### **Research Article**

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### The correlation of health spending and infant mortality rate in Asian countries

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### ABSTRACT

**Background:** Infant Mortality Rate (IMR) is one of the most vital health indicators. A number of factors impact and influence IMR. One of the most important ones could be public health spending. Health spending however is not uniform throughout Asia and varies from region to region.

**Methods:** Data obtained from the World Health Organization and World Bank Databases were used to assess the effect of state health spending on IMR. Factors such as per capita spending on health, proportion of GDP directed at health and private spending as a percentage of total health spending and their influence on IMR were also studied.

**Results:** Data from 34 Asian countries was included in the study. Singapore (2) and South Korea (3) had the least IMR in the region. Afghanistan (71) had the highest IMR and also the least per capita governmental spending on health and Qatar the highest spending on health.

**Conclusion:** Per capita state spending on health was the most important determinant of IMR in our study and countries with higher per capita spending on health had significantly lower levels of IMR.

Keywords: Health spending, Infant mortality rate, Health indicators

### **INTRODUCTION**

Rapid economic growth and significant increase in the literacy rate among Asian countries has spurred a desire and demand for greater state health spending and more accountability from policy makers. The health scenario in terms of vital indicators such as Infant Mortality Rate (IMR) is not uniform in the region. A study which analyzed government spending on health and public health indicators suggested that public health spending had an important influence upon health and particularly upon infant mortality.<sup>1</sup> A study on state health expenditure and IMR in India also showed similar results.<sup>2</sup> High income countries and countries with access to natural resources like oil, spend a greater proportion of their wealth on providing and building a robust health infrastructure. Low income countries have not accorded

the same degree of prioritization to health and their dividends in terms of health outcomes are mixed. The marginal return on health expenditure in high-income countries is low, whereas that in low-income countries is comparatively high.<sup>3</sup> Western democracies have an higher Human Development Index and better parameters in terms of mortality rates in particular and health in general. In Asia however, governance models range from democracies, monarchies, communism to autocratic regimes, therefore people are not always able to voice their opinions, aspirations or preferences through a ballot. This has sometimes resulted in skewed health spending. Wealth is also unevenly distributed in Asia, Middle Eastern monarchies and the Asian tiger economies in South East Asia have much higher per capita incomes and have resulted in an imbalance on health parameters. A study used data from 133 low and middle income

countries examined the relationship between country health spending and selected health outcomes such as infant mortality rate and revealed that health spending has a significant effect on reducing IMR.<sup>4</sup> The purpose of this study is to (i) evaluate the effect of health spending on one vital health indicator - infant mortality rate and to (ii) determine if greater state investment on health has significant tangible benefit in lowering the IMR.

#### **METHODS**

Data on health spending of various Asian nations was obtained from the global health expenditure database <sup>5</sup> of the World Health Organization (WHO), this data was further demarcated into parameters such as per capita government spending on health in dollars, health spending as a proportion of Gross Democratic Product (GDP) and private health spending as a proportion of total health spending.

Current data on infant mortality rate for Asian Nations was obtained from the World Bank health indicators database.<sup>6</sup> Infant Mortality Rate (IMR) is defined as the number of infant deaths per 1000 live births.<sup>7</sup>

The data obtained for IMR and health spending was then divided into sub regional groups like South Asia, South East Asia, Middle East and Central Asia. The IMR parameters were later matched with the health spending data to determine if countries that had a higher per capita state health expenditure had better IMR indicators. Total spending on health and the proportion of that spending which was private helped us in determining if there was a scope for greater state health investment.

#### RESULTS

Singapore and South Korea had the least IMR in Asia and had a high per capita spending on health by their governments. Both these nations are high income countries and devoted a significant portion of their GDP towards health resources. Afghanistan had the least per capita governmental health spending and the highest IMR. Myanmar spent only a measly portion of its GDP on health and had a relatively high IMR. Iraq and Afghanistan spent a higher proportion of their GDP on health but this was probably related to recent events and circumstances in these strife torn nations which required greater allocation of income for rebuilding health resources.

Figure 1 shows the IMR and per capita government spending on health in U.S. dollars for the South Asian Region, Afghanistan has the least spending on health and consequently the highest IMR. Maldives has the highest per capita health spending and also the least mortality rate in the region. Among the 8 nations in South Asia, India is ranked 4th in health spending and 7<sup>th</sup> in IMR with only Pakistan having a higher IMR.



# Figure 1: Government health spending and infant mortality rate for South Asian countries.

Table 1 shows total and private health spending, Pakistan spends the least on health as a percentage of GDP, while Afghanistan spends the highest but what should be factored in is the dismal state of affairs in Afghanistan as a result of a long drawn war and insurgency, Maldives is the next highest spender on health and this is reflected by the low levels of IMR in Maldives. Afghanistan also has the highest private spending on health as a percentage of all spending on health and this indicates the lack of access to public health facilities there. Bhutan has an astonishingly low level of private health spending.

 Table 1: Total health spending and private health spending in South Asian countries.

Countries	Health spending as % of GDP	Private spending on health as % of all spending
Afghanistan	7.6	88.3
Bangladesh	3.5	66.4
Bhutan	5.2	13.2
India	4.1	70.8
Maldives	6.3	39.5
Nepal	5.5	66.8
Pakistan	2.2	61.5
Sri Lanka	2.9	55.3

Figure 2 shows the IMR and per capita government spending on health in U.S. dollars for the South East Asian Region, oil rich Brunei spends the maximum and is followed by Singapore; Singapore has the least IMR, an enviable 2 and is followed by Brunei. Myanmar and Laos spend the least on health and the same two countries have the highest IMR in the region.

Table 2 shows total and private health spending in South East Asia, Myanmar has an extremely low level of health spending as a percentage of GDP and not surprisingly the proportion of total health spending which is private is the highest in the region, Cambodia has the highest spending on health in percentage of GDP terms. Brunei has a very low level of private spending but that is probably because of the high state spending on health in the monarchy.



Figure 2: Government health spending and infant mortality rate for south East Asian countries.

## Table 2: Total health spending and private healthspending in South East Asian countries.

Countries	Health spending as % of GDP	Private spending on health as % of all spending
Brunei	2.8	15.1
Cambodia	5.6	62.8
Indonesia	2.6	50.9
Laos	4.5	66.7
Malaysia	4.4	44.5
Myanmar	2.0	87.8
Philippines	3.6	64.7
Singapore	4.0	63.7
Thailand	3.9	25.0

Figure 3 shows the IMR and per capita government spending on health in U.S. dollars for the Middle East. There is a clear divide here between the countries which have access to a valuable resource like oil and countries which are devoid of such a blessing. Qatar has the highest spending on health and enjoys the best IMR while Yemen which spends the least has the highest IMR in the region.





Table 3 shows total and private health spending in the Middle East, not surprisingly a significant amount of the oil wealth is channeled towards health spending. Health spending as a percentage of GDP is highest for Iraq, probably because that nation is rebuilding its resources. The least private health spending on health is seen in Oman. Countries in the Gulf subsidize health to a high extent and this is reflected in low levels of private spending in those countries.

# Table 3: Total health spending and private healthspending in Middle Eastern countries.

Countries	Health spending as % of GDP	Private spending on health as % of all spending
Iran	5.6	59.9
Iraq	8.4	18.8
Jordan	8.0	32.3
Kuwait	2.6	19.6
Lebanon	7.0	60.8
Qatar	1.8	22.5
Saudi Arabia	4.3	37.1
Syria	3.4	54.0
UAE	3.7	25.6
Yemen	5.2	75.8
Oman	2.8	19.9

Figure 4 shows the IMR and per capita government spending on health in U.S. dollars for the Central Asian Region. South Korea spends the highest per capita on health and therefore benefits from the lowest IMR and Vietnam which spends the least has the highest IMR in the region. China, the most populous country in the world benefits from a rapid acceleration of economic growth and has a relatively low IMR.



## Figure 4: Government health spending and infant mortality rate for Central Asian countries.

Table 4 shows total and private health spending in Central Asia, South Korea spends a high proportion of GDP on health, while Kazakhstan spends the least. Private spending on health as a proportion of all health spending is highest in Vietnam and least again in Kazakhstan.

Countries	Health spending as % of GDP	Private spending on health as % of all spending
China	5.1	46.4
Kazakhstan	4.3	40.6
Mongolia	5.4	44.9
Uzbekistan	5.8	52.5
Vietnam	6.8	62.2
South Korea	6.9	41.0

### Table 4: Total health spending and private healthspending in South Asian countries.

#### DISCUSSION

In the present study Asian countries with a higher per capita state spending on health had a lower IMR and generally had a higher proportion of their GDP directed at health needs. Countries with higher per capita income like Singapore, South Korea and Arab nations like Qatar and the UAE could afford higher health budgets and generally performed better than their peers. Health budgets have generally burgeoned globally. In a study funded by the Bill and Melinda Gates foundation and published in the Lancet, showed that from 1995 to 2006 in all developing countries, public financing of health in constant US\$ from domestic sources increased by nearly 100%.<sup>8</sup> Canada has one of the best health system and is the envy of most countries. In Canada, about 70% of total health expenditure comes from the general tax revenues of the federal, provincial and territorial governments.<sup>9</sup> Countries with small populations such as Qatar and Brunei spent a lower proportion of their GDP on health but when translated into per capita spending it still ranked as the highest in their regions. Middle Eastern countries had a lower private spending on health but this was because of the state subsidizing health to a higher degree. Poorer countries had a higher proportion of private spending on health and this is due to the lack of access to quality public health care. Democracies outspent monarchies and one party regime's in terms of proportion of GDP directed at health spending and this is probably because of greater accountability and incumbent governments having to periodically face the electorate. The returns on investment on health are not uniform for all age groups. Adults and older children benefit more from health investment and health infrastructure for example, in the Indian subcontinent, in Bangladesh, the national neonatal mortality rate has undergone an annual decline of 4.0% since 2000, reflecting greater progress than both the regional and global averages, but the mortality reduction for children 1-59 months was double this rate, at 8.6%.<sup>10</sup> Bangladesh spent 19 \$ per capita or 3.5% of its GDP on health. Similarly in Nepal, neonatal mortality rate reduced by 3.6% per year, which was faster than the regional average (2.0%) but slower than national annual progress for mortality of children aged 1-59 months (7.7%) and maternal mortality (7.5%).<sup>11</sup> Nepal spent 22 \$ per capita or 5.5% of its GDP on health. Similar data and results are seen all over the world, in

Malawi for instance between 2000 and 2010 NMR reduced 3.5% annually.<sup>12</sup> This indicate that IMR has declined globally and the rate of decline is similar in third world countries. In our study what is clearly visible is that the per capita spend on health had a much larger impact on IMR than percentage of GDP budgeted for health. Qatar and Oman's health spend was only 1.8% and 2.8% of GDP, but when translated into per capita spending the figures were 1257 and 479 dollars. Conversely Afghanistan, Cambodia and Iraq spent 7.6, 5.6 and 8.4 percent of GDP on health, but per capita figures were 545 and 276 US dollars and the IMR for these countries was among the highest in the region. It is not just Health spending that determines the IMR and there are various other factors involved. In a study done in 16 Arab countries, the infant mortality rate in 1978 and 1998 were studied, the impact of social, demographic and economic factors on the IMR was also studied and IMR was inversely related to literacy status, annual gross national product per capita and access to safe drinkingwater and adequate sanitation facilities.<sup>13</sup> In another study, cross-national data was used to examine the impact of both public spending on health in determining child and infant mortality and the study revealed that 95% of cross-national variation in mortality can be explained by a country's income per capita, inequality of income distribution, extent of female education and level of ethnic fragmentation.<sup>14</sup> National-level data from 152 countries based on World Development Indicators 2003 were used for multivariate linear regression analyses and public health spending, gross national income/capita, poverty, inequality and female illiteracy were the socioeconomic predictors listed in order of importance determining mortality.<sup>15</sup> In infants and children there are other factors that may also influence mortality, these factors may include cultural and social practices including gender preference. Health manpower may also play a significant role. A study in Lancet examined the role of human resources for health and determined that health worker density was significantly associated with coverage vaccinations.<sup>16</sup>

There are many studies that show public health spending having a major influence on IMR, a recent study done in the Eastern Mediterranean Region assessed the impact of public and private health expenditure on infant mortality rate and concluded that public health expenditures in the Eastern Mediterranean countries improved health outcome, while the private health expenditures did not have any significant relationship with health status.<sup>17</sup> In a similar study covering 44 countries in Sub Saharan Africa the results showed that both public and private health care spending showed strong positive association with health status even though public health care spending had relatively higher impact.<sup>18</sup> In the present study too countries that had a relatively high percent of government spending on health had better infant mortality indicators, on the other hand countries which had a high proportion of private spending on health did not necessarily have a lower IMR. Governmental health spending on health in

terms of per capita was the most important determinant of IMR. South Korea, Qatar, Singapore and Maldives spent the highest amount per capita on health in their regions and they also had the best IMR figures in their regions. Higher governmental spending determines that the section most vulnerable, the poor and the lower middle class can avail the benefits of affordable or subsidized health care. In the 1990s Italy privatized a significant portion of its healthcare delivery system the authors of an epidemiological study calculated the average rate of change in avoidable mortality rates in 19 of Italy's regions for a decade and concluded that public spending was significantly associated with reductions in avoidable mortality rates, while greater private sector spending was not.<sup>19</sup> In the present study Afghanistan, Myanmar, Yemen and Vietnam had the highest proportion of private spending as a percentage of total spending and also had the highest IMR in their regions. This indicates that when a good public health care system and infrastructure is not available or found wanting, then citizens have to depend on private health care which may not be always affordable and consequently results in poorer health outcomes. In a study on achieving the millennium developmental goals in India, the authors pointed out that poverty, low literacy, poor nutritional status, urban-rural divide and lower budgetary allocations are the reasons most responsible for high IMR and increasing governmental spending has started showing encouraging results.<sup>20</sup> A cross-country study in seven Pacific island countries evaluated the relationship between per capita health expenditure and health outcomes such as infant mortality rate and the results provided strong evidence that per capita health expenditure is an important factor in determining health outcomes. The study suggested that a 10% increase in per capita health expenditure in a country such as Papua New Guinea would see a reduction of 3.6 in the IMR.<sup>21</sup> Health budget allocation would ultimately depend on the strength of the economy of an country, higher income countries would find it easier to allocate a higher proportion of their spending on wealth. A study on under five mortality in 43 developing countries suggested that economic growth is associated with widening poor-rich disparities in mortality.<sup>22</sup> A faster pace of economic growth could fuel greater health spending, developed country's allocation for health is rising at a faster rate. A study assessed the value of healthcare spending growth in 14 western countries between 1996 and 2006 and showed an average decline of 2.6-5.3% in their avoidable mortality. During the same period, healthcare spending rose between 1.9 and 5.9% per year. Most countries with above-average spending growth demonstrated above-average reductions in avoidable mortality.<sup>23</sup> In the present study it is apparent that certain countries can dedicate more capital towards building health resources. Myanmar for instance spends only 2% of its GDP on health, which in per capita terms is 4 dollars per individual, which is lower than what even Afghanistan spends, private spending in Myanmar accounts for nearly 88% of total health spending. Similarly Pakistan spends only 2.2% of GDP and 23

dollars per individual on health. This results in dismal health outcome and indicators.

#### CONCLUSIONS

The present study demonstrates that the benefits of a declining IMR accrue when the per capita health spending is robust, even low income countries which allocate a reasonable proportion of state spending on health enjoy a relatively lower IMR. In every region, countries which allocate and apportion more towards health have lower IMR than their peers. The proportion of GDP directed at health indicates that there is a scope among many countries for increased earmarking of funds for health. The gains of higher health budgets would be many- a rapid reduction in IMR would be one of the most vital. In this study private spending on health did not have a significant benefit on IMR and this is probably due to factors such as affordability and affluence impacting private health care. State health spending on the other hand is more focused at vulnerable sections of society and results in more perceptible and tangible gains and outcomes.

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