International Journal of Multidisciplinary Research and Growth Evaluation.

Determinants shaping child mortality patterns: Evidence from CIS countries

Munisa Makhmudova [1*], **Umida Mamasalaeva** [2]
[1] Tashkent State University of Economics, Uzbekistan
[2] Institute for Macroeconomic and Regional Studies (IMRS), Uzbekistan

* Corresponding Author: **Munisa Makhmudova**

Article Info

ISSN (online): 2582-7138
Volume: 04
Issue: 05
September-October 2023
Received: 15-07-2023
Accepted: 10-08-2023
Page No: 01-08

Abstract
During the past few decades, substantial strides have been undertaken globally to mitigate child mortality rates. This study discerns the assessment of child mortality within the Commonwealth of Independent States (CIS) through the utilization of data sourced from the World Bank and UNICEF. For the remaining set of eight nations, the substantiating evidence is of a conjectural nature, derived from disparities observed within official datasets, alongside considerations regarding the delineation of live births. Methodologically, the analytical approach encompasses the utilization of linear regression models, specifically Ordinary Least Squares (OLS) and Generalized Least Squares (GLS) for binary outcomes, supplemented by the application of Fixed Effect models in a majority of instances. The findings demonstrated that the reduction of child mortality rates is notably linked to the availability of safe potable water and reliable electricity, as opposed to factors such as income or healthcare expenditures.

Keywords: child mortality, income, water, GDP, literacy

Introduction

Health and income are strongly linked between countries and among countries. The rate at which newborns and children under the age of five die shows the impact on economic and social factors on the health of mothers and newborns, as well as the effectiveness of health-care systems, access to clean water and electricity. It is estimated that improvements in water, sanitation, and hygiene might avert over 3.5 million child and adult deaths globally each year (Pruess-Uestuen *et al.*, 2008). Individual characteristics, such as the family environment and behaviors, are included in these economic and social situations. They also include features at the state level, such as the quality and accessibility of medical care within the local health system. Access to improved water and sanitation reduces exposure to fecally transmitted illnesses does not only reduce diarrhea incidence but also significantly reduces the risk of malnutrition (Pruess-Uestuen *et al*., 2008) as well as the risk of severe infection with other diseases, thereby improving the chances of survival for protected children (Caulfield *et al.*, 2008). Walker *et al.*, 2007; Cutler and Miller, 2005; Ewbank and Preston, 1990). One of the remaining challenges in the field of survival and development is that the newborn period, the first 28 days of a child's life, is when the majority of deaths occur under the age of five. The key outcome variable of interest in this research is child mortality, which is commonly defined as the number of children dying before the age of five per 1000 children born alive. This figure can be computed as a cohort measure, which indicates that a certain birth cohort is monitored for five years, or as a period measure, which combines age-specific death rates from several birth cohorts for a specified time window. Better health has the potential to enhance livelihoods and raise national income. Despite the fact that there is a link between wealth and health is still debated. First influential article by Pritchett and Summers (1996) nvx argued that “wealthier are healthier”. However, the extent of this impact in different regions, as well as the influence of other socioeconomic factors, such as wealth distribution, has been a topic of debate in the research. Given that the WHO standards categorize any intervention that costs less than the yearly GDP per capita per life-year saved as "very cost effective", further investment in water and sanitation looks to be highly desirable from a policy standpoint.

According to UNICEF in 2019, 2.4 million children perished in their first month of life all across the world. And there is another estimation which is child mortality from first year to 5th birthday while it is much less than infant mortality. From 93 deaths per 1,000 live births in 1990 to 38 deaths per 1,000 live births in 2019, the global under-five mortality rate has decreased by 59%. Despite this significant gain, ensuring child survival remains a top priority. Every day in 2019, around 14,000 children under the age of five died, an unacceptably high number of entirely preventable child deaths.

In 2000, the World Health Organization (WHO) purposed to minimize infant mortality with a help of joint efforts and proper health care system, which should be every governments' primary liability. Increased support for children's health is critical in general because it is a human right. If a newborn isn't regarded alive when birth, he or she can't be said to have died. As a result, the definition of "live birth" is an important factor in determining the infant mortality rate. In 1950, the World Health Organization established the following definition of "live birth": In other words, a live birth and infant death should be defined as any birth with any indications of life, no matter how minor, followed by death, no matter how swiftly. In most nations, both developing and developed, this concept is officially recognized.

Child mortality is caused by a variety of factors, including poor sanitation, poor water quality, maternal and infant malnutrition, insufficient prenatal and medical care, and the use of infant formula as a breast milk substitute. Infant mortality rates are also influenced by women's status and financial differences. Infant mortality rates are higher in locations where women have little rights and where there is a huge income gap between the rich and the poor. Poor education and restricted access to birth control both contribute to the problem, resulting in a high number of births per woman and short intervals between births. High-frequency births provide moms less time to recover and may result in food shortages in low-income families. Women who are educated are more likely to have children later in life and to seek better health care and education for their children. As a result, the relationship between health and income is neither unidirectional nor stable across time or across variables. "Better health can lead to improved living conditions and increased national wealth. Improvements in life expectancy, for example, have been shown to have a beneficial effect on GDP growth rates, and that increased maternal and newborn health improves household economic position. "As a result, the relationship between health and income is neither unidirectional nor stable across time or across variables. Better health can lead to improved living conditions and increased national wealth. Improvements in life expectancy, for example, have been shown to have a beneficial effect on GDP growth rates, and that increased maternal and newborn health improves household economic position.

This work includes three main steps (literature review, methodology, result and discussion parts) to summarize the research. Theorems and hypotheses tested in relevant studies were provided by experts from across the world in the theoretical section of the literature review. The study done in Limin Wang will be discussed with certain formulas and methodologies in the empirical section of the literature review. In the following phase, I will perform empirical research using OLS and GLS and Fixed Effect models and provide some descriptive graphs and information in the methodology section. The findings will be obtained and evaluated in the results and comments

Literature Review

Access to conveniently accessible health facilities, as well as increased methods for properly caring for children, are both essential factors in reducing infant fatalities, particularly in developing countries. The literature analyzing the effects of income per capita and save water on child mortality is moderate and include various empirical approaches and variables of interest. The researchers used a variety of empirical approaches and ways to investigate the impact. However, opinions and findings on the relationship between incomes per capita, safe water and infant mortality differ from one another.

To begin with, the relationship between income per capita and child mortality by Fiala *et al* (2014) [1]. In general, improving child- health financing is essential because it is human rights, infant mortality usually identifies socio-economic indicators of citizens (children's well-being, nourishment and education to their further labor supply and productivity). Further, Roman (2019) researches area was focused on investigated income inequality and infant mortality rate in USA for three years from 2007 to 2010 in the period of great recession while Gini coefficient were used to estimate income inequality. Also, Multilevel logistic regression was used to analyze1) state-level income inequality in the United States, as defined by Z-transformed Gini coefficients in the year of birth, and 2) the change in Gini coefficient between 1990 and the year of birth (2007-2010), predicted newborn or neonatal death. Their analyses took into account both individual and state-level factors. According to the relative income hypothesis, one's health is influenced not just by one's own income but also by the earnings of others in society. And the outcome of study proved that rising income disparity at the state level is a substantial risk factor for infant mortality. More precisely, infants born in states with rising inequality were more likely to die within their first year of life. Sarah and Jed (2011) [3] supplemented the research through using an exceptionally large data set of 1.7 million births in 59 developing countries using DHS survey, investigation illustrated whether short-term variations in aggregate income affect infant mortality. They explored that per capita GDP and infant mortality have a strong negative relationship. Even though, boys' mortality is higher in comparison to girls while female child mortality is more sensitive to negative economic shocks than male infant mortality, implying that interventions protecting the health of female infants may be more relevant during economic downturns. Limin Wang (2002) used empirical study to analyze child mortality in low-income countries both at the rural and urban areas separately. Research contains 60 low-income countries from 1990 to 1999 using DHS data taking into consideration social-economic group, or geographic location in order to design poverty rate. In order to estimate results, he used OLS and WLS models. The finding suggests that, income inequality and child mortality has negative association and there is a large variance between urban and rural areas. Empirical findings highlighted that access to electricity, vaccination in the primary year of life and public health expenditure can noticeably diminish child mortality. However, electricity effect sometimes independent from incomes. Providing access to electricity would significantly reduce child mortality in urban areas whereas vaccination coverage is essential for rural areas' children. Following this, Tim Ensor *et al* (2015) [5] preferred to use time series data from 14 high- and middle-income countries to study relation between previous economic recession and boom periods including GDP per capita on infant and maternal outcomes from 1936 to 2005. Both fixed and random effects are considered. The effect of altering per capita income on maternal, child, and neonatal mortality was investigated using panel regression. A Hausman test, which was used to compare the consistency of random vs fixed effects, was statistically significant (P 0.01), Income appears to be less of a factor of mortality outcomes today than it was in the past, according to data. Technological advances that have traditionally taken decades to attain and scale-up in now-rich countries might be made available to countries at a considerably cheaper cost and at a much earlier stage of development. The findings show that recessions do have a negative impact on mother and baby outcomes, especially in the early phases of a country's growth, though the consequences vary greatly amongst various systems. Almost all of the world's poorest countries have had their GDP per capita fall by 10% or more in at least one of the last five decades. The design and execution of procedures that safeguard disadvantaged groups from the effects of shifting national income is a challenge for today's policymakers. Bernadette *et al* (2013) preferred to use meta-analysis in identifying income and child mortality connection. The comprehensive literature search turned up 24 papers with 38 estimations that looked at the effect of income on death rates. They created pooled estimates of the association between income and mortality using meta-analysis. The pooled estimate of the link between income and infant mortality is 0.33 (0.39 to 0.26) after controlling for variables, whereas the estimate for under-five mortality is 0.28. (0.37 to 0.19). If a country's infant mortality rate is 50 per 1000 live births and its GDP per capita buying power parity grows by 10%, the infant mortality rate falls to 45 per 1000 live births.

Income is a key factor of child survival, and this study gives a framework for understanding it. Following this, H. Issa and B Outtara (2005) purposed to identify the effect of health spending on infant mortality (IMR). They divided health spending into private and public categories and divided countries into two groups based on their development levels. They investigated that findings from 160 nations using OLS and panel data approaches demonstrate a strong negative relationship between health expenditure and IMR. In addition, studies justified strong negative relationship between GDP per capita and IMR and female education. Next, Marcella Alsan and Claudia Goldin (2018) Explored decrease in child mortality in the US and provide results proved that clean water and sewerage system was vital in diminishing U5M. They took period from 1880 to 1920 and their findings proved in order to minimize child mortality developing countries should invest in infrastructure which can significantly improve child health. And used difference in difference model to analyze the estimation. Virgilia *et al*., (2015) researchers examined supply water and sewerage enlargement impact on child mortality in Ecuador. Research has typically calculated the benefits of these types of interventions by comparing aggregate outcome indicators of regions with and without facilities, frequently overlooking systematic variations between treated and non-treated areas. They used propensity score matching (PSM) analysis at the individual level to account for these critical observations. They created a mortality index at the motherhood level using indirect techniques based on census data and developed five distinct effect estimators based on the propensity scores. Explorers discovered that the program's average impact ranged from 7.2 percent (local linear regression-kernel matching) to 9.0 percent (5-nearest neighbors matching). Matching difference-in-differences estimators also revealed an 8% decrease in child death rates. The reflexive or naive assessment for the cross-section would have projected an average impact of 16.5 percent, and the difference-in-differences naive evaluation would have estimated an average impact of 19 percent, both of which would have clearly overstated the intervention's impacts. When they noticed at the heterogeneity of affects, researchers divided the sample into quartiles based on spending per capita, and surprise, there was no significant improvement among those in the worst quartile compared to their matched peers. However, even in the lowest quartiles, if a woman had at least a primary education, the family benefited significantly from W&S treatments.

However, the extent of this impact in different regions, as well as the influence of other socioeconomic factors, such as wealth distribution, has been a topic of debate in the research. In reality, trade-offs between efficiency and equity in health policy must frequently be considered. The goal of this research is to discover major determinants of health outcomes in CIS nations at the national level, in order to choose effective policy measures.

The main aim of study is to clarify the link between access to clean piped water and under five child mortality

- To determine the main influencing factors on child mortality and identify their measurements
- To find key factors diminishing child health problems
- To derive and explain key practical and theoretical results.

Methodology

Theoretical framework

The dependent variable is child mortality rate which is collected from The World Bank. All variables are measured in per 1,000 live births of the given country's population for girls and for boys separately. In addition, affecting factors on child and infant mortality are studied deeply by many scientist as it is vital issue. Limin Wang research main was to determine level and inequality in child mortality and find best solutions for both urban and rural areas separately in tackling current issues. Their variables included: 1 income; 2 various social and environmental indicators, including women education, sanitation facilities, topwater; 3 policy measurements as health expenditure, immunization; 4 location urban or rural. Further he used OLS and WLS.

Model Specification

It must be mentioned that relation between safe drinking water and child mortality are strongly related as without clean water and sanitation health of humanity will be seriously damaged. The presence of non- linear relationship between child mortality and safe drinking water and other variables has been empirically analyzed using three alternative methods OLS GLS and Fixed effect.

Data source

The analysis based on 8 CIS countries. The sample of CIS countries which are Azerbaijan, Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia, Tajikistan and Uzbekistan. The research was constructed panel data and data are derived from World Bank's World development indicators and UNICEF (The United Nations international children's emergency fund). The brief outlook of the data includes periods from 2010 to 2019. Dependent variable is Child mortality under five Boys and girls separately (U5M girls and U5M boys) and GDP per capita, health expenditure, fertility rate, immunization (vaccination), tertiary education of women, tertiary education of men, access to safe drinking water and access to electricity.

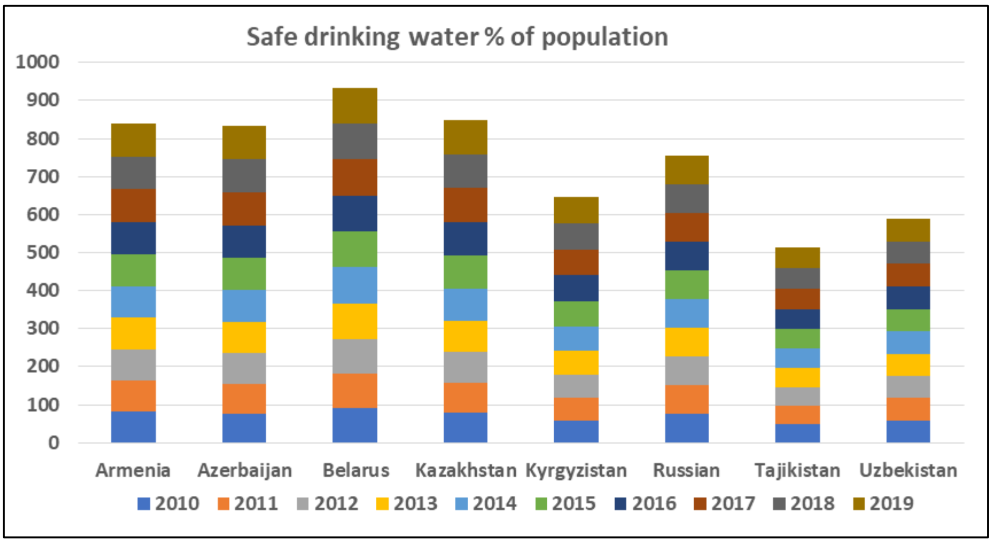

Fig 1: Safe drinking water % of population

It is clear from the above provided table that only three main Central Asian countries lack in providing piped water. Lowest number goes to Tajikistan with 50% by 2019. Uzbekistan population also having serious problems in consuming safe drinking water with almost 60% by 2019, while Kyrgyz Republic is slightly better than Uzbekistan case approximately 65% by 2019.

Table 1: Variable

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	80	2014.5	2.89	2010	2019
u5m girls	80	16.571	9.564	2.738	37.537
u5m boys	80	20.979	12.033	3.503	47.609
gdp pc	80	5439.555	4199.025	749.552	15974.645
health exp	80	5.707	2.161	2.446	11.335
Fertility	80	2.348	.721	1.382	3.623
Immune	80	95.725	3.438	80	99
edu women	76	49.983	30.699	5.994	108.111
edu men	76	42.232	21.366	9.951	80.176
Water	80	74.48	14.066	47.413	94.587
electricity	80	99.7	.651	95.5	100
c code	80	4.5	2.306	1	8
est fixed	80	.85	.359	0	1
est random	80	.85	.359	0	1

It is obvious from above illustrated table that maximum and minimum intercepts of variables. Number of observations is 80 but only for education for both male and female were around 76 observations. While maximum reported deaths for boys and girls were 47.609 and 37.537 respectively and minimum was reported as 3.503 and 2.738. And it is cleair that boy's mortality always was higher in comparison to girls. Also, we found that maximum value for GDP was 15974 in $ USD currency simultaneously value of minimum was 749.552. Moreover, fertility rate largest number around 3.6 lowest number 1.3. Another noticeable differences can be seen in enrollment to tertiary education of men and women minimum 9.9 and 5.9 while these number increased significantly 80.1 and 108.1 respectively. Moreover, vital source of life safe drinking water minimum value was 47.4 and maximum point was 94.

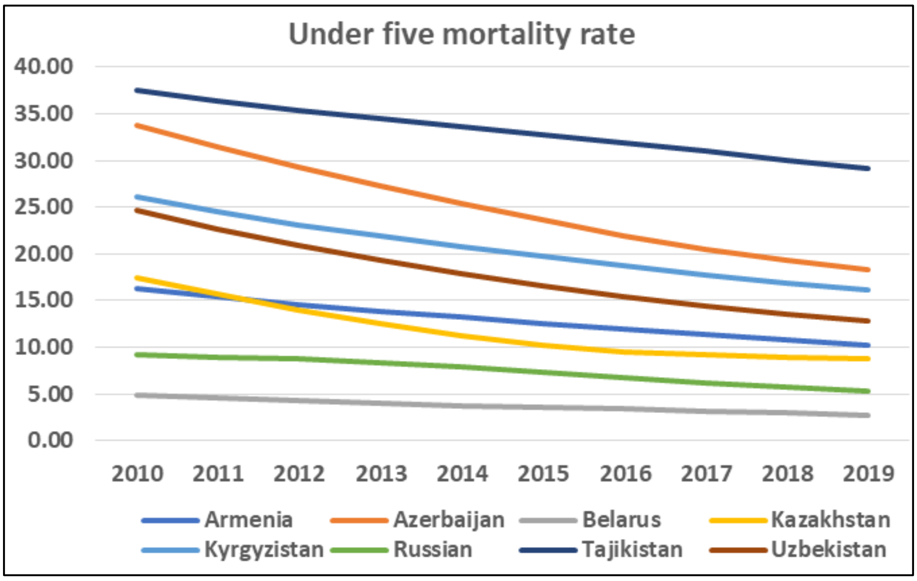

Fig 2: Under five mortality rate

$\boldsymbol{Mortality\ rate}_{it} = \alpha_1 + \beta_t + \beta_1(GDP\ pc) + \beta_2(water.Soc.X) + \beta_3(Health\ exp.Soc.X) + \beta_4(Female\ edu.Soc.X) + \beta_5(Male\ edu.Soc.X) + \beta_6 l(Fertility\ r.SocX) + \beta_7 log(electiricity.Soc.X) + \beta_8 log(Immun.SocX) + u_{it}$

Identifications: *where* α_1*- country fixed effect dummy,* β_t*- time fixed effect dummy, and* u_{it}*-error term.*

Let's say we have a regression as followed (1), and we are interested in estimating the β_1:

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Z_i + u_{it}$$

Y is the outcome variable

X is the variable we are interested is measuring the causal effect on Y

Z is those unobserved variables

U is the error

I is the notation for entity, could be geo-location, e.g. states

T is the notation for time

Since we assume the unobserved variables is constant over rime, but varies entity to entity, the Z_i only have one subscript "i", instead of two.

We can rewrite the (1) by combining β_0 and $\beta_2 Z_i$ as a_i, and a_i is the fixed effect for entity i, as (2).

$$Y_{it} = \beta_1 X_{it} + a_i + u_{it}$$

Or we can replace the $\beta_2 Z_i$ by bunch or dummy variable as (3): $Y_{it} = \beta_0 + \beta_1 X_{it} + \gamma_2 D2 + \gamma_3 D3 + \cdots + \gamma_n Dn + u_{it}$

D2, 3,..n are Dummy variables for being in the second, third, "n"th entity

D1 is omitted, since having it will introduce perfect multicollinearity (1),(2),(3) are the same.

Recall the formula (2) above:

$$Y_{it} = \beta_1 X_{it} + a_i + u_{it}$$

If we take average of both side, we will get mean as follow:

$$\frac{1}{T} * \sum_{t=1}^{T} Y_{it} = \beta_1 * \frac{1}{T} * \sum_{t=1}^{T} X_{it} + \frac{1}{T} * \sum_{t=1}^{T} a_i + \frac{1}{T} * \sum_{t=1}^{T} u_{it}$$

I is the notation entity

T is the notation for time

Since we assume the a_i is constant over time, the $\sum_{t=1}^{T} a_i$ part in the formula (4) will simply equal to a_i

$$\frac{1}{T} * \sum_{t=1}^{T} Y_{it} = \beta_1 * \frac{1}{T} * \sum_{t=1}^{T} X_{it} + a_i + \frac{1}{T} * \sum_{t=1}^{T} u_{it}$$

Reorganize the formula a little bit (4):

$$\overline{Y}_{it} = \beta_1 \overline{X}_{it} + a_i + \overline{u}_{it}$$

Let's do the demean, "subtract mean":

$$Y_{it} - \overline{Y}_{it} = \beta_1 X_{it} - \beta_1 \overline{X}_{it} + a_i - a_i + u_{it} - \overline{u}_{it}$$

Reorganize the formula a little bit again (5)

$$Y_{it} - \overline{Y}_{it} = \beta_1 (X_{it} - \overline{X}_{it}) + (u_{it} - \overline{u}_{it})$$

We just construct the demean OLS to estimate β_1 without having all the Dummy variable for the entities

In large samples, the sampling distribution of the OLS estimator in the fixed effects regression model is normal if the fixed effects regression assumptions specified are met. The variance of the estimations may be calculated, and standard errors, t-statistics, and confidence ranges for coefficients can be computed. In the next part, we'll look at how to estimate a fixed effects model in R and generate a model summary that includes heteroskedasticity-resistant standard errors. We leave sophisticated estimation formulas alone.

Results

Research used OLS fixed effect model to find most affecting variable on child deaths. We first investigate the simple bivariate association between mortality rates and all potential explanatory variables. The regression matrices are summarized in Table 1. At the national level, variables which are highly correlated with mortality rates, ranked in descending order, include access to electricity, immunization, fertility, GDP per capita, access to piped water, male tertiary education, and female tertiary education. Another fact that mortality is noticeably higher in Central Asia in comparison to other CIS countries. The conclusion that access to piped water had the greatest influence on mortality reduction compared to all other factors analyzed (especially access to electricity and GDP per capita) is extremely intriguing. This is a novel discovery because no previous cross-country study have revealed the water impact. But how developing countries improve their health results if they have access to safe water.

Table 2: Especially access to electricity and GDP per capita

u5m_boys	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
gdp_pc	.001	.001	1.30	.199	-.001	.003	
L	-.001	.001	-1.66	.103	-.003	0	
health_exp	-.365	.245	-1.49	.142	-.856	.126	
Fertility	.505	1.263	0.40	.691	-2.025	3.035	
Immune	-.438	.298	-1.47	.146	-1.035	.158	
edu_women	-.157	.128	-1.23	.225	-.413	.099	
L	-.036	.136	-0.27	.791	-.309	.236	
Water	3.827	.981	3.90	0	1.861	5.793	***
L	-3.997	.973	-4.11	0	-5.946	-2.047	***
Electricity	-3.324	1.455	-2.28	.026	-6.239	-.409	**
L	-2.124	1.544	-1.38	.174	-5.218	.969	
Constant	627.092	212.852	2.95	.005	200.699	1053.485	***
Mean dependent var	20.193		SD dependent var		11.425		
R-squared	0.854		Number of obs		68		
F-test	34.099		Prob > F		0.000		
Akaike crit. (AIC)	416.475		Bayesian crit. (BIC)		443.109		
*** *p*<.01, ** *p*<.05, * *p*<.1							

P value is less than 5% so it is significant, Water and electricity was most significant sources providing 1 % of population with safe drinking water can decrease mortality 3.997 thousand children while 1% of population access to electricity can decrease mortality by 3.324 thousand children.

This statistics for boys only.

$\beta_0 = 627$, $\beta_1 = 0.001$, $\beta_2 = 0.365$, $\beta_3 = 0.5$, $\beta_4 = -0.438$ $\beta_5 = -0.157$, $\beta_6 = -3.99$, $\beta_7 = -3.3$

Table 3: Water and electricity was most significant sources providing

u5m_girls	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
gdp_pc	.001	.001	1.18	.241	-.001	.002	
L	-.001	.001	-1.54	.128	-.002	0	
health_exp	-.318	.207	-1.54	.129	-.733	.096	
Fertility	-.002	1.069	-0.00	.998	-2.143	2.139	
Immune	-.419	.266	-1.58	.121	-.952	.114	
edu_women	-.112	.107	-1.04	.301	-.327	.103	
L	-.041	.113	-0.37	.715	-.268	.185	
Water	3.223	.815	3.95	0	1.59	4.857	***
L	-3.351	.808	-4.15	0	-4.97	-1.732	***
Electricity	-2.743	1.206	-2.27	.027	-5.159	-.327	**
L	-1.787	1.258	-1.42	.161	-4.306	.733	
Constant	525.517	174.773	3.01	.004	175.405	875.629	***
Mean dependent var	15.958		SD dependent var		9.083		
R-squared	0.839		Number of obs		68		
F-test	31.255		Prob > F		0.000		
Akaike crit. (AIC)	391.892		Bayesian crit. (BIC)		418.526		
*** *p*<.01, ** *p*<.05, * *p*<.1							
There is no noticeable difference between boys and girls regression table.							

$\beta_0 = 525$, $\beta_1 = 0.001$, $\beta_2 = 0.318$, $\beta_3 = 0.002$, $\beta_4 = -0.419$, $\beta_5 = -0.112$, $\beta_6 = -3.35$, $\beta_7 = -2.7$

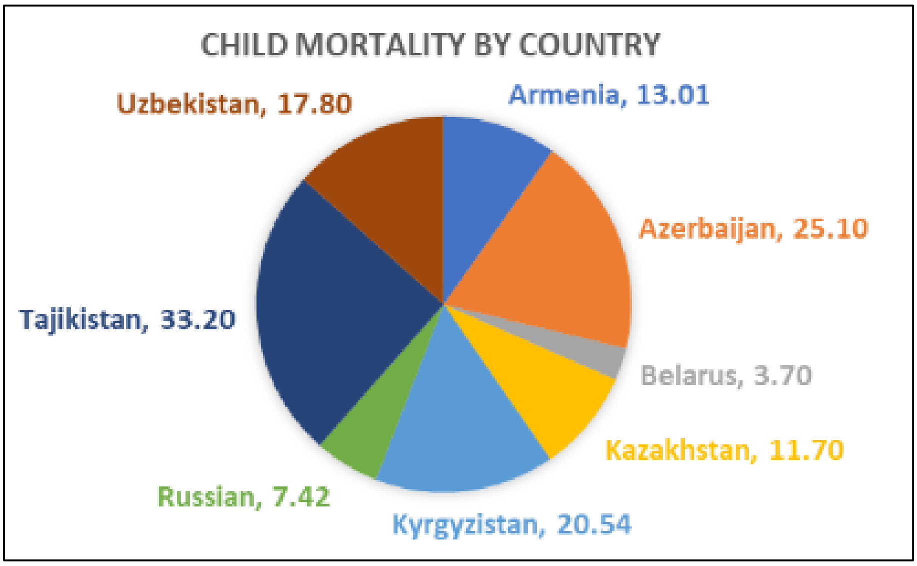

Fig 3: Child mortality by country

It is clear from the pia that highest number relates to Tajikistan with 33,2 thousand mortality cases. Kyrgyzstan and Azerbaijan also represented quite high numbers 20,5 thousand and 25,1 thousand respectively. Simultaneously, medium quantity goes to Uzbekistan 17,8 thousand, Armenia 13,01 thousand and Kazakhstan with 11,7 thousand mortality cases.

Discussion

Limin Wang begin by looking at the basic bivariate relationship between death rates and all plausible explanatory factors. Access to power, asset index, GDP per capita, access to piped water, access to sanitation, and female secondary education are all substantially connected with death rates at the national level, in descending order.

We discovered that unimproved water and sanitation considerably raised the risk of post-neonatal and child mortality, but had no influence on neonatal mortality. This pattern is consistent with previous studies conducted in Egypt and Eritrea, in which the authors reported that the impact of household environmental factors is very weak during the neonatal period, but has a large and statistically significant impact during the post-neonatal and child periods. One possible reason for our findings is that exclusive breastfeeding improves newborn survival, boosts immunity, and reduces the risk of chronic diarrhoea; neonates are less likely to be exposed to pathogens in polluted water.

Male newborns had a much greater chance of dying during the neonatal period than female neonates. This conclusion is similar with the findings of a cross-sectional research done in Kenya in 2007, which found that male newborns were 1.34 times more likely to die than female neonates. This gap might be explained by biological causes. The data also revealed that maternal age at birth (20 years old) and mothers' impression of infant size at birth (small or very little) were highly connected to neonatal and post-neonatal mortality, but not to child mortality. Paternal education has a significant influence on infant and child mortality. Children whose fathers had a secondary education or higher had a much reduced risk of mortality than those whose fathers had just a primary education or none at all. This conclusion is similar with studies in Bangladesh and Pakistan, which found a substantial association between father education level and childhood mortality. The decreased risk of mortality found in children whose dads were educated might be attributed to educated fathers being more inclined to invest in both better water sources and sanitary facilities.

The ranking, however, differs at the disaggregate level. In urban regions, mortality is substantially connected with access to electricity, asset index, and female secondary education, but in rural areas, mortality is closely related to access to piped water, access to electricity, female education, asset index, and vaccine coverage. The ranks for IMR and U5MR are practically identical, which is not unexpected considering the similarities.

Our research has shed light on the negative effects of safe water and access to electricity on child mortality throughout the CIS countries, particularly in developing nations. Social factors were shown bw common and be related with large declines in child mortality. We found that male children had a significantly higher risk of dying during the under-five period compared with female children.

Conclusion

Inadequate water and sanitation pose significant health risks for children under five in developing countries like the CIS. Globally, nearly a billion lack safe drinking water and 2.5 billion lack proper sanitation, leading to diseases like diarrhea that annually claim around 1.4 million children's lives. Children's vulnerability arises from developing systems and exposure to contaminants. Lower-income nations are more affected, emphasizing their healthcare limitations. The study underscores the need for community-based water and electricity interventions to prevent child mortality, focusing on Central Asian CIS households. The UN's Sustainable Development Goals and Water Aid advocate universal access to water and sanitation by 2030, encompassing healthcare facilities.

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