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Evaluation of Maternal and Child Health by Country Income Groups: A Descriptive Study

Ülke Gelir Gruplarına Göre Anne ve Çocuk Sağlığının Değerlendirilmesi: Tanımlayıcı Bir Çalışma

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ABSTRACT Objective: The economic situation of countries is one of the important determinants of health. The aim of this study is to evaluate the socioeconomic inequalities in maternal and child health using the indicators of maternal and child health of countries by World Bank's income classification. **Material and Methods:** In the research, 166 countries were included. The data were analyzed using IBM SPSS Statistics (Ver. 20). The Kruskal-Wallis H test was used to analyze whether variables about maternal and child health differ according to country income groups. The significance level was accepted as $p<0.05$. Mann-Whitney U test was used to understand from which groups the difference originated. **Results:** As a result of this study, it was determined that maternal and child health variables differed statistically significantly between country groups according to the World Bank income classification. **Conclusion:** Using the World Bank's income classification, this study highlights socioeconomic inequalities in maternal and child health. Although very serious risks in maternal and child health are not observed in high-income and upper-middle-income countries, there remain problems, particularly in low-income and lower-middle-income countries. The results show that children in low-income countries have more limited access to important health interventions such as vaccines and medical care. Eliminating inequalities in maternal and child health should be seen as a necessity for achieving the Sustainable Development Goals. Global cooperation is considered necessary to reduce socioeconomic inequalities in maternal and child health. International organizations are expected to support these countries with seriously aid.

Keywords: Child health; maternal health services; health services accessibility

ÖZET Amaç: Ülkelerin ekonomik durumu, sağlığın önemli belirleyicilerinden biridir. Bu çalışmanın amacı, ülkelerin anne ve çocuk sağlığı göstergelerini kullanarak anne ve çocuk sağlığındaki sosyoekonomik eşitsizlikleri Dünya Bankasının gelir sınıflandırmasına göre değerlendirmektir. **Gereç ve Yöntemler:** Araştırmaya 166 ülke dâhil edilmiştir. Veriler, IBM SPSS Statistics (Sürüm 20) kullanılarak analiz edilmiştir. Anne ve çocuk sağlığına ilişkin değişkenlerin ülke gelir gruplarına göre farklılık gösterip göstermediğini incelemek için Kruskal-Wallis H testi kullanılmıştır. Anlamlılık düzeyi $p<0,05$ olarak kabul edilmiştir. Farklılığın hangi gruplardan kaynaklandığını anlamak için Mann-Whitney U testi kullanılmıştır. **Bulgular:** Bu araştırma sonucunda anne ve çocuk sağlığı değişkenlerinin Dünya Bankası gelir sınıflandırmasına göre ülke grupları arasında istatistiksel olarak anlamlı şekilde farklılık gösterdiği saptanmıştır. **Sonuç:** Dünya Bankasının gelir sınıflandırmasını kullanan bu araştırma, anne ve çocuk sağlığındaki sosyoekonomik eşitsizlikleri vurgulamaktadır. Anne ve çocuk sağlığı konusunda yüksek gelirli ve üst-orta gelirli ülkelerde çok ciddi riskler görülmemekle birlikte özellikle düşük gelirli ve alt-orta-gelirli ülkelerde sorunlar devam etmektedir. Sonuçlar düşük gelirli ülkelerdeki çocukların aşılar ve tıbbi bakım gibi önemli sağlık müdahalelerine daha sınırlı erişimi olduğunu göstermektedir. Anne ve çocuk sağlığındaki eşitsizliklerin ortadan kaldırılması, Sürdürülebilir Kalkınma Hedefleri'ne ulaşmak için bir gereklilik olarak görülmelidir. Anne ve çocuk sağlığında sosyoekonomik eşitsizliklerin azaltılması için küresel iş birliğinin gerekli olduğu düşünülmektedir. Uluslararası kuruluşların bu ülkelere ciddi yardımlarda bulunmaları beklenmektedir.

Anahtar Kelimeler: Çocuk sağlığı; ana sağlığı hizmetleri; sağlık hizmetlerine ulaşılabilirlik

Maternal and child health programs include women who are pregnant, in labour or postpartum, and at the newborn, infants, and children, according to World Health Organization (WHO). Routine services are globally accepted interventions proven to be effective measures to improve maternal and child health such as family planning, antenatal care, immunization, breast-feeding.[1]

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Since 1946, when United Nations Children's Assistance Fund (UNICEF) was established, substantial studies have been conducted, particularly in the areas of maternal and child health and children's rights, in 190 countries. In the early 1980s, a project called the Child Survival and Development Revolution was created, which concentrated on 4 low-cost initiatives. These measures are growth monitoring, oral rehydration therapy, breastfeeding promotion, and immunization. By the 2010s, it has been a pioneer in challenging systematic inequality around the world.[2]

The "Millennium Declaration" is an action plan developed by the WHO to promote health and reduce inequities. The objectives of enhancing maternal health and lowering child mortality were included in the summit that was held in 2000 with the participation of 189 United Nations (UN) member countries. Despite advancements, millions of infants, kids, and mothers still pass away every year, most often from ailments or injuries that can be avoided or treated. These fatalities highlight how children and communities have limited access to crucial health interventions like vaccinations and medical care.[3] The UN has organized one of the most significant international projects on maternal and child health.[4] A goal of the UN is to "to reduce the global maternal mortality rate to below 70 per 100,000 live births by 2030".[5]

The economic situation and the income distribution of countries are one of the important determinants of health.[6] The studies have shown that socioeconomic status and child and infant mortality are inversely proportional.[7,8] The highest maternal and child mortality rates are among the poor in remote and rural areas with limited access to health care.[9] A study in the African region found that lower middle-income countries have lower vaccination coverage than low-income or upper middle-income countries.[10] A cross-continental comparison study concluded that a large proportion of women in Asia and Africa do not benefit from basic maternal health services such as antenatal care and skilled birth assistance.[11]

The Constitution of the WHO states "that the enjoyment of the highest attainable standard of health is a fundamental right for every human being without distinction of race, religion, political belief, or economic or social condition".[12] By examining how maternal and child health variables differ according to country income, it is thought that useful information will be provided about the problems to be addressed by countries. This research serves the purpose of informing actors at the local and international level regarding this issue which deserves intense policy attention. This study aims to evaluate the socioeconomic inequalities in mother-child health, with the latest data available, using the indicators of infant, child and maternal health, infant, child and maternal mortality, childhood vaccinations, health workers and fertility rates, based on the World Bank income classification.

MATERIAL AND METHODS

In this research were included 166 countries. Because of incomplete data, 52 out of 218 classifications were excluded from the scope of the research. After all, in the research, 24 low-income, 52 low-middle-income, 51 middle-high-income, and 39 high-income countries were included (Appendix 1).

The World Bank categorizes countries based on their gross national product (GNP). This classification, which covers almost all countries in the world, is regularly updated every year.[13] In this study, the income classification of 2021 was used. The research includes especially recent data (Appendix 2). Information on the other variables is shown in Table 1.

In this research, it was analyzed whether the mother-child health variables differ between different countries with different income levels. The data were analyzed using IBM SPSS Statistics (IBM SPSS Statistics for Windows, Version 20.0. Armonk, United States). Normality assumptions were analyzed with the Shapiro-Wilk test, Skewness, and Kurtosis. The Kruskal-Wallis H test was used to analyze whether variables about maternal and child health differ according to country income groups. The range was used as a measure of spread in the study. The range is a non-parametric measure of spread obtained by subtracting the smallest value from the largest value in the distribution.[14] Mann-Whitney U test used to understand from which groups the difference orig-

APPENDIX 1: Countries included in the research.

Number	Country	Income Groups
1	Afghanistan	Low income
2	Albania	Upper middle income
3	Algeria	Upper middle income
4	Angola	Lower-middle income
5	Antigua and Barbuda	High income
6	Argentina	Upper middle income
7	Armenia	Upper middle income
8	Austria	High income
9	Azerbaijan	Upper middle income
10	Bahamas	High income
11	Bahrain	High income
12	Bangladesh	Lower-middle income
13	Barbados	High income
14	Belarus	Upper middle income
15	Belize	Lower-middle income
16	Benin	Lower-middle income
17	Bhutan	Lower-middle income
18	Bolivia	Lower-middle income
19	Bosnia and Herzegovina	Upper middle income
20	Botswana	Upper middle income
21	Brazil	Upper middle income
22	Brunei Darussalam	High income
23	Bulgaria	Upper middle income
24	Burkina Faso	Low income
25	Burundi	Low income
26	Cabo Verde	Lower-middle income
27	Cambodia	Lower-middle income
28	Cameroon	Lower-middle income
29	Canada	High income
30	Central African Republic	Low income
31	Chad	Low income
32	Chile	High income
33	China	Upper middle income
34	Colombia	Upper middle income
35	Comoros	Lower-middle income
36	Congo, Dem. Rep	Lower-middle income
37	Costa Rica	Upper middle income
38	Côte d'Ivoire	Lower-middle income
39	Croatia	High income
40	Cuba	Upper middle income
41	Cyprus	High income
42	Czech Republic	High income
43	Dominican Republic	Upper middle income
44	Ecuador	Upper middle income
45	Egypt, Arab Rep.	Lower-middle income
46	El Salvador	Lower-middle income
47	Equatorial Guinea	Upper middle income
48	Eritrea	Low income
49	Estonia	High income
50	Eswatini	Lower-middle income
51	Ethiopia	Low income

APPENDIX 1: Countries included in the research *(continued)*.

Number	Country	Income Groups
52	Fiji	Upper middle income
53	France	High income
54	Gabon	Upper middle income
55	Gambia, The	Low income
56	Georgia	Upper middle income
57	Germany	High income
58	Ghana	Lower-middle income
59	Greece	High income
60	Grenada	Upper middle income
61	Guatemala	Upper middle income
62	Guinea	Low income
63	Guinea-Bissau	Low income
64	Guyana	Upper middle income
65	Haiti	Lower-middle income
66	Honduras	Lower-middle income
67	India	Lower-middle income
68	Indonesia	Lower-middle income
69	Iran, Islamic Rep.	Lower-middle income
70	Iraq	Upper middle income
71	Ireland	High income
72	Italy	High income
73	Jamaica	Upper middle income
74	Japan	High income
75	Jordan	Upper middle income
76	Kazakhstan	Upper middle income
77	Kenya	Lower-middle income
78	Kiribati	Lower-middle income
79	Korea, Dem. People's Rep.	Low income
80	Korea, Rep.	High income
81	Kuwait	High income
82	Kyrgyz Republic	Lower-middle income
83	Lao PDR	Lower-middle income
84	Latvia	High income
85	Lebanon	Upper middle income
86	Lesotho	Lower-middle income
87	Liberia	Low income
88	Libya	Upper middle income
89	Lithuania	High income
90	Madagascar	Low income
91	Malawi	Low income
92	Malaysia	Upper middle income
93	Maldives	Upper middle income
94	Mali	Low income
95	Malta	High income
96	Mauritania	Lower-middle income
97	Mauritius	Upper middle income
98	Mexico	Upper middle income
99	Micronesia, Fed. Sts.	Lower-middle income
100	Moldova	Upper middle income
101	Mongolia	Lower-middle income

APPENDIX 1: Countries included in the research *(continued)*.

Number	Country	Income Groups
102	Montenegro	Upper middle income
103	Morocco	Lower-middle income
104	Mozambique	Low income
105	Myanmar	Lower-middle income
106	Namibia	Upper middle income
107	Nepal	Lower-middle income
108	Netherlands	High income
109	New Zealand	High income
110	Nicaragua	Lower-middle income
111	Niger	Low income
112	Nigeria	Lower-middle income
113	North Macedonia	Upper middle income
114	Norway	High income
115	Oman	High income
116	Pakistan	Lower-middle income
117	Panama	Upper middle income
118	Papua New Guinea	Lower-middle income
119	Paraguay	Upper middle income
120	Peru	Upper middle income
121	Philippines	Lower-middle income
122	Poland	High income
123	Portugal	High income
124	Qatar	High income
125	Romania	Upper middle income
126	Russian Federation	Upper middle income
127	Rwanda	Low income
128	Samoa	Lower-middle income
129	São Tomé and Principe	Lower-middle income
130	Saudi Arabia	High income
131	Senegal	Lower-middle income
132	Serbia	Upper middle income
133	Seychelles	High income
134	Sierra Leone	Low income
135	Singapore	High income
136	Slovak Rep.	High income
137	Solomon Islands	Lower-middle income
138	Somalia	Lower-middle income
139	South Africa	Upper middle income
140	Sri Lanka	Lower-middle income
141	St. Lucia	Upper middle income
142	St. Vincent and the Grenadines	Upper middle income
143	Sudan	Low income
144	Suriname	Upper middle income
145	Switzerland	High income
146	Syrian Arab Republic	Low income
147	Tajikistan	Lower-middle income
148	Thailand	Upper middle income
149	Timor-Leste	Lower-middle income
150	Togo	Low income
151	Tonga	Upper middle income

APPENDIX 1: Countries included in the research *(continued)*.

Number	Country	Income Groups
152	Trinidad and Tobago	High income
153	Tunisia	Lower-middle income
154	Türkiye	Upper middle income
155	Turkmenistan	Upper middle income
156	Uganda	Low income
157	Ukraine	Lower-middle income
158	United Arab Emirates	High income
159	United States	High income
160	Uruguay	High income
161	Uzbekistan	Lower-middle income
162	Vanuatu	Lower-middle income
163	Vietnam	Lower-middle income
164	Yemen, Rep.	Low income
165	Zambia	Lower-middle income
166	Zimbabwe	Lower-middle income

APPENDIX 2: The year of the variables used in research.

Variable	Year
Under 5 mortality rate	2019
Neonatal mortality rate	2019
Infant mortality rate	2019
Stillbirths rate	2019
Immunization, diphtheria, pertussis, and tetanus	2019
Immunization, HepB3 (hepatitis B)	2019
Immunization, measles	2019-2020*
Immunization, polio (Pol3)	2020-2021**
Nurses and midwives (per 1,000 people)	2011-2018***
Maternal mortality ratio	2017
Births attendend by skilled health staff (% of total)	2003-2020****
Fertility rate (% of total)	2017-2019*****

*2020: The countries except listed above countries; 2019: Algeria, Bosnia and Herzegovina, Cyprus, France, Gambia, Korea, Rep., Kuwait, Morocco, Namibia, Sao Tome and Principe, Singapore, Trinidad and Tobago; **2021: The countries except listed above countries; 2020: Antigua and Barbuda, Austria, Belarus, Belize, North Macedonia; ***2011: Cameron; 2014: Azerbaijan, Kyrgyz Republic, Somalia, Turkmenistan, Ukraine, Uzbekistan; 2015: Bahrain, Belarus, Bulgaria, Central African Republic, Gambia, Kazakhstan, North Macedonia; 2016: Albania, Comoros, Croatia, Cyprus, Guinea, Niger, Serbia, Seychelles, Sierra Leone, Slovak Republic, Syrian Arab Republic, Vietnam; 2017: Afghanistan, Argentina, Armenia, Austria, Bolivia, Burkina Faso, Burundi, Chad, China, Czech Republic, Equatorial Guinea, Gabon, Germany, Greece, Iran, Ireland, Korea, Latvia, Libya, Malaysia, Mauritius, Moldova, Morocco, Netherlands, Portugal, Romania, Russian Federation, Senegal, Singapore, South Africa, St. Lucia, Sudan, Switzerland, Tajikistan, Tunisia, Türkiye, United States, Uruguay; 2018: The countries except listed above countries; ****2003: Netherlands; 2004: Lebanon, Puerto Rico; 2006: Somalia, Switzerland, Uganda; 2007: Micronesia, Fed. Sts., Syrian Arab Republic; 2010: Central African Republic, Eritrea, Kiribati; 2011: Equatorial Guinea; 2012: Comoros, Gabon, Seychelles, Tonga; 2013: Algeria, Libya, Namibia, Vanuatu, Yemen, Rep; 2014: Belarus, Cambodia, Egypt, Arab Rep., Eswatini, Guinea-Bissau, Iran, Islamic Rep., Kenya, Lithuania, Russian Federation, Samoa, São Tomé and Principe, Serbia, Sudan, Ukraine, Vietnam; 2015: Bulgaria, Burkina Faso, Chad, Guyana, Korea, Rep., Mauritania, Mozambique, Rwanda, Solomon Islands, United Arab Emirates; 2016: Angola, Armenia, Bahamas, Barbados, China, Côte d'Ivoire, Dominican Republic, Ethiopia, Fiji, Guatemala, India, Ireland, Italy, Jamaica, Kuwait, Malawi, Mexico, Myanmar, Niger, South Africa, Sri Lanka, St. Vincent and the Grenadines, Tanzania, Thailand, Timor-Leste, Turkmenistan; 2017: Antigua and Barbuda, Argentina, Australia, Bahrain, Belize, Botswana, Brazil, Brunei Darussalam, Burundi, Cabo Verde, Chile, Crotia, Czech Republic, Germany, Ghana, Grenada, Haiti, Honduras, Korea, Dem. People's Rep., Lao PDR, Latvia, Malaysia, Maldives, Malta, Mauritius, Nepal, New Zealand, Nicaragua, Philippines, Qatar, St. Lucia, Tajikistan, Togo, Trinidad and Tobago, Uruguay; 2019: Colombia, Indonesia, Peru, Senegal, Sierra Leone, Zimbabwe; 2020: Liberia; 2018: The countries except listed above countries; *****Only Australia data is for 2017.

TABLE 1: Explanations of variables about maternal and child health.

Variable	Definition	Source
Infant and Child Mortality		
Under five mortality rate	It is the probability of dying by age 5 per 1,000 live births.	UNICEF
Neonatal mortality rate	It is the probability of dying during the first 28 days of life, per 1,000 live births.	UNICEF
Infant mortality rate	It is the probability of dying between birth and exactly 1 year of age, per 1,000 live births.	UNICEF
Stillbirths rate	It is the number of babies born with no sign of life at 28 weeks or more of gestation per 1,000 births.	IGME
Immunization		
Immunization, DPT (diphtheria, pertussis, and tetanus)	It is the percentage of children ages 12-23 months who received DPT vaccinations before 12 months.	World Bank
Immunization, HepB3 (hepatitis B)	It is the percentage of children ages 12-23 months who received hepatitis B vaccinations before 12 months or at any time before the survey.	World Bank
Immunization, measles	It is the percentage of children ages 12-23 months who received the measles vaccination before 12 months or at any time before the survey.	World Bank
Immunization, Polio (Pol3)	It is the percentage of children ages 12-23 months who received the polio vaccination before 12 months or at any time before the survey.	WHO
Health Workers		
Nurses and midwives	It includes professional nurses and midwives, per 1000 people.	World Bank
Maternal Mortality and Maternal Health		
Maternal mortality ratio	Maternal mortality ratio is the number of women who die from pregnancy-related causes while pregnant or within 42 days of pregnancy termination per 100,000 live births.	World Bank
Births attended by skilled health staff (% of total)	It is the percentage of deliveries attended by personnel trained to give the necessary supervision, care, and advice to women during pregnancy, labor, and the postpartum period; to conduct deliveries on their own; and to care for newborns.	World Bank/UNICEF
Fertility rate (% of total)	It represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with age-specific fertility rates of the specified year.	World Bank

DPT: Diphtheria, pertussis, and tetanus; UNICEF: United Nations Children's Assistance Fund; IGME: Inter-agency Group for Child Mortality Estimation; WHO: World Health Organization.

inated. The significance level was set as $p<0.05$. In this manuscript, there is no research involving "human beings". The manuscript is not based upon clinical study or patient data. Therefore, ethical approval not be applied.

RESULTS

As the income level of the countries increases, the number of midwives and nurses, immunization rates and, births attended by skilled health staff also increases. On the contrary, child mortality rate, maternal mortality ratio, and fertility rate decrease (Figure 1).

The comparisons by the country's income groups are shown in Table 2. The results of this study indicated a significant difference between the medians of the under-5 mortality rate, newborn mortality rate, infant mortality rate and stillbirths rate variables by country income groups ($p<0.001$). For all three variables, it has been determined that there is a significant difference between high-income countries and countries in other income groups, upper-middle-income and lower-middle-income countries, as well as upper-middle-income countries and low income countries. Apart from these, there is a significant difference between lower-middle-income and low-income countries in the stillbirths rate (Table 2).

It is found that there is a significant difference between the percentage of children aged 12-23 months who received diphtheria, pertussis, and tetanus (DPT), hepatitis B, measles and polio vaccinations by country income groups ($p<0.001$). A significant difference was found between low-income countries and high-income countries, lower-middle-income countries and high-income countries by all variables (Table 2).

A statistically significant difference was found between the numbers of midwives and nurses ac-

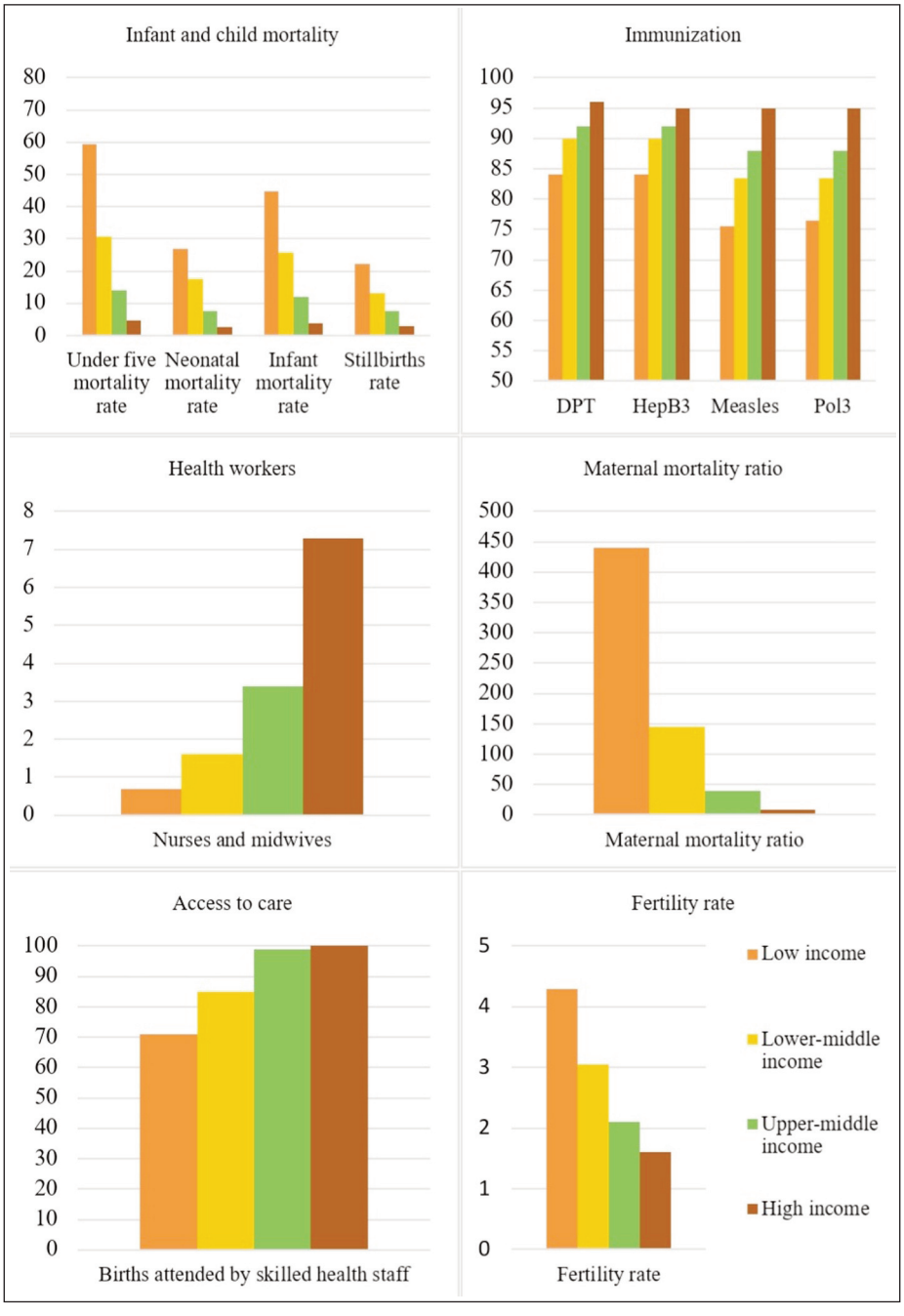

FIGURE 1: Maternal and child health variables by country income groups.
DPT: Diphtheria, pertussis, and tetanus.

cording to the country's income groups ($p<0.001$). This difference originated from the difference between low-income countries and other income groups; lower-middle-income and upper-middle-income countries; lower-middle-income and high-income countries; upper-middle-income and high-income countries (Table 3).

It is found that, according to country income groups, there is a significant difference between the medians of the maternal mortality ratio ($p<0.001$). A statistically significant difference was found between high-income countries and other income groups, upper-middle-income and lower-middle-income countries, upper-middle-income and low-income

TABLE 2: Distribution of child health and immunization variables by country income groups.

Variables	Country Income Groups	n	Median	Range	p value
Infant and Child Mortality					
Under five mortality rate	Low income	24	59.33	96.49	<0.001
	Lower-middle income	52	30.77	110.10	
	Upper-middle income	51	13.93	79.52	
	High income	39	4.74	15.21	
Neonatal mortality rate	Low income	24	26.89	30.23	<0.001
	Lower-middle income	52	17.49	38.53	
	Upper-middle income	51	7.52	27.79	
	High income	39	2.76	10.69	
Infant mortality rate	Low income	24	44.69	67.90	<0.001
	Lower-middle income	52	25.59	68.09	
	Upper-middle income	51	12.03	58.38	
	High income	39	3.94	13.86	
Stillbirths rate	Low income	24	22.12	23.7	<0.001
	Lower-middle income	52	13.1	26.11	
	Upper-middle income	51	7.7	14.36	
	High income	39	3	10.05	
Immunization					
Immunization, DPT	Low income	24	84	51	<0.001
	Lower-middle income	52	90	64	
	Upper-middle income	51	92	46	
	High income	39	96	14	
Immunization, HepB3	Low income	24	84	51	<0.001
	Lower-middle income	52	90	64	
	Upper-middle income	51	92	46	
	High income	39	95	30	
Immunization, measles	Low income	24	75.5	58	<0.001
	Lower-middle income	52	83.5	55	
	Upper-middle income	51	88	75	
	High income	39	95	19	
Immunization, Pol3	Low income	24	76.5	95	<0.001
	Lower-middle income	52	83.5	67	
	Upper-middle income	51	88	44	
	High income	39	95	24	

DPT: Diphtheria, pertussis, and tetanus.

countries (Table 3). While the median maternal mortality ratio of high-income countries is 8, the median maternal mortality ratio of low-income countries is (55 times higher) 440. This highlights the socioeconomic inequality in maternal mortality.

According to country income groups, a significant difference was found in the median percentage of births attended by skilled health staff ($p<0.001$). A statistically significant difference was found between low-income countries and upper-middle-income groups; low-income and high-income countries; lower-middle-income and upper-middle-income countries; lower-middle-income and high-income countries. While skilled health staff attends in all births in high-income countries, this rate is 71% in low-income countries. It is understood from the difference of 29% that skilled health staff do not participate in the birth of approximately one-third of women living in socio-economically disadvantaged countries (Table 3).

TABLE 3: Distribution of health workers and maternal health variables by country income groups.

Variables	Country Income Groups	n	Median	Range	p value
Health Workers					
Nurses and midwives	Low income	24	0.7	4	<0.001
	Lower-middle income	52	1.6	11	
	Upper-middle income	51	3.4	11	
	High income	39	7.3	16	
Maternal Mortality and Maternal Health					
Maternal mortality ratio	Low income	24	440	1,109	<0.001
	Lower-middle income	52	145	901	
	Upper-middle income	51	39	299	
	High income	39	8	68	
Births attended by skilled health staff	Low income	24	71	76	<0.001
(% of total)	Lower-middle income	52	85	91	
	Upper-middle income	51	99	32	
	High income	39	100	3	
Fertility rate (% of total)	Low income	24	4.30	5	<0.001
	Lower-middle income	52	3.05	5	
	Upper-middle income	51	2.10	3	
	High income	39	1.60	2	

It is found that, according to the fertility rate, there is a significant difference between the medians of the country's income groups ($p<0.001$). The difference between high-income countries and other income groups, upper-middle-income and lower-middle-income countries, upper-middle-income and low-income countries is significant (Table 3).

DISCUSSION

As a result of the research, a significant difference was found between the medians of the country income groups for each of the under-5 mortality rate, newborn mortality rate, infant mortality rate and, stillbirths rate variables. Many studies in the literature confirm that socioeconomic status and child and infant mortality are inversely proportional. Higher infant mortality rates are observed in regions with low socioeconomic status. Infant mortality rates rise steadily as incomes decline.[7] In a regression model conducted by Chung and Muntaner, it was found that gross domestic product (GDP) per capita predicted the infant mortality rate by 70% and mortality rate under 5 years old by 64%.[8] Sub-Saharan Africa is the region with the highest under-five mortality rate, with 76 deaths per 1,000 live births in 2017. This means that 1 in 13 children dies before their fifth birthday. When compared with Australia and New Zealand, which are in the high-income group, it is observed that the under-five mortality rate is 20 times higher in Sub-Saharan Africa. A child born in sub-Saharan Africa or South Asia is nine times more likely to die in the first month than a child in a high-income country.[15]

Low- and middle-income countries have poorly organized health systems and disadvantaged socioeconomic conditions. In low- and middle-income countries, methods such as vaccination and other preventive health services, fight against common diseases, nutrition education and nutritional supplements, social interventions (home visits), and dissemination of health services in local areas can be adopted to reduce inequalities in mother-child health. Breastfeeding and hygiene education and the use of visual tools for the mother as educational tools will be effective. Education, preventive treatments and simple messages can be provided through primary care providers.[16] In these countries, it is necessary to provide financial or information support to people to reduce barriers to accessing health services.[17]

As a result of the research, it is found that there is a significant difference between the percentage of

children aged 12-23 months who received DPT, hepatitis B, measles and polio vaccinations and number of midwives and nurses by country income groups. In a study found that coverage of childhood vaccinations is insufficient in low- and middle-income countries. They argue that it is important to maintain and increase current vaccination levels in these countries and that improving vaccination levels should be given a global priority.[18] In a study by Hajizadeh, it was observed that 58.3% of children in low-income countries were vaccinated for four main (bacillus Calmette-Guérin, DPT, polio, and measles) diseases. Vaccination rates were found to be 52.9% and 68% in lower-middle-income and upper-middle-income countries, respectively. In Nepal, Honduras and Armenia, more than 85% of children had all four vaccinations, compared with less than 35% in Mali, Nigeria and Ethiopia.[19]

As a result of the research, a significant difference was found between the medians of the country's income groups according to the maternal mortality ratio. There are many studies in which the maternal mortality ratio is associated with income level. According to Bayati et al. found a negative significant relationship between maternal mortality rate and GDP per capita in their study in 22 Eastern Mediterranean countries.[20] Buor and Bream, in their study of 28 sub-Saharan African countries, found that per capita GNP had a strong negative relationship with maternal mortality.[21] According to Kurjak et al., African and Asian countries accounted for 59% of all maternal deaths in 2015. It is suggested in this study that low and middle-income countries account for 99% of maternal deaths in 2015.[22]

A significant difference was found in terms of birth percentage and fertility rate attended by skilled health staff compared to the median of income groups of countries. While skilled health staff participate in all births in high-income countries, this rate decreases as the income level decreases. Additionally, as the income level of the countries increases, the fertility rate also increases (Figure 1). According to many studies, the percentage of births attended by skilled health staff is an important factor reducing the maternal mortality rate.[20,21] The fertility rate, on the other hand, emerges as a factor that increases the maternal mortality rate.[23,24] Anindya et al. in their study of 39 countries, found that upper middle-income countries had higher effective coverage levels in family planning, antenatal care, maternity care, and postnatal care compared to low- and lower-middle-income countries.[25] In a report published by UNICEF, the presence of a qualified healthcare professional at every birth is seen as a powerful strategy to reduce maternal and neonatal morbidity and mortality. Countries with the lowest participation of skilled health staff in childbirth are observed as the poorest countries with the highest levels of maternal mortality.[26]

Although the countries included in the income classification of the World Bank have changed over the years, previous studies have found that variables such as antenatal care, delivery care, postnatal care, modern contraception, immunization coverage, and mortality rate have changed in line with this research.[25,27-30]

CONCLUSION

A country's economic situation impacts its citizens' health. Maternal and infant mortality rates and stillbirths are higher in low-income countries, vaccination rates are lower, and skilled professionals are inadequate. Using the World Bank's income classification, this study highlights socioeconomic inequalities in maternal and child health. There are serious problems in service delivery and access, especially in low-income and lower-middle-income countries. The results show that children in low-income countries have more limited access to important health interventions such as vaccines and medical care. Eliminating inequalities in maternal and child health should be seen as a necessity for achieving the Sustainable Development Goals.

To eliminate serious inequalities in maternal and child health in low and middle-income countries, interventions to improve the provision of services and strengthen the primary health center network are thought to be beneficial. Also, interventions such as the provision of nutrition supplementation, expanding immunization coverage campaigns, conditional cash transfer schemes, health staff training, and dissemination are recommended. In addition to inter-

ventions at the national level efforts, global cooperation is considered necessary to reduce socioeconomic inequalities in maternal and child health and to make progress towards achieving universal health coverage. It is expected that international organizations (UNICEF, UN, etc.) will provide serious assistance to these countries.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Gökçen Özler;* ***Design:*** *Gökçen Özler, Kübra Sütcü, Burak Tekerek;* ***Control/Supervision:*** *Gökçen Özler, Kübra Sütcü, Burak Tekerek;* ***Data Collection and/or Processing:*** *Gökçen Özler, Kübra Sütcü, Burak Tekerek;* ***Analysis and/or Interpretation:*** *Gökçen Özler, Kübra Sütcü, Burak Tekerek;* ***Literature Review:*** *Gökçen Özler, Kübra Sütcü, Burak Tekerek;* ***Writing the Article:*** *Gökçen Özler, Kübra Sütcü, Burak Tekerek;* ***Critical Review:*** *Gökçen Özler, Kübra Sütcü, Burak Tekerek.*

REFERENCES

1. World Health Organization. Managing maternal and child health programmes: a practical guide. Serie no: 10. Geneva: WHO Library Cataloguing; 1997. [Link]
2. UNICEF. Responding to COVID-19; UNICEF annual report 2020. New York: UNICEF; 2020. [Link]
3. UNICEF. Annual Report for 2018. UNICEF DPR Korea Country Office. 2018. [Link]
4. Griggs D, Nilsson M, Stevance A, McCollum D. A guide to SDG interactions: from science to implementation. International Council for Science, Paris. 2017. [Link]
5. Ages A. UNDP Support to the Implementation of Sustainable Development Goal 3. United Nations Development Programme. 2017. [Link]
6. Sargutan AE. Sağlık sektörü ve sağlık sistemlerinin yapısı [Health sector and structure of health systems]. Hacettepe J Health Adm. 2005;8(3):401-28. [Link]
7. Bedger JE, Gelperin A, Jacobs EE. Socioeconomic characteristics in relation to maternal and child health. Public Health Rep (1896). 1966;81(9):829-33. [Crossref] [PubMed] [PMC]
8. Chung H, Muntaner C. Political and welfare state determinants of infant and child health indicators: an analysis of wealthy countries. Soc Sci Med. 2006;63(3):829-42. [Crossref] [PubMed]
9. Bhutta ZA, Black RE. Global maternal, newborn, and child health--so near and yet so far. N Engl J Med. 2013;369(23):2226-35. [Crossref] [PubMed]
10. Casey RM, Hampton LM, Anya BM, Gacic-Dobo M, Diallo MS, Wallace AS. State of equity: childhood immunization in the World Health Organization African Region. Pan Afr Med J. 2017;27(Suppl 3):5. [Crossref] [PubMed] [PMC]
11. Yaya S, Ghose B. Global inequality in maternal health care service utilization: implications for sustainable development goals. Health Equity. 2019;3(1):145-54. [Crossref] [PubMed] [PMC]
12. World Health Organization. Inequality monitoring in sexual, reproductive, maternal, newborn, child and adolescent health: a step-by-step manual. Geneva: World Health Organization; 2022. [Link]
13. Fantom NJ, Serajuddin U. The World Bank's classification of countries by income. World Bank Policy Research Working Paper. 2016:7528. [Link]
14. Karagöz Y. SPSS-AMOS-META Uygulamalı İstatistiksel Analizler. 2. Baskı. Ankara: Nobel Yayıncılık; 2016.
15. UNICEF. Levels & Trends Child Mortality Report 2018. New York: UNICEF; 2018. [Link]
16. Gilmore B, McAuliffe E. Effectiveness of community health workers delivering preventive interventions for maternal and child health in low- and middle-income countries: a systematic review. BMC Public Health. 2013;13:847. [Crossref] [PubMed] [PMC]
17. Yuan B, Målqvist M, Trygg N, Qian X, Ng N, Thomsen S. What interventions are effective on reducing inequalities in maternal and child health in low- and middle-income settings? A systematic review. BMC Public Health. 2014;14:634. [Crossref] [PubMed] [PMC]
18. Tao W, Petzold M, Forsberg BC. Routine vaccination coverage in low- and middle-income countries: further arguments for accelerating support to child vaccination services. Glob Health Action. 2013;6:20343. [Crossref] [PubMed] [PMC]
19. Hajizadeh M. Socioeconomic inequalities in child vaccination in low/middle-income countries: what accounts for the differences? J Epidemiol Community Health. 2018;72(8):719-25. [Crossref] [PubMed]
20. Bayati M, Vahedi S, Esmaeilzadeh F, Kavosi Z, Jamali Z, Rajabi A, et al. Determinants of maternal mortality in Eastern Mediterranean region: A panel data analysis. Med J Islam Repub Iran. 2016;30:360. [PubMed] [PMC]
21. Buor D, Bream K. An analysis of the determinants of maternal mortality in sub-Saharan Africa. J Womens Health (Larchmt). 2004;13(8):926-38. [Crossref] [PubMed]
22. Kurjak A, Stanojević M, Dudenhausen J. Why maternal mortality in the world remains tragedy in low-income countries and shame for high-income ones: will sustainable development goals (SDG) help? J Perinat Med. 2022. [Crossref] [PubMed]
23. Muldoon KA, Galway LP, Nakajima M, Kanters S, Hogg RS, Bendavid E, et al. Health system determinants of infant, child and maternal mortality: A cross-sectional study of UN member countries. Global Health. 2011;7:42. [Crossref] [PubMed] [PMC]

24. Pinzón-Flórez CE, Fernández-Ni-o JA, Ruiz-Rodríguez M, Idrovo ÁJ, Arredondo López AA. Determinants of performance of health systems concerning maternal and child health: a global approach. PLoS One. 2015;10(3):e0120747. [Crossref] [PubMed] [PMC]

25. Anindya K, Marthias T, Vellakkal S, Carvalho N, Atun R, Morgan A, et al. Socioeconomic inequalities in effective service coverage for reproductive, maternal, newborn, and child health: a comparative analysis of 39 low-income and middle-income countries. EClinicalMedicine. 2021;40:101103. [Crossref] [PubMed] [PMC]

26. UNICEF. Healthy Mothers, Healthy Babies: Taking Stock of Maternal Health. New York: UNICEF; 2019. [Link]

27. Arsenault C, Jordan K, Lee D, Dinsa G, Manzi F, Marchant T, et al. Equity in antenatal care quality: an analysis of 91 national household surveys. Lancet Glob Health. 2018;6(11):e1186-e1195. [Crossref] [PubMed] [PMC]

28. World Health Organization. State of inequality: reproductive maternal newborn and child health: interactive visualization of health data. Geneva: World Health Organization; 2015. [Link]

29. Barros AJD, Wehrmeister FC, Ferreira LZ, Vidaletti LP, Hosseinpoor AR, Victora CG. Are the poorest poor being left behind? Estimating global inequalities in reproductive, maternal, newborn and child health. BMJ Glob Health. 2020;5(1):e002229. [Crossref] [PubMed] [PMC]

30. Wong KLM, Restrepo-Méndez MC, Barros AJD, Victora CG. Socioeconomic inequalities in skilled birth attendance and child stunting in selected low and middle income countries: Wealth quintiles or deciles? PLoS One. 2017;12(5):e0174823. [Crossref] [PubMed] [PMC]