467	22.18
Higher	1,611	24.35
<b>Wealth index</b>		
Poorest	963	14.56
Second	1,122	16.96
Middle	1,234	18.65
Fourth	1,558	23.55
Richest	1,738	26.27
<b>Region</b>		
Batken	621	9.39
Jalal-Abad	670	10.13
Issyk-kul	795	12.02
Naryn	775	11.72
Osh	656	9.92
Talas	791	11.96
Chui	774	11.70
Bishkek c	769	11.63
Osh c	764	11.55
<b>Place of residence</b>		
Urban	2,683	40.56
Rural	3,932	59.44

The results in the table 2 showed that adequate water availability was associated with gender, ethnicity, education level, wealth index, region, and place of residence ( $p < 0.05$ ), but not significantly to age. Women, ethnic Russians and “others”, those with higher education, the richest group, and residents of the Issyk-Kul region and urban areas had the highest proportions of sufficient water. In contrast, men, ethnic Uzbeks, those with secondary education, the poorest group, and residents of regions such as Talas, Chui, and Batken showed lower proportions of adequate water availability, highlighting the inequality of sufficient water based on social and geographical characteristics.

**Table 2. The bivariate analysis results of factors associated with sufficient water in households**

Household characteristics (n=6,615)	Sufficient water			Chi2 ( <i>p-value</i> )
	No (%)	Yes (%)	Total	
<b>Sex</b>				7.2266 (0.007)
Male	21.68	78.32	4,764	
Female	18.69	81.31	1,851	
<b>Age</b>				1.2104 (0.271)
Not working age	21.91	78.09	1,087	
Working age	20.56	79.44	4,149	
<b>Ethnicity</b>				18.7182 (<0.001)
Kyrgyz	21.16	78.84	5,114	
Russian	14.92	85.08	476	
Uzbek	24.16	75.84	745	
Others	16.43	83.57	280	
<b>Education level</b>				53.9129 (<0.001)
Pre-school or none/Primary	22.67	77.33	75	
Basic secondary	20.62	79.38	451	
Complete secondary	24.38	75.62	3,011	
Professional primary/middle	19.63	80.37	1,467	
Higher	15.33	84.67	1,611	
<b>Wealth index</b>				186.3334 (<0.001)
Poorest	29.49	70.51	963	
Second	22.99	77.01	1,122	
Middle	25.61	74.39	1,234	
Fourth	22.14	77.86	1,558	
Richest	10.13	89.87	1,738	
<b>Region</b>				830.8529 (<0.001)
Batken	35.10	64.90	621	
Jalal-Abad	11.49	88.51	670	
Issyk-kul	1.26	98.74	795	
Naryn	18.06	81.94	775	
Osh	31.10	68.90	656	
Talas	39.19	60.81	791	
Chui	39.02	60.98	774	
Bishkek c	4.16	95.84	769	
Osh c	11.26	88.74	764	
<b>Place of residence</b>				126.3071 (<0.001)
Urban	14.05	85.95	2,683	
Rural	25.48	74.52	3,932	

The results of multivariate logistic regression (table 3) showed that significant factors associated with adequate sufficient water included “other” ethnicity (AOR=1.61,  $p=0.008$ ), wealth level (especially the second and richest group), and region of residence. Compared to Batken, regions such as Issyk-Kul (AOR=35.92), Bishkek (AOR=8.92), and Jalal-Abad (AOR=4.10) were significantly more likely to have adequate sufficient water. In contrast, Talas and Chui regions were much less likely. Variables such as gender, age, and place of residence (urban vs rural) did not show statistically significant associations. These findings emphasize the strong role of regional and economic factors in determining access to clean water.

**Table 3. The binary logistic regression of factors associated with sufficient water in household**

Household characteristics	AOR	95% CI (lower-upper)		<i>p-value</i>
<b>Sex</b>				
Male	ref			
Female	1.00	0.86	1.17	0.951
<b>Age</b>				
Not working age	ref			
Working age	1.08	0.92	1.27	0.343
<b>Ethnicity</b>				

Household characteristics	AOR	95% CI (lower-upper)		p-value
Kyrgyz	ref			
Russian	1.35	0.99	1.84	0.059
Uzbek	0.82	0.66	1.03	0.088
Others	1.61	1.14	2.29	<b>0.008</b>
<b>Education level</b>				
Pre-school or none/Primary	ref			
Basic secondary	1.04	0.56	1.95	0.895
Complete secondary	0.81	0.45	1.45	0.479
Professional primary/middle	0.91	0.50	1.64	0.745
Higher	0.88	0.48	1.61	0.684
<b>Wealth index</b>				
Poorest	ref			
Second	1.29	1.04	1.59	<b>0.020</b>
Middle	1.07	0.86	1.33	0.534
Fourth	1.23	0.99	1.54	0.067
Richest	1.52	1.13	2.03	<b>0.005</b>
<b>Region</b>				
Batken	ref			
Jalal-Abad	4.10	3.06	5.50	<b>&lt;0.001</b>
Issyk-kul	35.92	18.64	69.22	<b>&lt;0.001</b>
Naryn	2.23	1.70	2.92	<b>&lt;0.001</b>
Osh	1.23	0.96	1.58	0.099
Talas	0.76	0.59	0.96	<b>0.023</b>
Chui	0.69	0.54	0.88	<b>0.003</b>
Bishkek c	8.92	5.70	13.95	<b>&lt;0.001</b>
Osh c	3.78	2.72	5.25	<b>&lt;0.001</b>
<b>Place of residence</b>				
Urban	ref			
Rural	1.08	0.90	1.30	0.421

## DISCUSSION

The results of this study indicate that the availability of adequate water in households in Kyrgyzstan is significantly influenced by social, economic, and geographical characteristics. This finding is by previous studies that highlight the important role of structural factors in determining access to basic services, especially clean water (15,16). The geographical and economic inequality are major barriers to achieving universal access to water (17). A similar finding was also reported which stated that regional factors and welfare levels greatly determine the quality and quantity of water received by households (18).

The significant correlation between residential area and sufficient water in this study strengthens the argument that water infrastructure development is uneven across regions. The high AOR in regions such as Issyk-Kul and Bishkek indicates that more urbanized and administratively integrated regions have better water services. In contrast, regions such as Talas and Chui which showed lower AORs may still face constraints in the distribution and quality of basic infrastructure. These results are in line with previous study which states that in many developing countries, differences between urban and rural areas, as well as between regions, are still a major issue in clean water services (19). In terms of ethnicity, the results that "other" ethnic groups have a higher chance of accessing water may reflect variations in geographic distribution and socio-political relations between ethnic groups in Kyrgyzstan. This study shows that the Uzbek group actually has a lower chance, which is in line with a previous study which highlighted the potential for discrimination in basic services against minority groups in the local government system (20). In another study on household water treatment, it was found that household wealth greatly determines this behavior compared to poor households. This is in line with sufficient to clean water (21). Apart from urbanization and administrative factors, infrasturture development, investment in water systems between ethnic group may affect the diversity water availability in all areas.

In relation to the theory of social determinants of health, the results of this study provide strong support for the assumption that social factors such as economic status, education, and geographic location

have a major impact on access to basic services such as water (11). This theory emphasizes that inequalities in structural resources—such as income and housing—contribute to inequalities in health and well-being outcomes. The insignificance of gender and age in the logistic regression model also strengthens those structural determinants are more dominant than individual demographic factors in explaining differences in sufficient water. These results are supported by other studies that found that female primary school graduation rates and governance were key determinants of water security (22). Although most households are of working age and have secondary to tertiary education, this does not guarantee full access to sufficient water, especially if they live in areas with inadequate infrastructure services. These results suggest that the development of basic services must not only consider improving individual capacities (such as education), but also equitable development across regions and improving public services as a whole. As done by the country of Kyrgyzstan, it has a good status of water supply security and mapping (23). Equitable development not only improves people's quality of life but also strengthens resilience to climate risks and water crises in the future. The limitations of this study include the potential bias due to using secondary data, self-reporting errors, regional underrepresentation, or sampling weights. The recommendation is to related stakeholders to resolve the insufficient water in the households, which may include the government, non-governmental organisations, and international donors. The next study may emphasise Social Determinants of Health (SDH) and link to Sustainable Development (SDG).

## CONCLUSION

Sufficient water at the household level was significantly influenced by region, wealth level, and ethnicity, while factors such as gender, age, and place of residence (urban vs. rural) did not show significant associations in the multivariate model. Households located in regions such as Issyk-Kul, Bishkek, and Jalal-Abad, as well as those from the upper economic groups, were more likely to have access to adequate water. These findings indicate that inequality in access to clean water is more determined by structural and geographic factors than individual demographic factors. Therefore, efforts to improve water supply in Kyrgyzstan need to focus on equitable infrastructure development across regions and strengthening public services, especially in disadvantaged areas and economically disadvantaged communities.

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## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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