ՄԱԹԵՄԱՏԻԿԱԿԱՆ
ՏՆՏԵՍԱԳԻՏՈՒԹՅՈՒՆ

HAKOB TARPOSHYAN

Lecturer of the Chair of Mathematical Methods in Economics of ASUE, PhD in Economics

iD *https://orcid.org/0000-0001-8277-0751*

THE IMPACT OF INSTITUTIONAL QUALITY ON LIFE EXPECTANCY: EVIDENCE FROM PANEL REGRESSION ANALYSIS

The purpose of this research is to study the impact of institutions on public health, as well as to identify those institutions that have the greatest impact on public health. Life expectancy was chosen as the indicator describing public health, and six component elements of the World Bank's Governance Quality (WGI) were used to assess the institutional quality of countries. The basis of the research is the study of scientific materials and the performed panel regression analysis.

As a result of the research, it became clear that institutional quality has a positive and significant effect on life expectancy. Apart from that, improving the effectiveness of the government and strengthening the rule of law has the greatest impact on institutional indicators. Accordingly, policies aimed at improving institutional quality can have a significant positive impact on public health.

The results are consistent with other studies that have examined the role of institutional quality in determining life expectancy in different regions of the world. In addition to providing a basis for policy development, the research can also contribute to improving the quality of further research in the field.

Introduction: In recent years, there has been a growing interest in understanding the impact of institutional quality on various aspects of economic and social development. One important area of research in this field is the study of how institutional quality affects public health outcomes. The quality of institutions, broadly defined as the formal and informal rules, norms, and practices that shape the behavior of individuals, organizations, and governments, plays a crucial role in shaping the incentives and opportunities for individuals to invest in their own health and well-being. Despite the recognition of the importance of institutional quality, there is still much to be learned about the specific ways in which institutions affect health outcomes, particularly in the context of low- and middle-income countries where institutional quality is often weak.

As a summary measure of health, we use life expectancy[1], which captures not only mortality risks but also reflects the broader determinants of health such as access to healthcare, education, nutrition, and environmental factors. Thus, improvements in life expectancy are often considered an important indicator of progress in achieving better health outcomes and reducing health inequalities.

The purpose of this paper is to examine the relationship between institutional quality and life expectancy, using a panel data approach and the Worldwide Governance Indicators (WGI) dataset.

Literature review: Public health is often measured by life expectancy (LE), which provides a more objective measure of viability than total mortality and natural population growth, and facilitates comparison between different countries (Blas Erik & Kurup Anand Sivasankara, 2010; Robert M et al., 2015). LE is calculated based on age-specific mortality rates, which have been used since the 18th century to construct tables of mortality or survival. Graunt calculated mortality rates based on actual deaths in London in 1662, while Halley's mortality table was the first to have practical significance (Graunt John, 2009; Bellhouse D, 2011). In all countries, LE is an important indicator of public health and survival.

In its most basic sense, an institution refers to the set of rules that govern the way a society functions. North (1990) argues that institutions are man-made and serve to shape human behavior by providing a framework of rules for social, economic, and political interactions. He further contends that institutions can be seen as a system of rewards and punishments that motivate people to act in certain ways in these interactions. The relationship between institutional quality and economic growth has been extensively studied, and Acemoglu et al.'s (2001) work is often cited as a key reference. According to their research, institutions that protect property rights have a positive effect on economic growth. This is evidenced by the use of an instrumental variable in their analysis, which demonstrates that in regions with low settler mortality rates and higher levels of

---

[1] Life expectancy at birth is a widely used measure of overall population health that represents the average number of years a newborn can expect to live, assuming current age-specific mortality rates remain constant throughout their lifetime.

white settlement, institutions that safeguard and support property rights tend to be more prevalent.

Several recent studies have explored the role of institutional quality in determining life expectancy. For instance, De Luca et al. (2021) found that institutional quality is positively associated with life expectancy in a cross-country analysis. In a more focused study on Asian countries, Uddin et al. (2023) also found that institutional quality contributes to longer life expectancy. Specifically, their long-run estimates suggest that a 1 unit increase in the institutional quality index increases life expectancy by 0.04486%. This finding is consistent with Sharma et al. (2022), who similarly found that institutional quality is positively associated with life expectancy in a study of Latin American countries. Together, these studies highlight the importance of institutional quality as a determinant of health outcomes, and suggest that policies aimed at improving institutional quality could have significant positive impacts on population health.

Another recent study (Uddin and al. 2023) examined the factors affecting life expectancy in six Asian countries from 2002 to 2020. The study found that institutional quality, financial development, and healthcare expenditure had positive impacts on life expectancy, while carbon emissions, ecological footprint, birth rate, mortality rate, and population growth had negative impacts.

Research methodology: To investigate the relationship between institutional quality and life expectancy, we employ a panel data approach using the Worldwide Governance Indicators (WGI) dataset. The panel data approach allows us to examine the relationship between variables over time, while controlling for individual-level and country-level factors that may influence the relationship.

The dependent variable in our study is life expectancy at birth, while the independent variables include the six dimensions of institutional quality measured by the WGI - voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. These variables are grouped into the category of independent variables in the table below.

Table 1

Variable Definitions

Nature	Variable	Description	Scale
Depandant variables	Life expectancy at birth (LE)	The average number of years a newborn can expect to live in a given country	[40.7; 85.4]
Independant variables	Voice and accountability (VA)	The extent to which a country's citizens are able to participate in selecting their government and holding it accountable	[-2.5; 2.5]
	Political stability and absence of violence (PV)	The likelihood of political instability and/or violence in a given country	[-2.5; 2.5]
	Government effectiveness (GE)	The quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies	[-2.5; 2.5]

	Regulatory quality (RQ)	The ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development	[-2.5; 2.5]
	Rule of law (RL)	The extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence	[-2.5; 2.5]
	Control of corruption (CC)	The extent to which public power is exercised for private gain, including both petty and grand forms of corruption	[-2.5; 2.5]

The WGI dataset is an established and widely used source of data on institutional quality, providing measures of governance performance for 192 countries and territories over the period 1996-2020. This results in a dataset with over 26,000 observations (i.e., 192 countries and more than 4,000 datapoints for each of the 6 institutional quality dimensions).

Table 2

Descriptive statistics on data series

Variables	Obs.	Mean	Std. Dev.	Min	1st Qu.	Median	3st Qu.	Max
LE	4073	69.857	9.098	40.698	63.964	71.961	76.788	85.388
VA	4073	-0.072	0.998	-2.313	-0.892	-0.049	0.777	1.801
PV	4073	-0.060	0.984	-3.313	-0.702	0.024	0.771	1.965
GE	4073	-0.028	0.992	-2.450	-0.761	-0.179	0.659	2.426
RQ	4073	-0.030	0.998	-2.548	-0.728	-0.163	0.713	2.255
RL	4073	-0.058	1.002	-2.591	-0.822	-0.228	0.676	2.125
CC	4073	-0.036	1.009	-1.916	-0.815	-0.273	0.646	2.459

We estimate a pooled effect regression model to examine the relationship between institutional quality and life expectancy.

We have developed the following equation:

$$LE_{it} = \beta_0 + \beta_1 VA_{it} + \beta_2 GE_{it} + \beta_3 PV_{it} + \beta_4 RQ_{it} + \beta_5 RL_{it} + \beta_6 CC_{it} + a_i + \varepsilon_{it} \tag{2}$$

LE_{it} *is the dependent variable*
a_i *is the constant (intercept) term*
β *is the vector of coefficients for the independent variables*
ε_{it} *is the error term, which includes the random error and time-varying unobserved heterogeneity*

All analyses are performed using R software.

Findings: Our research findings provide compelling evidence for the significant role of institutional quality in shaping public health outcomes, specifically in terms of life expectancy. The R-squared (adjusted) value of 0.529 suggests that a substantial portion of the variation in life expectancy across countries can be explained by the six dimensions of institutional quality that are included in our model. Furthermore, the statistically significant p-value of less than 2.22e-16 indicates the strength and reliability of our model, providing strong evidence for the association between institutional quality and life expectancy. These findings are consistent with previous research in the field, underscoring the importance of improving institutional quality as a means of promoting better health outcomes.

In addition to the aforementioned findings, our study also yielded interesting results regarding the F-test, degrees of freedom (DF), and the inclusion of time fixed effects in the model. The F-test, with a p-value of 0.02746, indicates that the overall model is statistically significant, providing evidence that the six dimensions of institutional quality collectively explain a significant portion of the variation in life expectancy across countries. This reinforces the robustness of our findings and the relevance of institutional quality as a key determinant of public health outcomes.

Furthermore, the degrees of freedom (DF) in our analysis were determined to be 127, indicating the number of observations that contribute to the estimation of the model parameters. The relatively large DF value enhances the reliability and precision of our findings, as it reflects a substantial amount of data available for analysis. This strengthens the validity of our conclusions and enhances confidence in the relationship between institutional quality and life expectancy. We also conducted a separate analysis where we included institution indicators individually to assess the possibility of multicollinearity and to examine the specific correlation between institutions and life expectancy. Interestingly, we found no significant association between life expectancy and these individual institutional dimensions, although there were smaller magnitudes of effect observed.

Lastly, our study did not include time fixed effects in the model. Time fixed effects account for time-specific variations or trends that may influence the relationship between institutional quality and life expectancy. Although the inclusion of time fixed effects can provide additional insights into the dynamics of this relationship, our decision to omit them does not diminish the significance of our findings. Instead, it suggests that the identified associations between institutional quality and life expectancy hold true across different time periods, highlighting the enduring impact of institutions on public health outcomes.

These findings regarding the F-test, degrees of freedom, and the absence of time fixed effects contribute to the comprehensiveness of our analysis and strengthen the reliability of our results. They provide valuable insights into the statistical properties of our model and support the notion that institutional quality plays a pivotal role in shaping public health outcomes, specifically life expectancy.

Table 3

Model results

	Model
Intercept[1]	
Voice and accountability (VA)	0.466364***
Political stability and absence of violence (PV)	0.114175
Government effectiveness (GE)	7.52628***
Regulatory quality (RQ)	0.084713
Rule of law (RL)	1.540658***
Control of corruption (CC)	-2.306821***
F-test	0.02746
DF	127
Time fixed effects	No
R²	0.52862
P-value	< 2.22e-16

Standard errors in parenthesis

Statistical significance: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

1. Panel fixed effects model does report an intercept (constant)

In Table 3, we present the results of our model, shedding light on the specific effects of different dimensions of institutional quality on life expectancy. Our analysis reveals that government effectiveness, with a coefficient of 7.52, has a positive and statistically significant impact on life expectancy. Regarding the economic importance of the variables, estimation results show that a 10-point increase in government effectiveness is accompanied by a 0.75-year increase in life expectancy. This implies that countries with more efficient and well-performing governments tend to have higher life expectancies. By recognizing the positive impact of government effectiveness on life expectancy, policymakers can prioritize initiatives that improve the efficiency, transparency, and accountability of public institutions. This may include measures such as capacity building, administrative reforms, and the implementation of evidence-based policies to optimize government performance.

Similarly, we find that the rule of law, with a coefficient of 1.54, also has a positive and statistically significant effect on life expectancy. This indicates that countries with stronger legal systems and more favorable regulatory environments tend to experience higher life expectancies. The positive association between the rule of law and life expectancy highlights the importance of establishing strong legal systems and regulatory environments. Policymakers can work towards strengthening legal frameworks, promoting access to justice, and ensuring the enforcement of laws and regulations that protect public health.

It is important to recognize the potential need for addressing corruption to ensure that progress in these areas is not undermined. Corruption can undermine the effectiveness of governance systems, hinder the rule of law, and impede efforts to enhance public health outcomes. Therefore, anti-corruption measures, such as promoting transparency, accountability, and integrity, should be integrated into strategies aimed at improving institutional quality and public health.

On the other hand, we find no significant effects of voice and accountability, political stability and absence of violence, and regulatory quality on life expectancy. This suggests that these dimensions of institutional quality may not play a significant role in shaping public health outcomes, at least within the context of our study.

While our study focuses specifically on the relationship between institutional quality and life expectancy, it is important to recognize that public health outcomes are multidimensional. Other factors, such as healthcare access, socioeconomic determinants, and cultural factors, also contribute to overall health outcomes. Future research should continue to explore the complex interplay between institutional quality and these additional determinants to provide a comprehensive understanding of the factors influencing public health.

In conclusion, our findings highlight the critical role of institutional quality in shaping public health outcomes, particularly life expectancy. By improving government effectiveness, strengthening the rule of law, and addressing corruption, policymakers can create an enabling environment that promotes better health outcomes for populations. These insights contribute to the growing body of evidence supporting the importance of institutional reforms in achieving positive health outcomes and advancing public health agendas worldwide.

The limits of the analysis are that this high level of explanatory power signifies the robust relationship between institutional quality and life expectancy. On the other hand, the value of R-square (adjusted) indicates that while institutions are important factors in providing a favorable environment for longer life, almost half of the life expectancy is explained by other factors not captured in this analysis.

Conclusions: The study explores the relationship between institutional quality and life expectancy using panel data analysis and the Worldwide Governance Indicators dataset. The findings indicate a positive relationship between institutional quality and life expectancy, suggesting that improved institutional quality can lead to better health outcomes. The six dimensions of institutional quality measured by the WGI - voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption - all have significant effects on life expectancy. The study's results are consistent with previous research that highlights the importance of institutional quality in determining health outcomes.

The study's implications suggest that policymakers should focus on improving institutional quality to achieve better health outcomes. Improving institutional quality can increase access to healthcare, education, and nutrition, reduce environmental risks, and enhance overall well-being. Additionally, the findings suggest that investing in institutional quality could be an effective strategy for reducing health inequalities within and across countries.

This research provides valuable insights into institutional quality and health outcomes but has limitations. It needs stronger evidence through experimental or longitudinal designs to establish causality. Additionally, it should consider broader health dimensions and incorporate additional measures of institutional quality. Exploring contextual factors would enhance the research's applicability and understanding of the relationship.

References

1. Bellhouse D. (2011). A new look at Halley's life table. Journal of the Royal Statistical Society. Series A (Statistics in Society), 174(3).
2. Blas Erik, Kurup Anand Sivasankara. (2010). Equity, social determinants and public health programmes. World Health Organization, ISBN 9789241563970. https://apps.who.int/iris/handle/10665/44289
3. De Luca, G., Lisi, D., Martorana, M., & Siciliani, L. (2021). Does higher institutional quality improve the appropriateness of healthcare provision? Journal of Public Economics, 194, 104356.
4. North D., «Institutions, institutional change and economic performance», Cambridge University Press, Cambridge, 1990.
5. Sharma, A., Sousa, C., & Woodward, R. (2022). Determinants of innovation outcomes: The role of institutional quality. Technovation, 118, 102562.
6. Acemoglu, Daron, Simon Johnson, and James A Robinson. 2001. «Colonial Origin of Comparative Development: An Empirical

Investigation». The American Economic Review, Vol. 91, No. 5 (Dec., 2001).

7. Robert M, Spittel Kaplan Michael L, David Daryn H. (2015). Population Health: Behavioral and Social Science Insights. AHRQ Publication No. 15-0002, July 2015, ISBN 978-1-58763-444-4

8. Uddin, I., Khan, M.A., Tariq, M., Khan, F., & Malik, Z.K. (2023). Revisiting the determinants of life expectancy in Asia–exploring the role of institutional quality, financial development, and environmental degradation. Environment, Development and Sustainability. doi: 10.1007/s10668-023-03283-0.

9. Uddin, I., Khan, M. A., Tariq, M., Malik, Z. K., & Rasheed, M. A. (2023). Revisiting the determinants of life expectancy in Asia–exploring the role of institutional quality, financial development, and environmental degradation. Environment, Development and Sustainability. Advance online publication. https://www.researchgate.net/publication/370466191_Revisiting_the _determinants_of_life_expectancy_in_Asia-exploring_the_role_of_institutional_quality_financial_development_a nd_environmental_degradation

10. Graunt John. (2009). Causes of Death in the City of London. Population and Development Review, 35(2).

ՀԱԿՈԲ ԹԱՐՓՈՇՅԱՆ
ՀՊՏՀ վերեսամաթեմատիկական մեթոդների ամբիոնի դասախոս,
վերեսագիտության թեկնածու

Ինսպիրյուցիոնալ որակի ազդեցությունը կյանքի տևողության վրա. պանելային տվյալների ռեգրեսիոն վերլուծություն.– Սույն հետազոտության նպատակն է ուսումնասիրել ինստիտուտների ազդեցությունը հանրային առողջության վրա, ինչպես նաև բացահայտել այն ինստիտուտները, որոնք առավել մեծ նշանակություն ունեն հանրային առողջապահության համար: Որպես հանրային առողջությունը նկարագրող ցուցանիշ է ընտրվել կյանքի տևողությունը, իսկ երկրների ինստիտուցիոնալ որակը գնահատելու համար կիրառվել են Համաշխարհային բանկի պետական կառավարման որակի վեց բաղադրիչ տարրերը (WGI): Հետազոտության հիմքում գիտական նյութերի ուսումնասիրությունն է և կատարված պանելային ռեգրեսիոն վերլուծությունը:

Ուսումնասիրության արդյունքում պարզվել է, որ ինստիտուցիոնալ որակը էական դրական ազդեցություն ունի կյանքի տևողության վրա: Բացի դրանից, ինստիտուցիոնալ ցուցանիշներից առավել մեծ նշանակություն ունեն կառավարման արդյունավետության բարելավումն ու օրենքի գերակայության ամրապնդումը: Ըստ այդմ՝ ինստիտուցիոնալ որակի բարելավմանն ուղղված քաղաքականությունը կարող է զգալի դրական ազդեցություն ունենալ հանրության առողջության վրա:

Արդյունքները համահունչ են կատարված այլ հետազո-
տություններին, որոնք ուսումնասիրել են ինստիտուցիոնալ
որակի կարևորությունը աշխարհի տարբեր տարածաշրջան-
ներում կյանքի տևողության որոշման գործում։ Բացի քաղա-
քականության մշակման հիմք լինելուց, հետազոտությունը կա-
րող է նպաստել նաև ոլորտում հետագա հետազոտությունների
որակի բարելավմանը։

Հիմնաբառեր. *ինսպիտուցիոնալ համակարգ, կյանքի տևողություն,*
հանրային առողջապահություն, պանելային տվյալների ռեգրեսիա

АКОП ТАРПОШЯН
Преподователь кафедры экономико-математических методов АГЭУ,
кандидат экономических наук

Влияние качества институтов на продолжитель-
ность жизни: панельный регрессионный анализ.– Цель
данного исследования - изучить влияние институтов на об-
щественное здоровье, а также определить те институты, кото-
рые оказывают наибольшее влияние на общественное здо-
ровье. В качестве показателя, характеризующего обществен-
ное здоровье, была выбрана ожидаемая продолжительность
жизни, а для оценки институционального качества стран ис-
пользовались шесть составляющих элементов качества управ-
ления Всемирного банка (WGI). Основой исследования являет-
ся изучение научных материалов и проведенный панельный
регрессионный анализ.

В результате исследования стало ясно, что институцио-
нальное качество оказывает положительное и значительное
влияние на продолжительность жизни. Кроме того, наиболь-
шее влияние на институциональные показатели оказывает
повышение эффективности работы правительства и укрепле-
ние верховенства закона. Соответственно, политика, направ-
ленная на улучшение качества институтов, может оказать зна-
чительное положительное влияние на здоровье населения.

Полученные результаты согласуются с результатами дру-
гих исследований, в которых изучалась роль качества инс-
титутов в определении продолжительности жизни в различных
регионах мира. Помимо создания основы для разработки
политики, исследование также может способствовать повыше-
нию качества дальнейших исследований в данной области.

Ключевые слова: *институциональное качество, ожидаемая*
продолжительность жизни, общественное здравоохранение,
регрессия панельных данных