DOES HEALTH WORKFORCE DENSITY IMPROVE HEALTH OUTCOMES IN A COUNTRY? A COMPARISON STUDY IN SOUTH ASIAN REGION

By

Muditha Chathuranga Amarasinghe

A THESIS

Submitted to

KDI School of Public Policy and Management

in partial fulfillment of the requirements

for the degree of

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Committee in charge:

Supervisor Shin, Jaeun, supervisor _____

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ABSTRACT

DOES HEALTH WORKFORCE DENSITY IMPROVE HEALTH OUTCOMES IN A COUNTRY? A COMPARISON STUDY IN SOUTH ASIAN REGION

By

Muditha Chathuranga Amarasinghe

Health Human Resources are the cornerstone of health care provision around the world. Their availability, ability, & commitment are imperative to bring out the desired health outcomes of a country. Health Human Resources are not uniformly distributed around the world. Even within countries there are un-even distributions of health human resources. Since Health Human Resources are directly in contact with people who seek care, they are mostly related to the desired health outcomes of a country. There are number of studies that show a relationship between Health Human Resources & Health Outcomes. Defining as the number of health workers for ten thousand people, health workforce density is the most commonly measured health workforce indicator. In this study, relationships between health human resource density and health outcomes have been assessed choosing five countries in South Asia region considering literacy, income, and health care expenditure abilities. Within the country, Sri Lanka shows a wide variation of distribution of human resources, so as health outcomes. Most of the health outcomes were related to health workforce density although it was not the case at all the time. While comparing Sri Lanka with four other countries in the region namely India, Pakistan, Bangladesh, and Maldives it is evident that there are variations in health human resources & health outcomes. While Maldives is showing better health outcomes with high density of human resources, Pakistan showed poor outcomes with low

density of health workers. Sri Lanka is exceptional to show better outcomes even with low density of human resources. While assessing other related factors, it was evident that health outcomes were related not only to health workforce density, but also to adult literacy, Per-capita income and Total Health Expenditure (THE) per-capita. High Literacy, High GNI per-capita, and high THE per-capita was associated with better health outcomes.

DEDICATION

This work is dedicated to all health workers, who commit themselves to heal the world

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ABBREVIATIONS

AMOH	Additional Medical Officer of Health
GDP	Gross Domestic Product
GNI	Gross National Income
HDI	Human Development Index
HNP	Health Nutrition & Population
HRH	Human Resources for Health
IMR	Infant Mortality Rate
MCH	Maternal & Child Health
MDG	Millennium development Goals
MMR	Maternal Mortality rate
MOH	Medical Officer of Health
NMR	Neonatal Mortality Rate
SBA	Skilled Birth Attendance
SDG	Sustainable Development Goals
THE	Total Heath Expenditure
WB	World Bank
WHO	World Health Organization
WHR	World Health Report

1. Introduction

Human resources play an important role in any industry whether it is production or service provision. In any industry a human being with a learned set of skills is an asset. Even though the technology has taken over some of the activities done previously by humans, they still have a considerable role to play in any industry. This is particularly important in service industry because human resources more often become direct contact of the service consumers. Out of the different service industries which consumers have frequent contact with, health care industry is an important area to be considered because of the close connection exists with human wellbeing. On the other hand health care service is considered to be an area where health workers has to deal with very sensitive issues most of the time.

Human resources involved in health care industry have wide variation in their skills and performance. But the ultimate outcome of all the human resources will be to bring good health to a community or to a country. World Health Organization estimates there are about fifty nine million health workers involved in different kinds of health care activities around the world.[1] They can be divided into two main categories. Those are the health service providers which constitute nearly 39.5 million and health management and support workers which constitute about 19.5 million. Health service providers are those who are in direct contact with consumers and this category mostly constitutes doctors, nurses and midwives.[2]

The distribution of health workers around the world shows wide variation with higher number of them concentrated in the developed parts while the developing world still having shortages. According to the world health statistics, most of the shortages are in Africa while Americas enjoy with the most number of health human resources. Studies have found that

[1] The World Health Report 2006 – *Working together for Health*, World Health Organization Geneva, 2006. http://whqlibdoc.who.int/publications/2006/9241563176_eng.pdf

[2] Ibid

one reason for the vast difference between the health outcomes between the developed and developing regions of the world is the misdistribution of health workforce. In Sri Lanka, even though the overall picture shows excellent performance, there are wide variations between health outcomes in different parts of the country.[3] This is probably be related to the differences in the distribution of health workers in the different regions.

1.1 Purpose of the Study

Health Workforce is defined as "all people engaged in actions whose primary intent is to enhance health".[4] A competent health work force is considered to be the heart of well-functioning health systems in the world. Therefore health work force has been included as one of the six components of the World Health Organization's Health System Framework. There are a number of studies that have shown a positive relationship between the health workforce and health outcomes.[5] In some countries the link between the health outcomes and health resources are not clearly understood due to unavailability of enough data. It is important for the countries to have an idea about its health work with respect to planning, developing, recruiting and retaining its health work force.

Health workforce density is defined as the number of health workers per ten thousand people. Health workforce density is considered to be the most commonly reported health workforce indicator throughout the world. It is very important in understanding the situation of the health human resources in a country. If measured accurately and

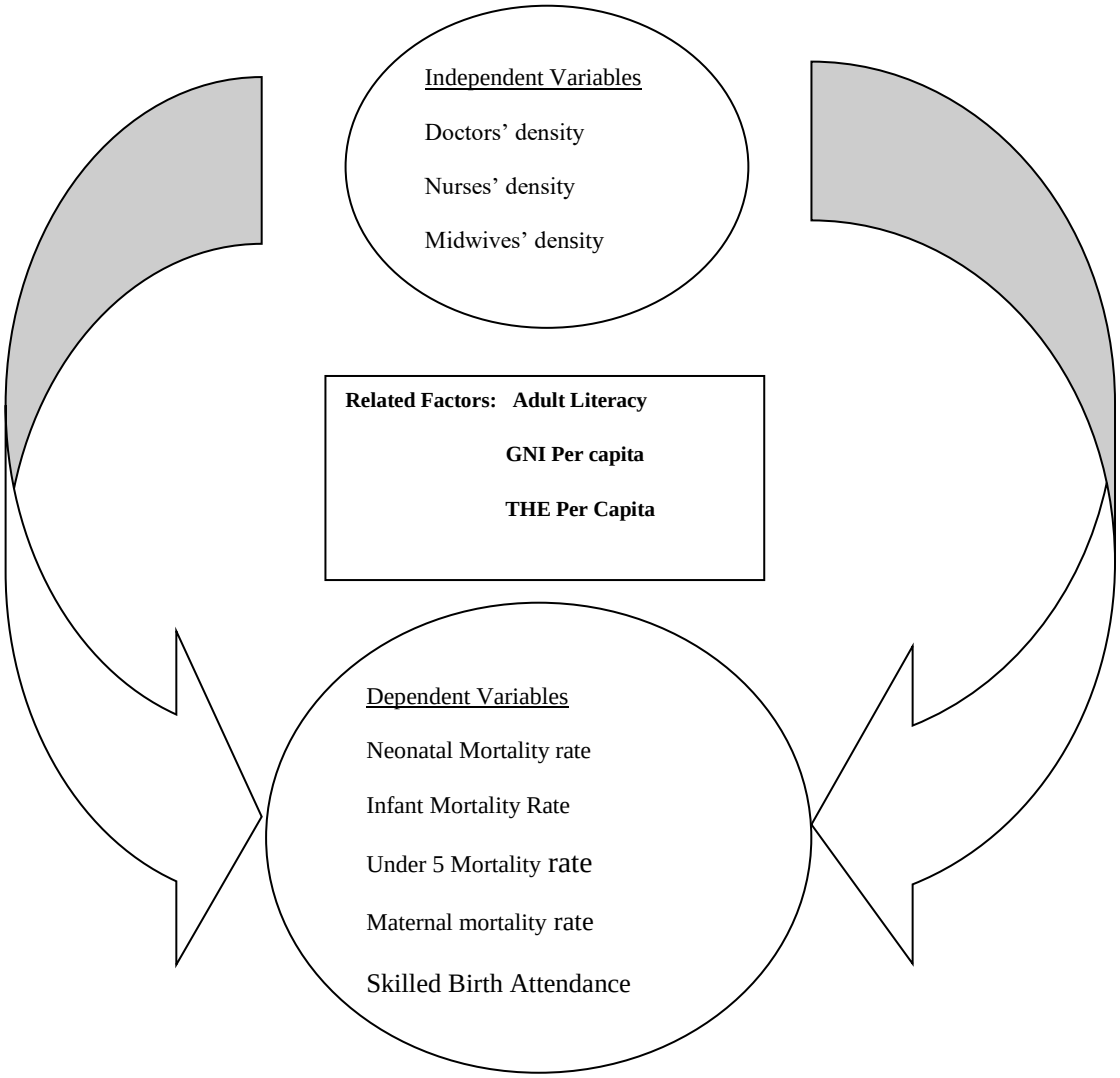
[3] Ministry of Health , Sri Lanka, *Health Facility Survey: District Profiles*, Management Development & Planning Unit, Ministry of Health Sri Lanka,2011, 1

[4] Ibid. The World Health Report 2006.

[5] Niko Speybroeck et-al. Reassessing the relationship between human resources for health, intervention coverage and health outcomes. *Background paper prepared for the World Health Report 2006*. Geneva, WHO 2006. http://www.who.int/hrh/documents/reassessing_relationship.pdf

systematically it can be used to see whether the size of the current workforce is adequate to provide the most basic level of care to the people in a country.[6] Health workforce density is relatively easy to calculate, it can be used to analyze figures across countries and it is very conveniently understood by many audiences. But it only takes into account the quantity of the health workers only.

Figure 1: Conceptual Framework, Health Human Resources & Health Outcomes



[6] World Health Organization, *Toolkit on monitoring health systems strengthening: Human Resources for Health*, World Health organization, May 2009 http://www.who.int/healthinfo/statistics/toolkit_hss/EN_PDF_Toolkit_HSS_HumanResources_oct08.pdf

Out of many different categories of health human resources, this study concerned about three major health workers who have direct contact with patients. Those are, Doctors, Nurses, and Midwives. At the same time as health outcomes, this study concerned four outcomes which are related to Maternal & Child Health (MCH). These outcomes were selected because of their readily availability and the possibility of comparing between different countries. In contrast three other factors were considered which has a probable link with the health outcomes and to see to what extent these factors affect health outcomes in the selected countries. Out of these factors, adult literacy and GNI per-capita were selected as general factors which can have an influence on health outcomes from the perspective of the public. On the other hand total Health Expenditure (THE) of the country was considered to see the differences when considering health outcomes.

1.2 Definition of Variables:

1.2.1 Independent variables.

1.2.1.1. Doctors density:

The number of doctors (both specialist & non specialist) engaged in provision of Maternal & Child Health care per ten thousand people in a population.

1.2.1.2. Nurses density:

The number of nurses involved in provision of Maternal & Child Health care per ten thousand people in a population.

1.2.1.3. Midwife density:

The number of midwives involved in the provision of Maternal & Child Health

care per ten thousand people in a population.

1.2.2 Dependent variables.

1.2.2.1. Skilled birth attendance:

Number of child deliveries attended by a person who has skills in dealing with delivery namely a doctor, nurse or a midwife.

1.2.2.2. Neonatal Mortality Rate:

Number of newborn babies died before completion of twenty eight days per thousand live births.

1.2.2.3. Infant Mortality Rate:

Number of children died under 1 year old per thousand live births.

1.2.2.4. Under 5 Mortality Rate;

Number of children died before completion of five years per thousand live births.

1.2.2.5. Maternal Mortality Rate:

Maternal deaths per hundred thousand live births (Maternal Mortality Ratio).

1.3 Statement of the Problem

Although Sri Lanka has achieved remarkable health outcomes compared to the other countries in the region, the system still experiences a number of shortcomings. These are

mainly observed in areas of organization and management, financing and service delivery mechanisms.[7] Due to these short comings, health outcomes do not reflect the actual performance done by the system. Out of those two important areas to be concerned are,

I. Stagnant health outcomes of the entire system.

II. Inter-area variations of health outcomes.

These two problems are particularly important with regard to the Maternal and Child Health (MCH) outcomes. Out of the many factors that contribute to these problems, health work-force has been identified as one important factor. Therefore it is imperative to assess the relationship between Health Human Resources (HRH) related to MCH and the outcomes. It will be further helpful to strengthen the system to achieve better outcomes in the future. Sustainable development goals were brought forward by the United Nations in September this year.[8] They will be implemented from 2016 to be achieved by the year 2030. The third sustainable goal has been stated as "Ensure healthy lives for all at all ages". In this respect two out of three targets are related to MCH.

I. Achieving Universal Health Coverage at every stage of life with particular emphasis on Primary Health Care including reproductive health, family planning and routine immunization.

II. End preventable deaths by reducing child mortality and maternal mortality.

There-fore it is imperative to have a better understanding of the relationship between health workforce and health outcomes particularly in relation to maternal and child health to achieve desired results in the future.

[7] Ibid Ministry of Health , *Health Facility Survey 2011,*1.

[8] Open Working Group Proposals for Sustainable Development Goals (United Nations, 2014) https://sustainabledevelopment.un.org/sdgsproposal

1.4. Situation in India, Pakistan, Bangladesh, and Maldives

India's health challenges are huge and complex. This is because of number of reasons. First and foremost is the huge population of the country. Second, India has a wide diversity in its population. Other important factors are the chronic poverty and inequality of the distribution of resources within the country. In India there are extreme inter-state variations of health outcome because of cultural diversity, differences in the stages of demographic transition, epidemiological transition, and socio-economic development.[9] Pakistan has a multi-tiered and a mixed health care delivery system that has been backed by the government as well as other development partners. Its health care delivery system consists of both state and non-state; and profit and non-for profit service organizations. Pakistan is also a classic example for the urban-rural disparities in the health care delivery and imbalance of the health force with inadequacy of the required numbers.[10] Bangladesh is one of the world's most densely populated countries with a population of 1.55 million in 2012, having a population density of 1050 per km2. The health system of Bangladesh is hierarchically structured and can be compared to a five-layer pyramid. At the base of the pyramid is the village-level health facility which includes community clinics responsible for the delivery of primary health care services and at the top of the health services pyramid, the medical colleges and post-graduate institutes offer a wide range of specialty services. Bangladesh is one of the 57 countries with a critical shortage of doctors, nurses and midwives. In addition to this other major human resource challenges faced by Bangladesh are; geographical & skill imbalance, unplanned postings & distribution, and poor work

[9] , Ministry of Statistics & Program Implementation, Manual on Health Statistics in India, Central Statistics Office, Ministry of Statistics & Program Implementation, Government of India, New Delhi 2015. http://mospi.nic.in/Mospi_New/upload/Manual-Health-Statistics_5june15.pdf

[10] World Health Organization,Pakistan, Country Cooperation Strategy at a glance, World Health Organization 2013. http://www.who.int/countryfocus/cooperation_strategy/ccs_pak_en.pdf

environment. [11] The Maldives is an archipelago in the Indian Ocean which is located 600 km south of Indian sub-continent. It consists of a chain of1192 tiny coral islands t stretching 820 km in length and 120 km in width. These islands cover a geographical area approximating 90,000 square kilometers of which land area comprises of only 298 square kilometers. These islands form 26 natural clusters (atolls) which are administratively grouped into 20 administrative atolls. Even though Maldives has achieved remarkable outcomes in their health status, it is a vast challenge for them to sustain accessibility of health services equitably throughout the country. The delivery of services is adversely affected by the geographical nature of the country with numerous islands scattered throughout and often the means of transport is by sea which can be affected by unfavorable weather.[12]

1.5. Research questions

a. What is the overall relationship between the health work force density and the health outcomes?
b. Whether the variation of health outcomes among different countries in the region is associated with the differences in human resource density?
c. What is the effect of the literacy rate on health outcomes when the Health Human resource Density is kept constant?
d. What is the effect of the per-capita income on health outcomes when the Health Human Resource Density is kept constant?
e. What is the effect on the Total Health expenditure (THE) on health outcomes when Human Resource Density is kept constant?

[11] WHO Country Cooperation Strategy, Bangladesh 2014-2017, World Health Organization Country Office for Bangladesh, 2014. http://www.who.int/countryfocus/cooperation_strategy/ccs_bgd_en.pdf

[12] Maldives Health Profile 2014, Ministry of Health & Gender. http://www.health.gov.mv/publications/13_1395305886_Maldives_Health_Profile_2014_final_final.pdf

1.6. Research hypothesis

"Health System Analysis is a distinct methodology which utilizes evidence on health system inputs, processes and outputs and analysis of how these combined to produce an outcome." The analysis can identify poor system performance and can suggest reform policies and strengthening strategies which improve performance.[13] In that respect this study attempts to identify the relationship between health workforce and health outcomes related to Maternal and Child Health (MCH). The main hypothesis is that more health workers per defined number of people will achieve better health outcomes in Maternal and Child Health arena. Alternatively this study will bring out other factors that will affect health outcomes when the Health Human Resource Density is kept constant. Also it will be helpful in identifying the HRH requirement for Sri Lanka and the other countries in the region to achieve the desired health outcomes in relation to MCH in achieving sustainable development goals. Thereby future predictions for the health work force requirement can be made and recommendations can be given to improve the health workforce.

1.7. Data and supporting argument

Considering the different parts, interconnections and purpose, The World Health organization defined the main purpose of a health system as "all activities whose primary purpose is to promote, restore and maintain health." Well organized and sustainable health systems are required to achieve results. Success cannot be achieved unless the correct chains of events prevent deaths, and extreme financial problems due to ill health. The World Health Organization in its health systems framework describes about six pillars or building blocks of

[13] Berman, P., Britan, R. *Health System Analysis for better Health System Strengthening.* iii. HNP Discussion Paper, International Bank for Reconstruction & Development/ World Bank http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/HealthSystemsAnalysisForBetterHealthSysStrengthening.pdf

a health system.[14] Out of those "a well performing health workforce is the one that is responsive efficient and fair in achieving the required health outcomes."(Figure: 2).

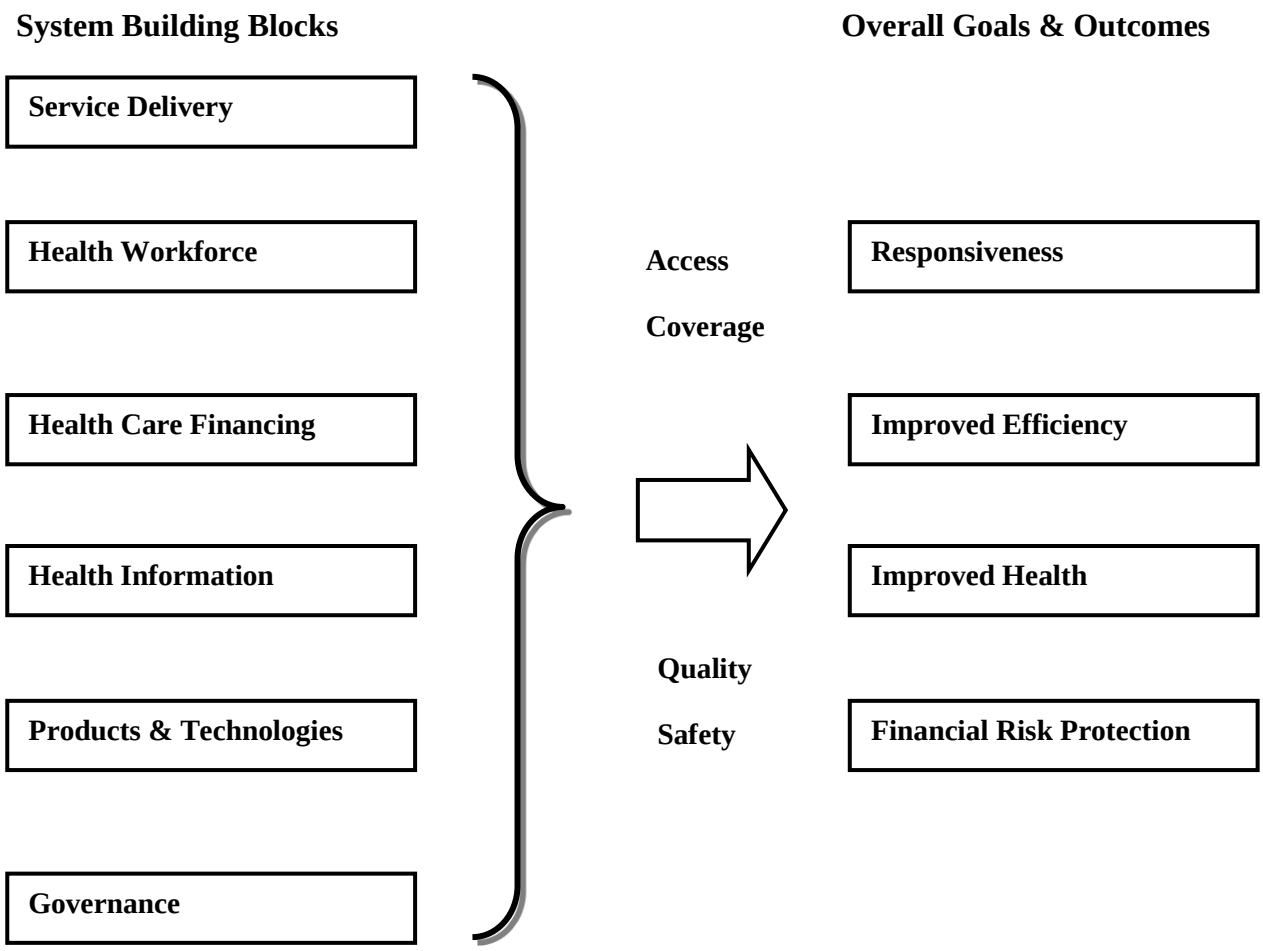
As a lower middle income country, Sri Lanka had achieved excellent health outcomes compared to the other countries of the South Asia. Even as a low income country it had long been recognized of having remarkable health outcomes.[15] The government has a commitment to provide health care in an equal basis. Sri Lanka has a very good chain of hospitals and public health units starting from the provision of primary care to tertiary care. This network of health care institutions were a cornerstone in achieving the health care outcomes coupled with the committed health workforce. In addressing the future needs of the health care in the country, need assessment and strengthening the health workforce is vital to face the future challenges as well as to maintain the current status.

In contrast when the other countries are concerned in the region, most of them do not show remarkable health outcomes even though an adequate health workforce has been deployed. This is an exception for Maldives. When the statistics are compared, Maldives & Sri Lanka have a higher income compared to other countries in the region and so as the health outcomes. India, Pakistan, and Bangladesh have comparably lower per-capita income and low health outcomes as well. When literacy rates are compared again Maldives & Sri Lanka remains at a higher level compared to other countries in the region

[14] WHO, "Everybody's Business," *Strengthening Health Systems to Improve Health Outcomes*: WHO's Framework for action (World Health Organization, 2007), 3. http://www.who.int/healthsystems/strategy/everybodys_business.pdf

[15] Kirsty Mcnay, Regina Keith and Angela Penrose, *Bucking the Trend: How Sri Lanka achieved good health at low cost-challenges and policy lessons for the 21st century* (Save the Children 2004) 4.

Figure 2: WHO Health Systems Framework



Source: World Health Organization 2007

Situation in Maldives:

In 2006 census population of Maldives was 298,968 and the projected population in 2014 was 341,848. Country's economy mostly dependent on tourism and it contributes 34% directly to its GDP. "The health care delivery system of Maldives is organized into a four-tier referral system with the island level health facilities referring patients to higher level health facilities in the atolls, regions and to central level depending upon the need and service availability. When considering the progress towards achieving Millennium Development

Goals, by 2014 Maldives have fully achieved goals 2, 4 and 6 with continued progress. Goals 1 and 5 have been achieved with some setbacks, on track with regard to goal no. 8 and on track with some setbacks for goals 3 & 5."[16]

Situation in Bangladesh:

Bangladesh is a densely populated country situated east of India. Its population is 152.4 million and poverty is deep & widespread.[17] The health system of Bangladesh is hierarchically structured and can be compared to a five-layer pyramid. At the base of the pyramid is the village-level health facility which includes community clinics responsible for the delivery of primary health care services which serves approximately 6000 people. On the other end at the top of the health services pyramid, the medical colleges and post-graduate institutes offer a wide range of specialty services. In between these two extremes three other levels can be identified. The next level is the Union Health and Family Welfare Centre, which is considered to be the first referral center. This Centre provides maternal and child health care as well as limited curative care. The third level is the Upazila Health Complex, a 30–50 bed hospital, and the fourth level is the district hospital. While the district hospital is conventionally the delivery layer with theatre facilities, some of the Upazila Health Complexes have been upgraded to offer emergency obstetric care.[18]

[16] Maldives Health Profile 2014, Ibid, 1

[17] Demographic and health Survey 2014, Key Indicators: National Institute of Population Research & Training, Ministry of Health & Family Wellfare, Bangladesh, 2014. https://www.k4health.org/sites/default/files/bdhs_2014.pdf.

[18] Ibid, WHO Country Cooperation Strategy, Bangladesh 2014-2017, 8.

Situation in Pakistan:

Pakistan is another highly populated country situated west of India. Its population is more than 173 million. Pakistani government has a federal democracy comprising four major provinces and one minor province. Pakistan's HDI is 0.567 and ranked 123 out of 186 in 2013. Pakistan has a multi-tiered and mixed health care delivery system. The system consists of state and non-state as well as profit & non-profit health provision. While the system consist of urban and rural disparities in service delivery, insufficiency of the health workforce is also marked with insufficient health managers, nurses, paramedics, and skilled birth attendants in peripheral areas.[19]

Situation in India

India is the second most populous country in the world with a wide diversity of population who bares different cultural characteristics. It is the seventh largest country by area and consists of a land area of 3,268090 km^2. India's population constitutes 1.2 billion people and said to be the largest democratic nation in the world. India's health challenges are huge an even complex due to its large population, diversity of population, chronic poverty, and due to inequalities. Due to this cultural diversity, different stages of demographic and epidemiological transition and different levels of socioeconomic development India has extreme inter- state variations.[20]

[19] Pakistan, Country Cooperation Strategy at a glance. World Health Organization 2013. http://www.who.int/countryfocus/cooperation_strategy/ccsbrief_pak_en.pdf

[20] Manual on Health Statistics in India, Central Statistical Office, Ministry of Statistics and Programme Implementation, Government of India, New Delhi, May, 2015. 8. http://mospi.nic.in/Mospi_New/upload/Manual-Health-Statistics_5june15.pdf

India's health financing system shows significant impoverishing effects on households. This is due to low public expenditure on health and excessive out of pocket expenditures by households.[21] Many states of India, faces huge shortages of Human Resources for Health in rural areas. There are number of other issues in relation to HHR in India. Some of those are; distributional imbalance, inadequate training & technical skills, improper deployment, inefficient skill mix.[22]

1.8. Objectives

1.8.1. General objective:

To assess and to compare the relationship between health workforce density and health outcomes in India, Pakistan, Bangladesh, Maldives, & Sri Lanka.

1.8.2 Specific objectives:

1.8.2.1. To compare the relationship between health human resources and health outcomes in different countries in the region.

1.8.2.2. To assess the effect of per-capita income on health outcomes when Health Human Resource Density is kept constant.

1.8.2.3. To assess the effect of literacy rate on health outcomes when Health Human Resource Density is kept constant.

1.8.2.4. To assess the effect of Total Health Expenditure (THE) on health outcomes when Human Resource Density is kept constant.

[21] Ibid 158.

[22] Deoki, N and Dinesh A., Human Resources for Health in India: Urgent Need for Reforms. Indian Journal of Community Medicine, 2012 Oct-Dec; 37(4): 205–206. Accessed on 2/03/2016 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3531009/

2. Literature Review

2.1 Human Resources for Health:

Health workers constitute an important component of a health system. The World Health Report 2006 on "Working Together for health" estimated there to be a total of 59.2 million fulltime paid health workers according to national senses and labor surveys (Table:1). Health workers are not just individuals, but are an integral part of a functioning health team although their skills and abilities may vary according to different settings and disciplines they are trained in.[23] While accounting for two thirds of a health budget, health workers are the cornerstone of a health system sticking together different parts to bring out health outcomes. Health care is a labor intensive service industry and they link the knowledge to health action to give a better life to the people they serve.

Table 1: Global Health Workforce by Density

WHO Region	Total Health Workers		Health Service Providers		Health Management & Support Workers	
	Number	Density (Per 1000)	Number	Percentage of THWF	Number	Percentage of THWF
African	1 640 000	2.3	1 360 000	83	280 000	17
Eastern Med.	2 100 000	4.0	1 580 000	75	520 000	25
S-E Asia	7 040 000	4.3	4 730 000	67	2 300 000	33
Western Pacific	10 070 000	5.8	7 810 000	78	2 260 000	23
Europe	16 630 000	18.9	11 540 000	69	5 090 000	31
Americas	21 740 000	24.8	12 460 000	57	9 280 000	43
World	59 220 000	9.3	39 470 000	67	19 750 000	33

Source: World Health Report 2006.

[23] Ibid, The World Health Report 2006.

While reviewing the progress of human resources for health in the preceding decade, the third global forum on health human resources emphasizes the critical requirement of the human resources for health in achieving Universal Health Coverage in many countries. Without which the health systems would not be able to function and achieve results.[24] On the other hand Health Human Resources are the most important way to transform the vision of Universal Health Coverage into a reality. The report further expresses that, despite having numerous improvements in the past decade, a number of challenges are still persisting ahead of us.

The report summarizes these challenges as, "shortage of health work force of some categories, an ageing health workforce without adequate replacement, differences in the skills of health care workers, in country variations of the availability & accessibility of human resources, inadequate adaptation of education and training of HHR into strategies, issues with regard to the motivation of HHR within their working environment, inadequate attention paid for the performance assessment & improving quality of care, differences in the capabilities of assessing the future need of HHR and lack of adequate and reliable data on HHR due to inadequacy of information." [25] In this respect the report further emphasizes on the need for the planning of future human resources to achieve the desired outcomes.

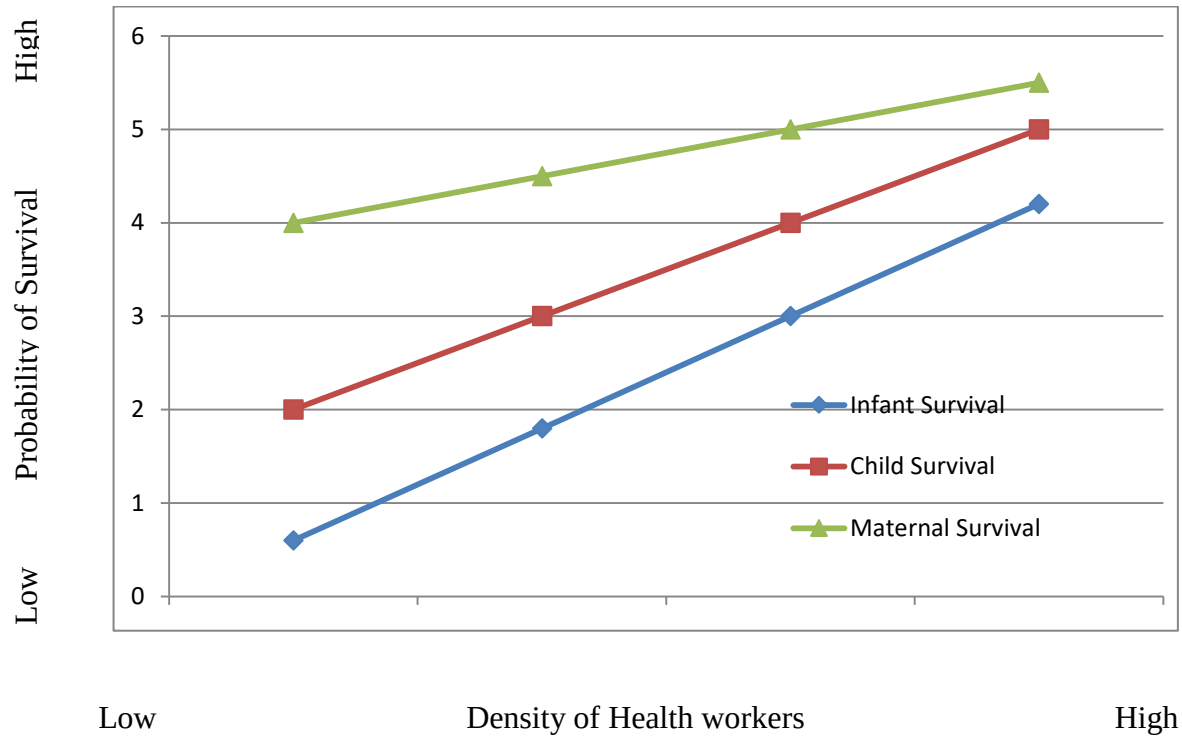
A number of studies carried out in the past have shown the positive relationship between health workforce and health outcomes. The quality of the health workers and their

[24] Human Resources for Health: Foundation for Universal Health Coverage and the post 2015 development agenda. *Report of the Third Global Forum on Human Resources for Health Brazil 2013*. (World Health Organization, Geneva, 2014, 2 http://www.observatoriorh.org/uruguay/sites/observatoriorh.org.uruguay/files/webfiles/fulltext/ACTIVIDADES/programa_foro-2013.pdf

[25] Ibid.

density has been shown to have a positive relation with the health outcomes in a country. This is particularly important in maternal, child and infant survival.[26]

Figure 3: Health Workforce Density & Probability of Survival



Source: World Health Report 2006

2.2 Health Work Force Density & Health Outcomes:

Health worker density is the most widely used health workforce indicator to analyze the health human resource situation in a country. It is expressed as the number of health workers per 10, 000 people by cadre. When measured accurately it expresses the stock of health workers relative to the population. It can also be used to monitor the threshold of the

[26] Ibid. World Health Report 2006.

workforce necessary for the desired health outcomes to be achieved.[27] Considerable attention has been given to the statistical association between health human resources, their intervention coverage and health outcomes. Even though some studies have not been able to identify an association between health worker density and health outcomes, studies done in the field of Maternal and Child Health have shown positive association in this regard.[28]

Speybroeck et al (2006) who worked on health worker density and MCH outcomes across six WHO regions has found that there is a strong and statistically significant association between health worker density and skilled birth attendance. While studying the effects of skilled birth attendance of doctor and nurse densities separately they have found that doctor density had only a borderline significant effect while density of nurses had a strong ($p<0.001$) significant effect. They further state that combined health worker density has a strong association with all health outcomes studied. They have also found that the relationship between doctor density and all the outcomes while the midwives and nurse's density has a significant association only with maternal mortality. With regard to the other outcomes, nurses and midwives have a statistically significant impact only through the interaction with doctors.[29] Chen et al. (2004) have found that higher worker density coupled with better work quality in combination with social determinants of health such as education, gender equality and higher income improves population based health and human survival. They further state that the density of workers in a population can give rise to a big difference in the effectiveness of its health interventions.[30]

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[27] World Health Organization, *Toolkit on monitoring heath systems strengthening*: Human Resources for Health, Geneva,2009. Ibid, 7

[28] Niko Speybroeck, Yohannes Kinfu, Mario R. Dal Poz and David B. Evans, Reassessing the relationship between human resources for health, intervention coverage and health outcomes. Evidence and Information for Policy, World Health Organization, Geneva 2006. 11 http://www.who.int/hrh/documents/reassessing_relationship.pdf

[29] Ibid

[30] Chen et al, Human resources for health: overcoming crisis. *The Lancet* volume 364, November 27, 2004, 1984-1990. http://www.globalsurgery.info/wp-content/uploads/2014/01/Human-Resources-for-Health.pdf

In a cross country econometric study carried out to see the association between human resources and health outcomes, Anand and Barninghausen has found that human resources for health in aggregate terms had significantly accounted for the three health outcomes that they have studied namely maternal, infant and under five mortality rates. Therefore they concluded that "doctors, nurses and midwives together had significantly contributed to reduce the above three mortality rates after controlling the other variables accounted for these outcomes. " [31] While studying further in this regard, with doctors and combined category of nurses and midwives separately they have found that doctor density was accounting for all three health outcomes. Nurse density has no association with outcomes except for the maternal mortality rate regression without income poverty. They have also found that the human resources for health elasticity for the maternal mortality rate are higher than that of the infant and under five mortality rate. They further state that the effect of human resources for health is greater in reducing maternal mortality than infant or child mortality because the risks of maternal deaths can correctly be addressed by qualified human resources.

While conducting another cross national study to examine the relationship between doctor and nurse concentrations and utilization rates of five essential health services of developing countries, Kruk et-al have found that "higher doctor concentration was significantly associated with greater use of measles immunization and higher nurse concentration was associated with a greater use of skilled birth attendants." Aggregate of both doctor and nurse concentration was associated with use of skilled birth attendant and measles immunization both positively and significantly. But they were unable to see any association between doctors and nurses and coverage of other essential services studied namely anti-natal care, TB diagnosis and care for acute respiratory infections. They conclude that

[31] Sudhir Anand and Till barninghausen, Human resources and health outcomes: cross country econometric study, *The Lancet* Volume 364, October 2004, 1603-09.

concentrations of doctors and nurses are not associated with the provision of several essential health services in low and middle income countries.[32]

In a study carried out among municipalities in Brazil to measure the efficiency of human resources for health for attaining health outcomes, Sousa et al have found that a "1% increase in total health worker density is associated with a 0.005% increase in the coverage of antenatal care." While using two different models to identify the significance of association between doctors and nurses they have found that nurse professionals are the only group that has a significant effect on coverage of antenatal care. However in a different model they studied excluding average years of education they have found that physicians also have a significant effect on coverage. While taking the categories differently they have found that" 1% increase in the density of nurse professionals will increase the coverage by 0.009% while 1% increase in physician density will increase the coverage by 0.004%." [33] They further elaborate that with a level of efficiency of 95%, one municipality (Acopiara) achieves 92% coverage of antenatal care with a workforce comprising four times more physicians than nurses while another municipality (Correntina) attains only 33% of coverage of antenatal care with 24% more nurse professionals than physicians. Therefore they conclude that the overall density of health workers has a statistically significant correlation with the coverage of antenatal care. When the categories are taken separately, nurse professionals have a greater impact on

[32] Margaret E Kruk, Marta R Prescott, Helen de Pinho and Sandro Galea. Are doctors and nurses associated with coverage of essential health services in developing countries? A cross sectional study. Human Resources for Health March 2009. http://human-resources-health.biomedcentral.com/articles/10.1186/1478-4491-7-27

[33] Angelica Sousa, Ajay Tandon, Mario R. Dal Poz, Amit Prasad and David B. Evans, Measuring the efficiency of human resources for health for attaining health outcomes across subnational units in Brazil, Background paper prepared for The world health report 2006 - working together for health, World Health Organization, Geneva 2006. http://www.who.int/hrh/documents/measuring_efficiency_Brazil.pdf

coverage than physicians. But interestingly they have found no association between nurse associates and antenatal care coverage.[34]

2.3 Human Resources & Health Outcomes in Sri Lanka

Sri Lanka has long being recognized as a country with excellent health outcomes even since it was a lower income country. While spending 3.2% of the GDP on health, Sri Lanka's health outcomes as a lower middle income country is comparable even with high income countries like Thailand and Malaysia in the region. Although the system is dominated by the public sector, private sector also gives a reasonable contribution. Lack of adequate health professionals to be served in both public and private sector is an important challenge faced by Sri Lanka. It has been observed that more health care personnel are needed to bring the system to an even better standard.[35] Most fascinating outcomes are observed in the maternal and child health (MCH) sector with achieving outstanding results in the relevant indicators. The effect towards the outcomes from the two sectors so far not being properly assessed mostly due to the lack of information flow from the private sector.

While exploring models of care that have reduced maternal mortality and morbidity in Sri Lanka, Haththtotuwe et-al describes that maternal mortality reduction in Sri Lanka had been rapid and sustained and have been documented for years.[36] They further estimated that the decline possibly started in 1920 with the establishment of preventive health services and health promotion. They believe that long term commitment of the state for the delivery of public services along with the development of the health care system to reach the rural areas

[34] Ibid.

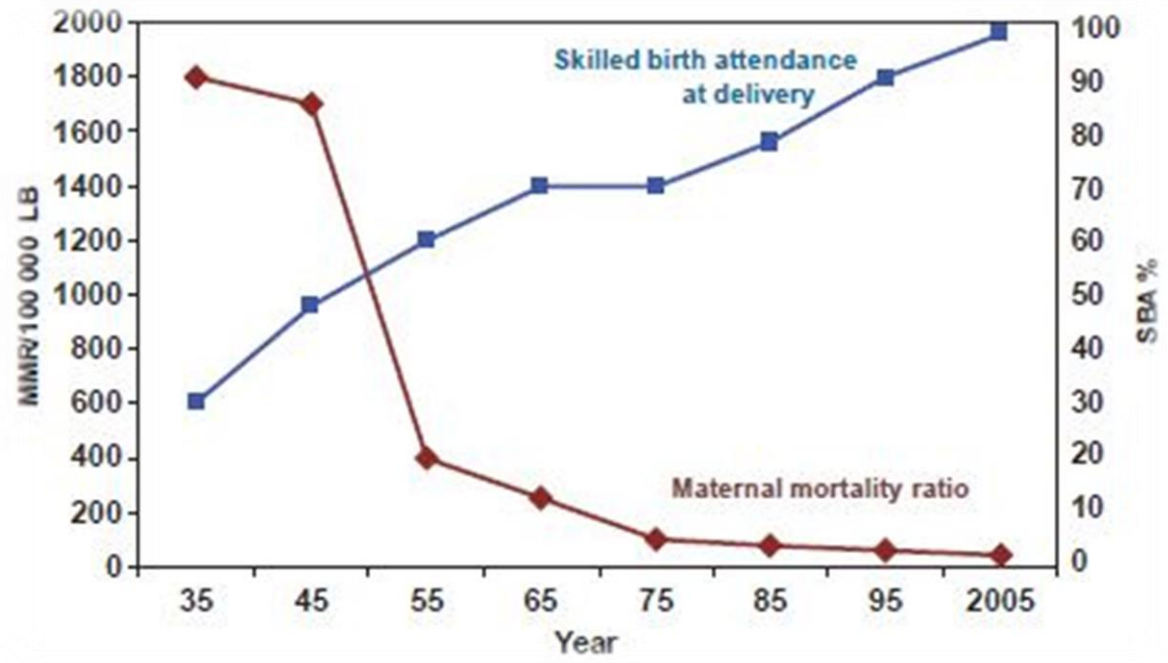
[35] Sri Lanka's health care challenges. The Economist. Retrieved on 23/09/2015 http://webcache.googleusercontent.com/search?q=cache:r9QDNFKFPZUJ:country.eiu.com/article.

[36] Rohana Haththotuwa, Lakshmen Senanayake, Upul Senarath and Deepika Atygalle. Modells of care that have reduced maternal mortality and morbidity in Sri Lanka. *International Journal of Gynecology & obstetrics.* 119 (2012) S45-49. http://www.ijgo.org/article/S0020-7292(12)00157-9/pdf

led to the reduction of maternal mortality in the country. Both health and non-health related factors have possibly contributed to the reduction of the maternal mortality rate. Out of those training different categories of health care provider in delivery of maternal care has significantly contributed to the health outcomes.

While reviewing the readiness of achieving the Millennium Development Goals 4 and 5 in Sri Lanka, Senanayake et-al have reiterated the relationship between the skilled birth attendance and the reduction in maternal mortality in Sri Lanka.[37] They stress the point that one of the most important factors on the improvement of maternal care was the increase of the cadre of midwives from 5000 in 1989 to 8995 in 2007. This has led to an increase in the skilled birth attendance in Sri Lanka from 40% in 1948 to 99.5% in 2007. Ultimately resulting in reducing maternal deaths dramatically and has improved overall survival.

Figure 4: Skilled Birth Attendance & Maternal Survival in Sri Lanka



Source: Achieving Millennium Development Goals 4 & 5 in Sri Lanka, Senanayake et-al 2011

[37] H. Senanayake, M. Gunawardene, A. Ranatunga, R. Haththotuwa, S. Amarasekara and I Amarasighe. Achieving Millenium Development Goals 4and 5 in Sri Lanka. *BJOG An Internationl Journal of Obstetrics & Gynaecology 2011*. 78-87 http://onlinelibrary.wiley.com/doi/10.1111/j.1471-0528.2011.03115.x/full

2.4 Human Resources & Health Outcomes in India, Pakistan, Bangladesh, & Maldives

It has been identified that India has about 2.2 million health workers. Among them almost 677,000 are doctors who practice Western Medicine. At the same time India is a well-known example for a country with a severe shortage of Human Resources for Health. In a cross country study, Rao et al have identified that the Allopathic Doctors, Midwives, & Nurses are only a half of the WHO benchmark of 25.4 workers per 10,000 population. Not only it has a severe shortage of health workforce, it also has a misdistribution of the health workers with most of them concentrating in urban areas. This results in most of the Indian people living in rural areas receiving health care from non-qualified personnel.[38] As observed by Reddy et-al, India still has unacceptably high Infant, Child & Maternal Mortality Rates. They also confirm that India also has a high number of premature deaths attributable to chronic diseases.[39]In a study carried out to assess the availability, production and distribution of Health workforce in India, Hazarika have concluded that, problems of imbalances of distribution of health workforce still exists although the production of health workforce is high.[40]

It has been observed that "Pakistan is the only country in the world without a National Health System or an equivalent since the dissolution of its Ministry of Health in 2010 and distributing managerial health responsibilities to local governments. Although a very few has access to world class health care in Pakistan, majority of the people do not have even the basic health care needs.

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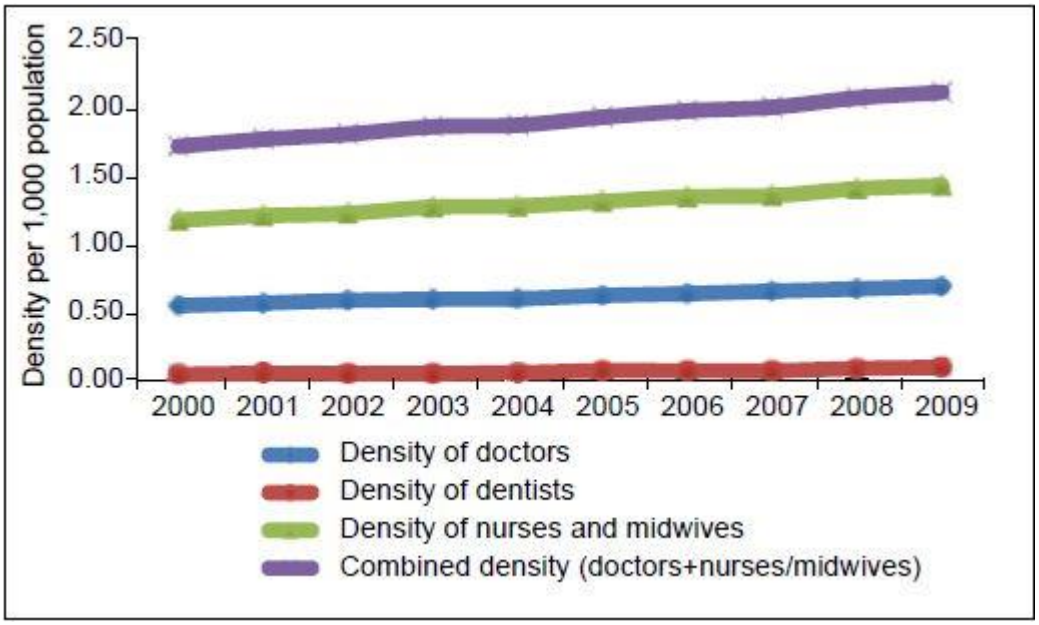
[38] Mohan Rao et-a,l India: Towards Universal Health Coverage 5, Human resources for health in India *The Lancet online January* 12, 2011. http://environmentportal.in/files/Human%20resources%20for%20health.pdf

[39] Srinath Reddy et-al, India: Towards Universal Health Coverage 7, Towards achievement of universal health care in Indiaby 2020: a call to action, *Lancet* 2011; 377: 760–68. http://www.human-resources-health.com/content/7/1/27

[40] Indrajith Hazarika, Health workforce in India: assessment of availability, production and distribution, WHO South-East Asia Journal of Public Health 2013 April–June. http://www.searo.who.int/publications/journals/seajph/seajphv2n2_p106.pdf

Figure 5: Density of Health Professionals per 1000 population in India (2000-2009)



Source: WHO South-East Asia Journal of Public Health, 2013 April–June.

It is the country with the third-highest number of newborn deaths in the world and nearly half of the children are undernourished and over 1.5 million children are acutely malnourished." [41]

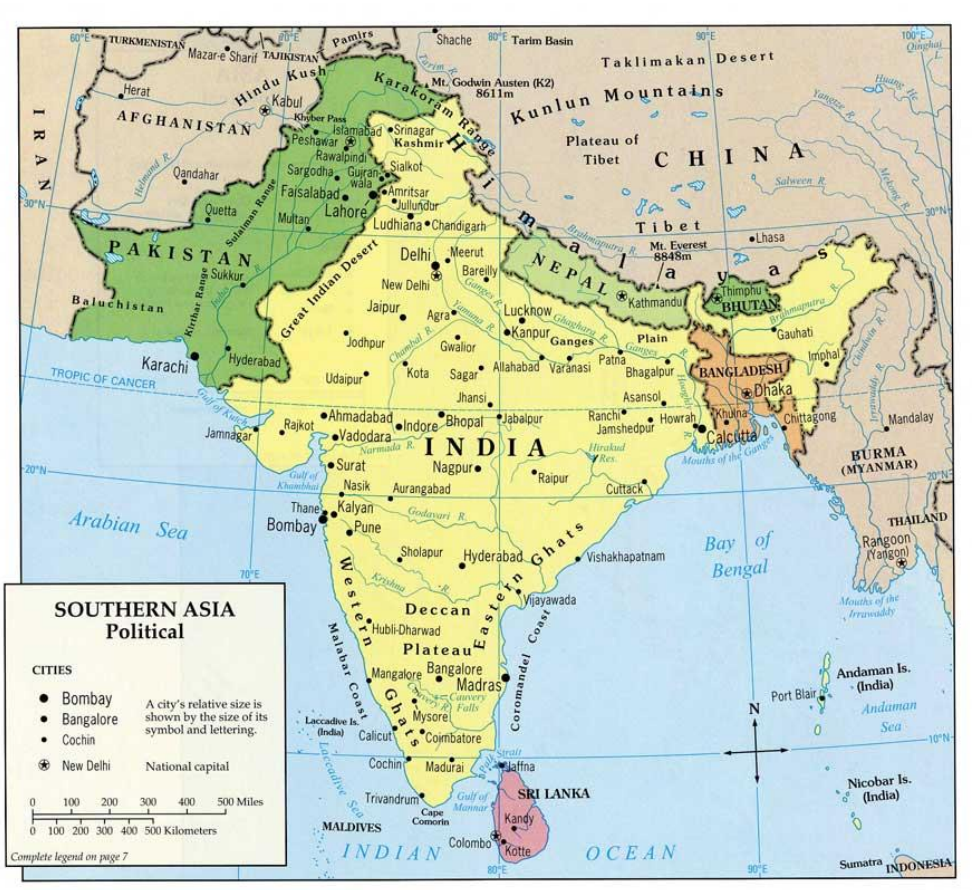
In the context of Bangladesh, Health Human Resources include, Health Professionals as well as all health care providers in the informal sector who are not under the regulation of the national bodies. Due to the shortages of health care professionals and trained health workers, these informal providers are also become an important sector in Bangladesh. As in the case of India and Pakistan, Bangladesh also characterized by a massive shortage of trained health care workers. At the same time they are disproportionately clustered in urban areas while the rural areas are suffering with the shortages.[42]

[41] Nina Zhu et-al, Lady Health Workers in Pakistan Improving access to health care for rural women and families Women and Health Initiative Maternal Health Task Force Harvard School of Public Health May 2014. https://cdn2.sph.harvard.edu/wp-content/uploads/sites/17/2014/08/HSPH-Pakistan5.pdf

[42] Bangladesh Health System Review Health Systems in Transition Asia Pacific Observatory on Public Health Systems and Policies Vol. 5 No. 3, World Health Organization 2015. 90-92.

Maldives also experience the inadequacy of practicing health care professionals in the country. Majority of health services are delivered by an expatriate workforce in Maldives. According to 2010 statistics, number of people per every practicing doctor was six hundred and nine. Whereas the number of people per practicing nurse were hundred and seventy one.[43] Maldives shows improved health outcomes especially for the past few decades managing to achieve infant and child related MDG targets. There had been an improvement in the Maternal Mortality Rate as well.[44]

Figure 6: Geographical location of the countries studied



http://www.wpro.who.int/asia_pacific_observatory/hits/series/bgd_health_system_review.pdf

[43] Maldives Health Profile 2014 Ibid 17

[44] WHO Country Cooperation Strategy, Republic of Maldives 2013-2017, World Health Organization Country Office, Maldives 2013, p16. http://www.who.int/countryfocus/cooperation_strategy/ccs_mdv_en.pdf

3. Research Method

3.1 Study design:

A comparison study to describe the relationship between Health Human Resources (HHR) & Health Outcomes in five different countries in the South Asian region with similar socioeconomic conditions.

3.2. Type of Date Used:

Secondary data were used in published material in both national and international publications including Annual Health Bulletins, National Health Accounts, International Publications of the World Health Organization and the World Bank.

3.3. Data Analysis:

Published data were analyzed both qualitatively and quantitatively to answer the research questions posed.

3.4. Descriptive Statistics:

3.4.1. Health Human Resources in Sri Lanka

Sri Lanka, and four other countries selected for this study are situated in South Asia and all of them were colonized by the British Empire from the 17th Century onwards. Therefore their health systems were initiated by the British rulers. Due to that reason Health

Systems of these five countries share common characters. But due to the fact that these colonies were offered independence and they are ruling their countries by themselves, certain differences of the Health Systems can be observed. Sri Lanka is a classic example for British Health System although it does not exactly follow the existing NHS system of Great Britain now. However education & training of health human resources still shows similarities with the British System.

Table 2: Categories of HRH in Sri Lanka & trend from2008 to 2012

Category of Staff	**Number**				
	2008	2009	2010	2011	2012
Doctors*	14255	14831	15283	17481	18190
Nurses	22996	25549	27494	29101	30136
Midwives	8337	8943	8726	8748	8745

*Non-Specialists

Source: Economic & Social Statistics of Sri Lanka 2014, Central Bank of Sri Lanka.

Table 2, shows the categories of health staff who are in direct contact with patients most of the time, and their distribution over five years. Accordingly the number of Medical Doctors' (Non-Specialists) and Nurses has increased over the time. Even though the number of Midwives have increased over the time, the increment is not as adequate as for the doctors' and the Nurses.

Figure 7 shows the trends of increment of Doctors, Nurses and Midwives with number of Midwives showing almost static.

Figure 7: Distribution of Doctors, Nurses & Midwives From 2008- 2012 in Sri Lanka

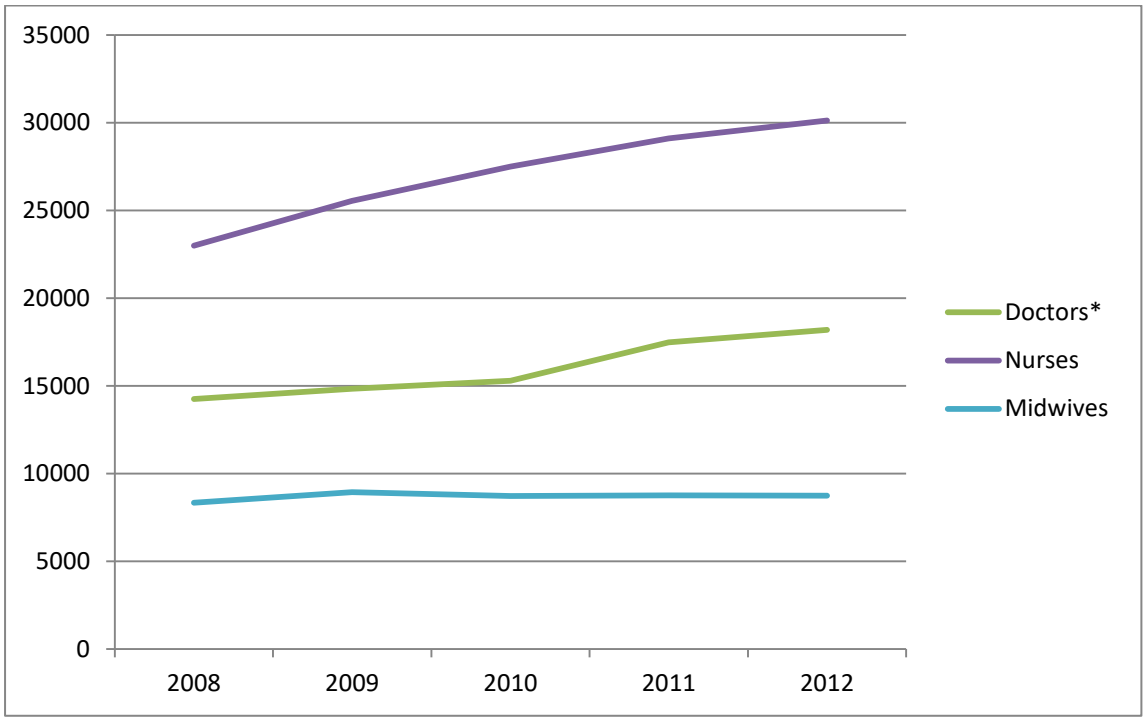


Table 3 shows distribution of Health Human Resources who are in direct contact with Maternal & Child Health (MCH) activities within the nine provinces of the country in the year 2011. According to the data, Western Province, where the Capital City is located, got the privilege of having highest number of Human Resources with the Northern Province having the least number of Health Human Resources. Compared to the other provinces; Western Province, Central Province, and the Southern Province have a higher number of Health Human Resources, followed by North Western, Sabaragamuwe and North Central Provinces.

Table 3: Health Human Resources in 9 Provinces in Sri Lanka

Province	Health Human Resources					
	Medical Officers	MOH	AMOH	Obstetricians	Nurses	Midwives
Central	1515	35	31	20	4087	806
Eastern	874	41	11	14	1887	476
Northern	519	15	5	7	981	368
North Central	629	25	15	7	1661	368
North Western	997	38	31	13	2636	552
Sabaragamuwa	761	24	24	10	2249	586
Southern	1053	43	32	14	3443	786
Uva Province	600	23	16	6	1496	459
Western	4114	37	75	44	10345	1275

Figure 8 shows the distribution of health human resources among the different provinces with the Western Province bearing the highest number of them followed by Central & Southern Provinces. Northern Province bears the least number of health care personnel. Figure 8 displays the composition of Medical Officers (Doctors) in different provinces. Again it shows the Western province bearing the highest number of doctors and Northern Province bearing the smallest number of doctors in the respective period.

Figure 8: distribution of Health Human Resources over different regions in 2011

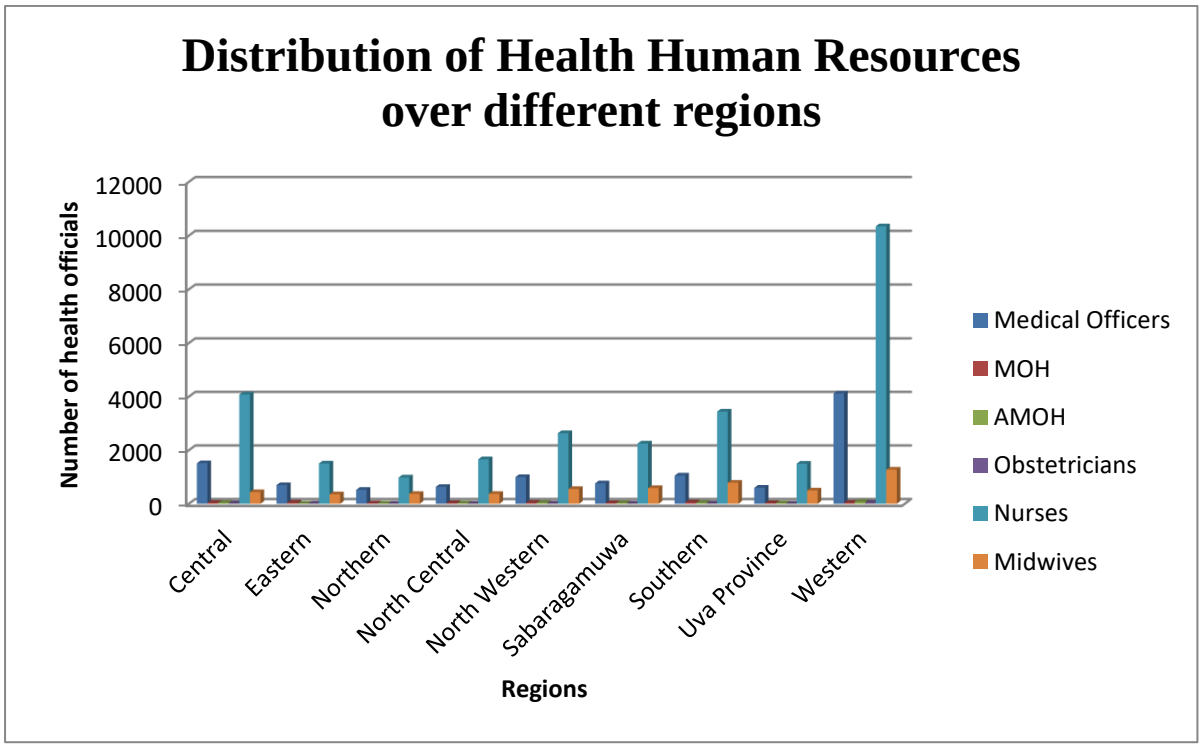
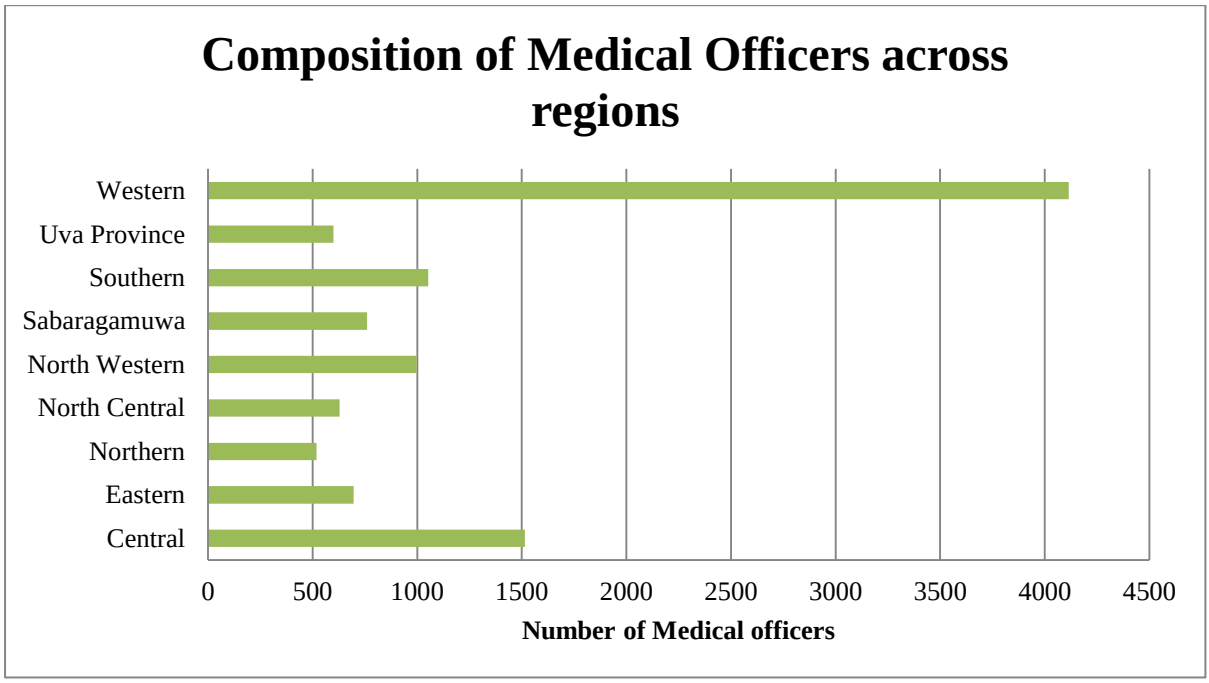


Figure 9: Composition of Medical Officers across Sri Lanka, 2011



3.4.2. Health Outcomes in Sri Lanka

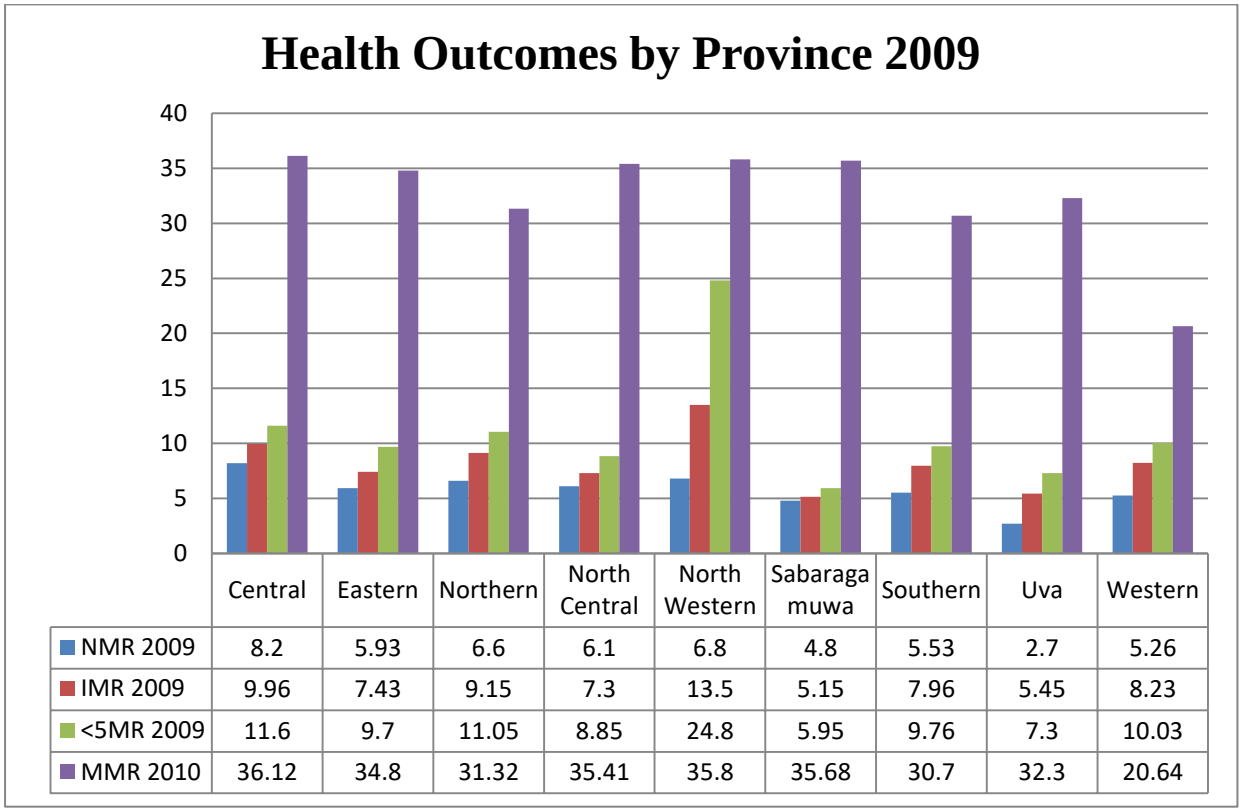
Health outcomes considered in this study includes, Neonatal Mortality Rate (NMR), Infant Mortality Rate (IMR), Under Five Mortality Rate (<5MR) and the Maternal Mortality Rate (MMR). Among these different health outcomes considered, Western Province shows excellent figures showing better outcomes in terms of the mortality rates considered. It shows the lowest figures for Neonatal Mortality and for Maternal Mortality. Uva Province shows best outcomes except for MMR. Central Province shows the lowest outcomes with the highest figures for the mortality rates considered. Northern Province with the lowest number of human resources lies in the middle with an average number of figures (Figure 10).

Table 4: Health Outcomes in 9 Provinces of Sri Lanka, 2011

Province	**Health Outcomes (2009)**			
	NMR	IMR	<5MR	MMR
Central	8.2	9.96	11.6	36.12
Eastern	5.93	7.43	9.7	34.80
North Central	6.6	9.15	11.05	31.32
North Western	6.1	7.3	8.85	35.41
Northern	6.8	13.5	24.8	35.8
Sabaragamuwa	4.8	5.15	5.95	35.68
Southern	5.53	7.96	9.76	30.70
Uva	2.7	5.45	7.3	32.3
Western	5.26	8.23	10.03	20.64

Source: Health Facility Survey 2011, Ministry of Health Sri Lanka

Figure 10: Health Outcomes by Province in Sri Lanka, 2009



	Central	Eastern	Northern	North Central	North Western	Sabaragamuwa	Southern	Uva	Western
NMR 2009	8.2	5.93	6.6	6.1	6.8	4.8	5.53	2.7	5.26
IMR 2009	9.96	7.43	9.15	7.3	13.5	5.15	7.96	5.45	8.23
<5MR 2009	11.6	9.7	11.05	8.85	24.8	5.95	9.76	7.3	10.03
MMR 2010	36.12	34.8	31.32	35.41	35.8	35.68	30.7	32.3	20.64

3.4.3. Health Human Resources & Health Outcomes:

Table 5 describes Health Human Resources and Health outcomes when the staff categories are taken as Doctors, Nurses, & Midwives. When the numbers of Doctors are taken as a whole (Both Non-Specialists and Obstetricians), again figures for the Western, Central, and Southern Provinces are higher compared to the figures in the other provinces. Again the lowest figure is recorded for the Northern Province, Followed by North Central & Sabaragamuwe Provinces.

Table 5: Health Human Resources & Health Outcomes 2011 (When the number of Doctors taken as a whole)

Province	Health Human Resources			Health Outcomes			
	Doctors	Nurses	Midwives	NMR	IMR	<5MR	MMR
Central	1601	4087	806	8.2	9.96	11.6	36.12
Eastern	940	1887	476	5.93	7.43	9.7	34.80
Northern	546	981	368	6.6	9.15	11.05	31.32
N. Central	676	1661	368	6.1	7.3	8.85	35.41
N. Western	1079	2636	552	6.8	13.5	24.8	35.8
S. Gamuwe	819	2249	586	4.8	5.15	5.95	35.68
Southern	1142	3443	786	5.53	7.96	9.76	30.70
Uwa	635	1496	459	2.7	5.45	7.3	32.3
Western	4270	10345	1275	5.26	8.23	10.03	20.64

Source: Health Facility Survey 2011, Ministry of Health Sri Lanka

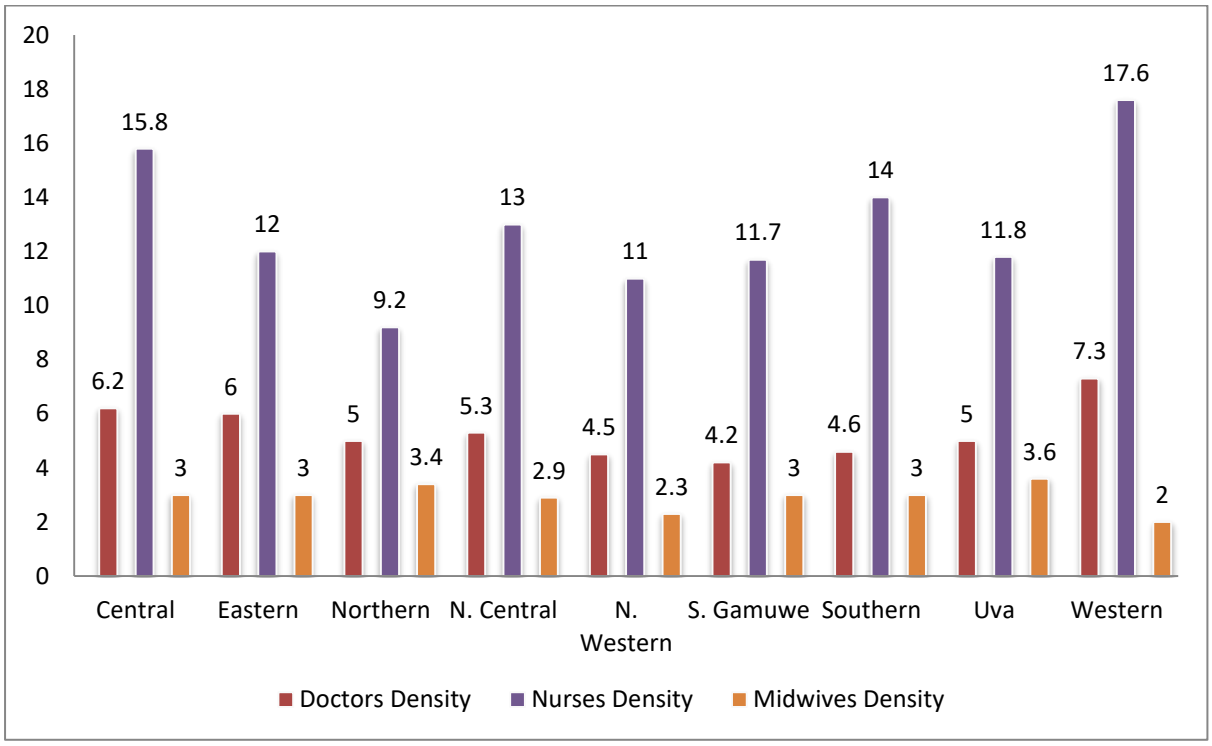
3.4.4 Health Work Force Density & Health Outcomes

Table 6 shows Health Work Force Density in different provinces of Sri Lanka. Western Province shows the highest density of Doctors and Nurses while Sabaragamuwe Province shows lowest density of Doctors and Northern Province shows lowest density of Midwives. Uva Province shows the highest density of Midwives with the Western Province showing the lowest density. Central & Eastern Provinces also has a higher density of Doctors while Southern, North Western & Northern Provinces are also showing a lower density. Nurses' density is also high in Central, Southern & North Central Provinces. Except for the Western, Uva, and Northern Provinces, Midwives density is similar in other provinces.

Table 6: Health Workforce Densities (Per 10,000population) in different provinces as at 2011

Province	Doctors		Nurses		Midwives	
	Number	Density	Number	Density	Number	Density
Central	1601	**6.2**	4087	**15.8**	806	**3.0**
Eastern	940	**6.0**	1887	**12.0**	476	**3.0**
Northern	546	**5.0**	981	**9.2**	368	**3.4**
N. Central	676	**5.3**	1661	**13.0**	368	**2.9**
N. Western	1079	**4.5**	2636	**11.0**	552	**2.3**
S. Gamuwe	819	**4.2**	2249	**11.7**	586	**3.0**
Southern	1142	**4.6**	3443	**14.0**	786	**3.0**
Uva	635	**5.0**	1496	**11.8**	459	**3.6**
Western	4270	**7.3**	10345	**17.6**	1275	**2.0**

Figure 11: Distribution of Doctors, Nurses & Midwives in different provinces in Sri Lanka



3.5. Comparison of the Health Human Resources & Health Outcomes of Sri Lanka, with other countries with similar socio-economical Background.

Comparison countries were selected on following criteria:

1. Level of income.
2. Located in the region.
3. Literacy rate of the population
4. Socio-economic characteristics.
5. Health care expenditure similarities.

Considering the above criteria, following countries were selected as comparison countries. Being the leader in the region, India is considered to be the most powerful country in the region and its income level is also similar to Sri Lanka. Pakistan is the next most powerful in the region and it also has a similar income level. Bangladesh is also situated in the same region but its income level is lower than the other countries in the region. In contrast Maldives has a similar income level to Sri Lanka and it is also doing well in its social characteristics.

Table 7: Comparison Countries by the level of income & region

Country	Level of Income	Region
Sri Lanka	Lower Middle	South Asia
Maldives	Lower Middle	South Asia
Bangladesh	Low income	South Asia
Pakistan	Lower Middle	South Asia
India	Lower Middle	South Asia

Table 8: Relationship between Health Human Resources & Health Outcomes 2008-2012

Country Name	Health Human Resources				Health Outcomes (2008)				
	Doctors		Nurses & Midwives		Neonatal Mortality	Infant Mortality	Under 5 Mortality	Maternal Mortality	SBA (%)
	Number	Density	Number	Density					
Sri Lanka	10479	**6**	30431	**17**	09	13	17	17	99
Maldives	302	**9**	886	**27**	16	24	28	72	84
Bangladesh	42881	**3**	39471	**3**	33	43	54	380	18
Pakistan	127859	**8**	62651	**4**	53	72	89	276	39
India	643520	**6**	1372059	**13**	37	52	69	254	47

Source: World Health Statistics 2010

Table 8 shows the relationship between health human resources & health outcomes. When Doctors taken separately from Nurses & Midwives, it is evident that Maldives has the highest density of Doctors as well as the highest density of Nurses & Midwives. Whereas Bangladesh has the lowest density of Doctors as well as the lowest density of Nurses & Midwives among the five different countries considered. When it comes to the Health Outcomes in two countries Maldives is performing well with low figures for all mortality rates and a higher figure for Skilled Birth Attendance. In the case of Bangladesh, all the mortality figures considered are extremely high compared to Maldives and the Skilled Birth Attendance is extremely low. When the other three countries are considered, it can be observed that, Health Workforce Density in Sri Lanka, Pakistan and India are almost alike with Sri Lanka performing extremely well with regard to the health outcomes considered.

Figure 12: Number of Doctors by Country

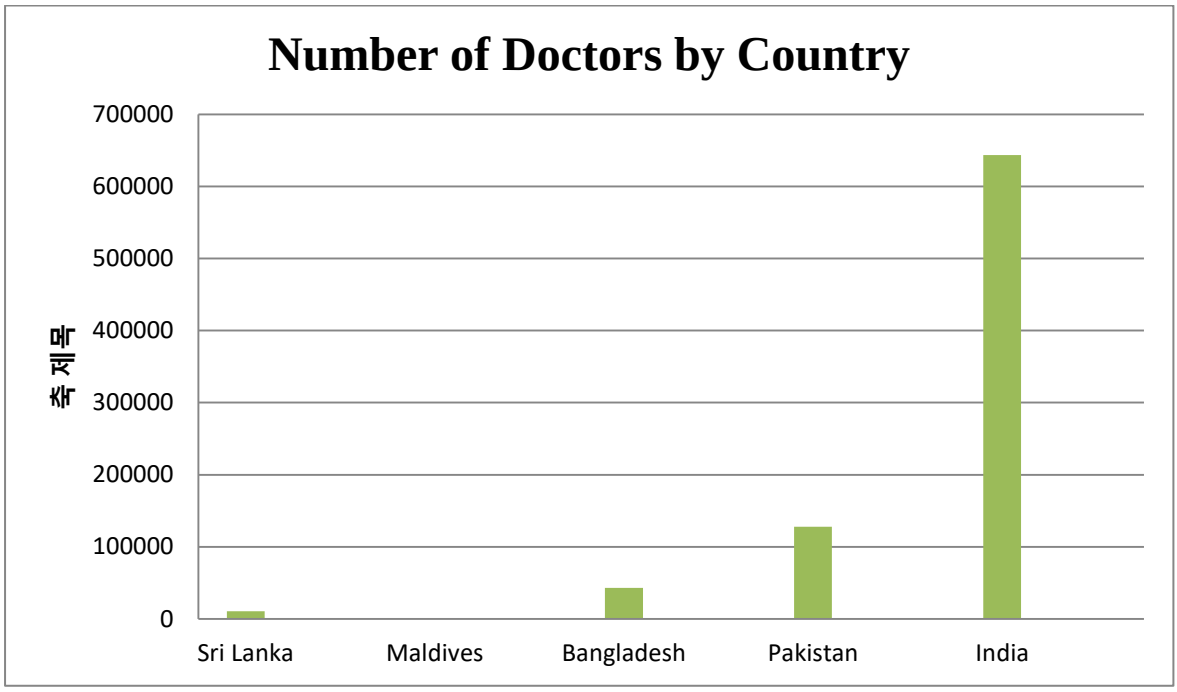


Figure 12 compares number of doctors by country, whereas figure 13 compares the doctor density among the five countries concerned. When the number of doctors is considered, India has the highest number and Maldives has the lowest number. Sri Lanka, Bangladesh, and Pakistan have an increasing number of doctors in that respective order. But when the density of doctors is concerned, Maldives has the highest density with Bangladesh having the lowest density. Densities of doctors in India & Sri Lanka are almost alike with Pakistan having a higher density.

Figure 13: Doctor Density by country

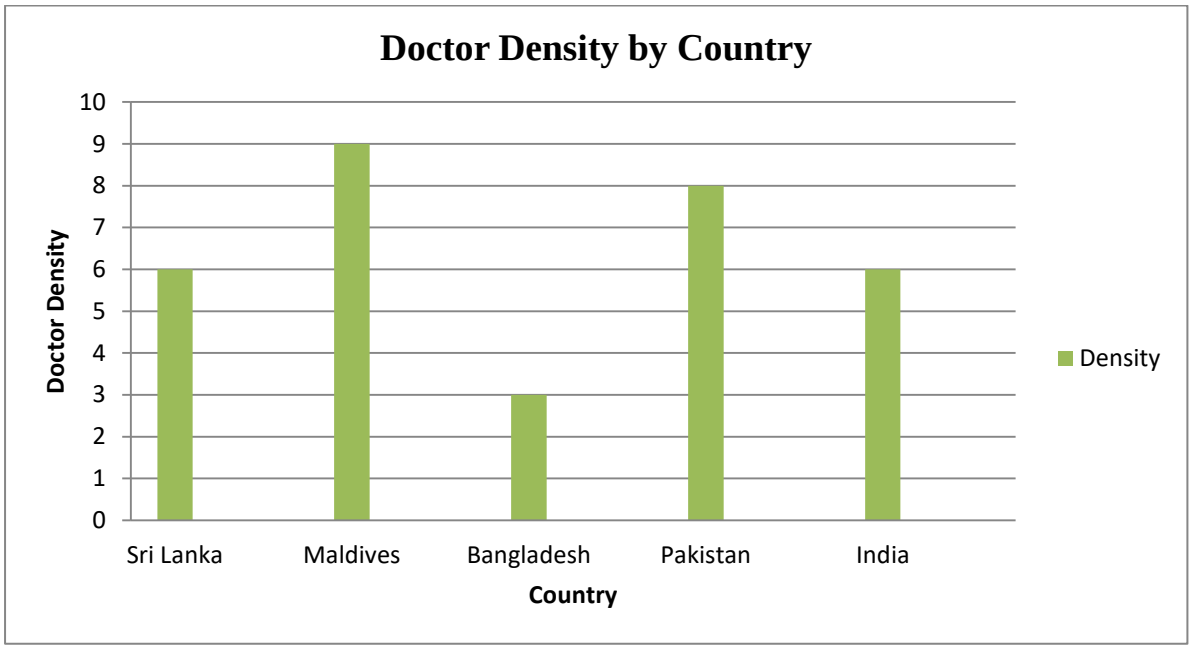


Figure 14 compares the number of nurses & midwives among the five different countries concerned. While India is having nearly 1.3 million nurses & midwives, Maldives is having only eight hundred and eighty six. Number of nurses & midwives in Sri Lanka, Bangladesh & Pakistan are low compared to India but higher than the number in Maldives. Figure 14 shows the density of Nurses & Midwives in five different countries concerned. When the density of nurses & midwives are compared, it can be observed that, Maldives has the highest density while Bangladesh having the lowest density. Sri Lanka, India and Pakistan have the densities of nurses & midwives in the descending order.

Figure 14: Number of Nurses & Midwives by Country

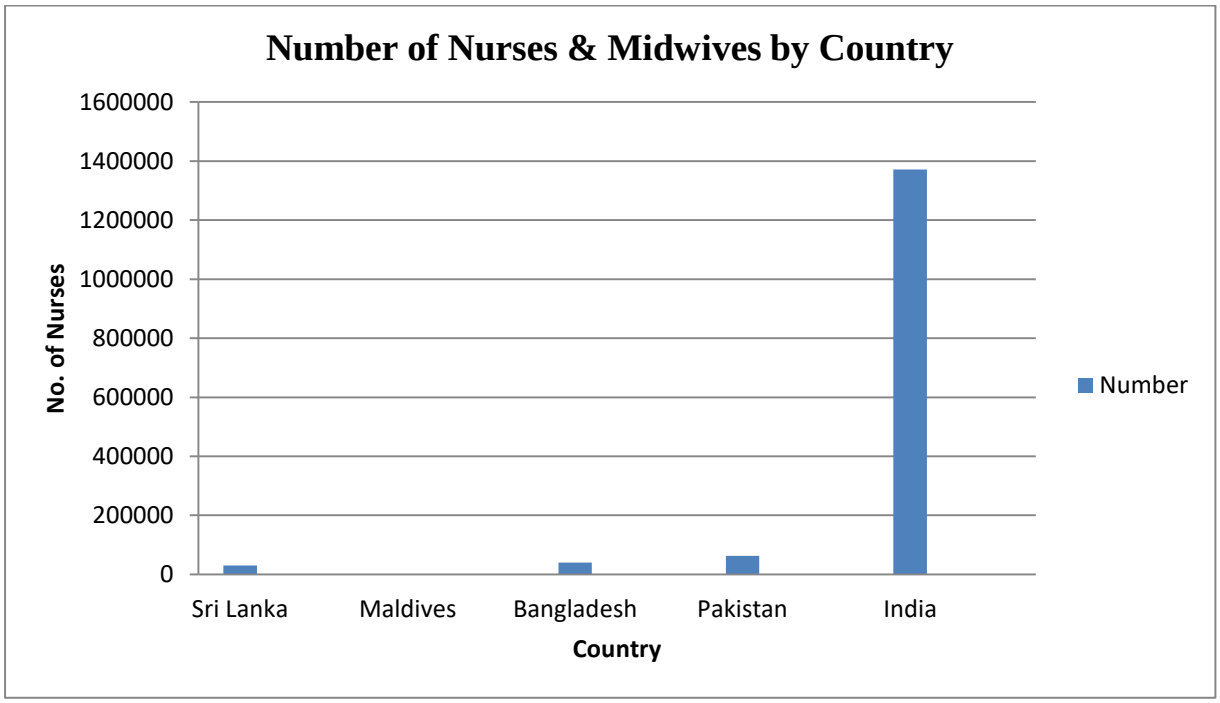


Figure 15: Density of Nurses & Midwives by Country

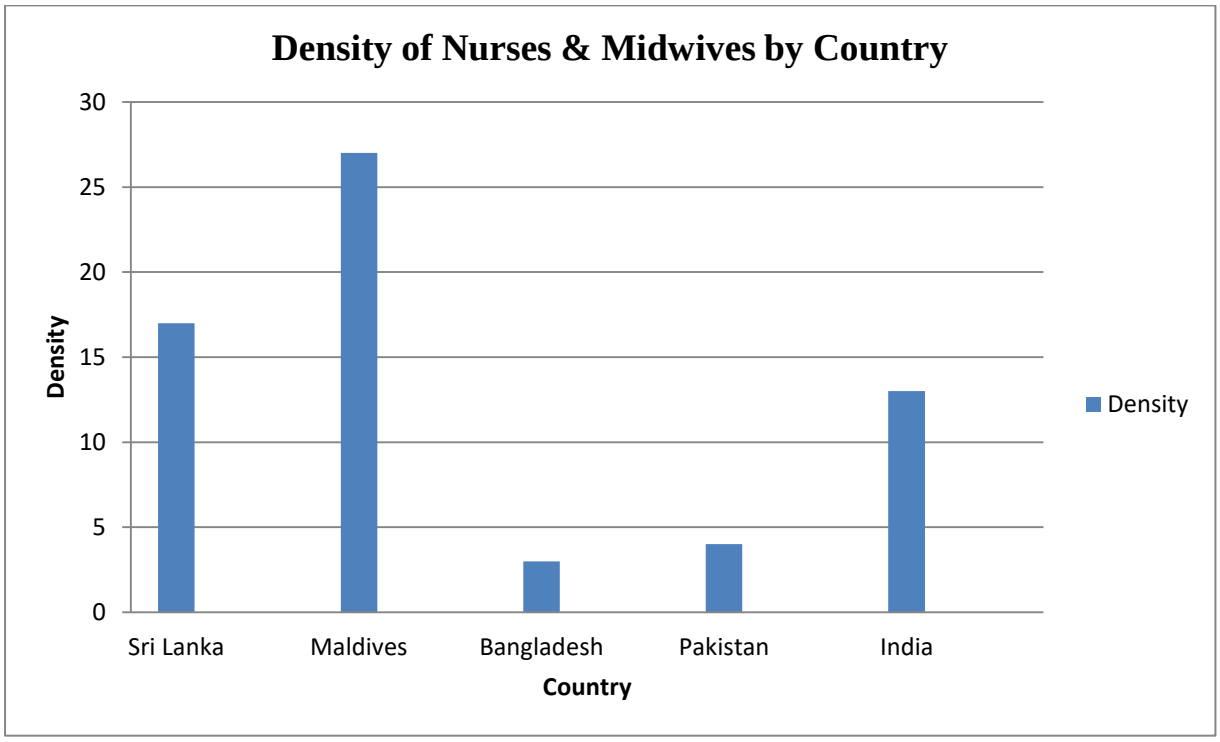


Figure 16: Distribution of Doctors, Midwives & Nurses by country

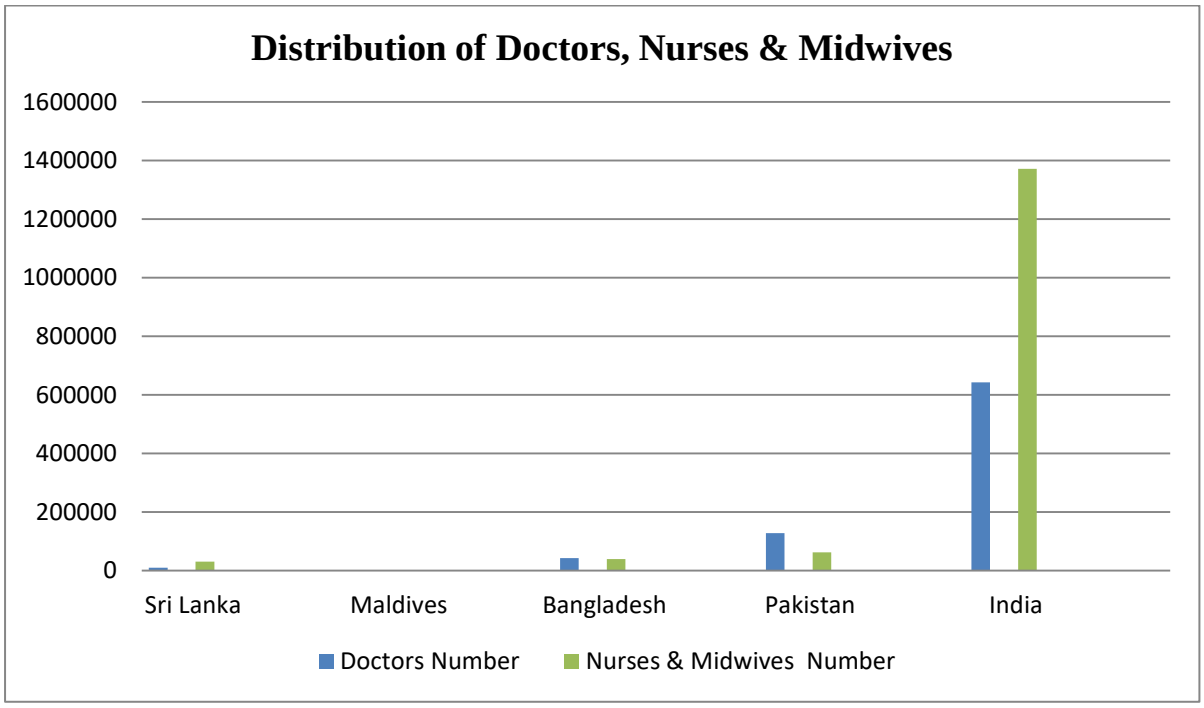


Figure 16 compares distribution of both doctors and nurses with midwives in the five different countries concerned. It can be observed that India is having the highest number of both doctors and nurses with midwives, while Maldives having the lowest figures. Sri Lanka, Bangladesh & Pakistan are lying in between. Figure 17 compares the densities of doctors with densities of nurses & midwives collectively showing Maldives having the highest densities and Bangladesh having lowest densities. Sri Lanka is also having a higher density even though it is below than that of Maldives.

Figure 17: Density of Doctors, Nurses & Midwives by country

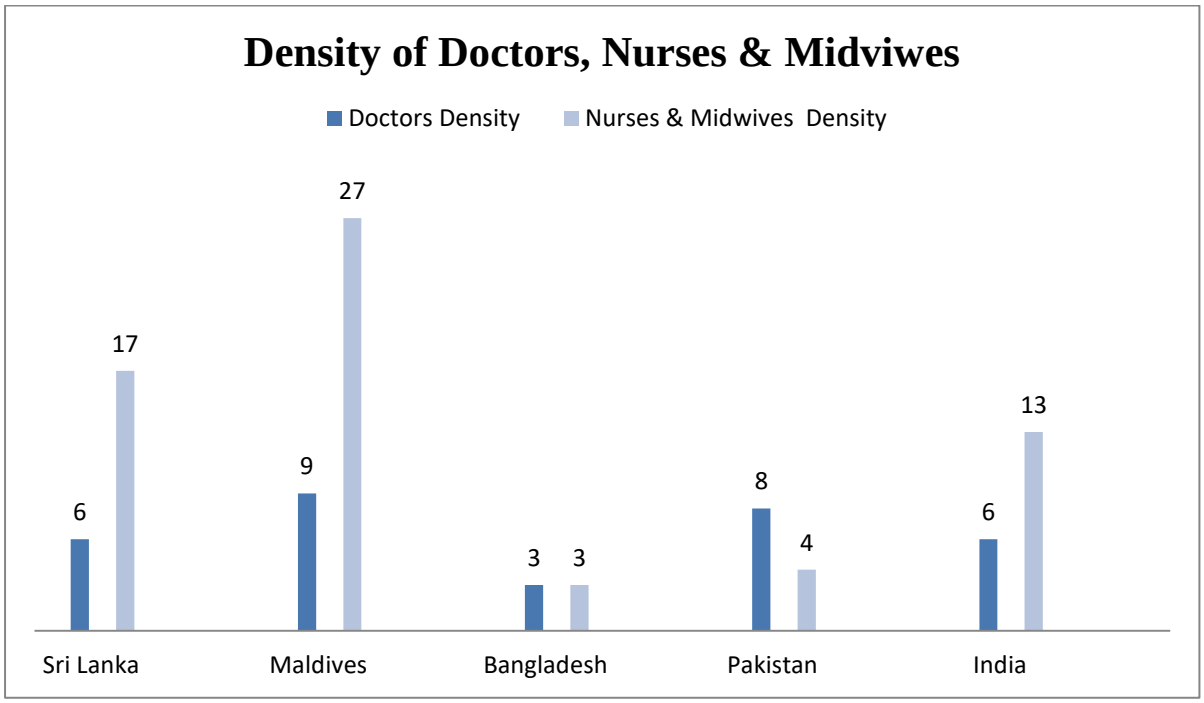


Figure 18 shows the different health outcomes considered in the five different countries. When these different health outcomes are considered it can be observed that, Sri Lanka shows best outcomes among the five different countries while Pakistan showing worst outcomes. Sri Lanka shows low figures for all the mortality rates considered and highest rate for Skilled Birth Attendance (SBA). In the case of Pakistan, it shows highest figures for mortality rates except for maternal Mortality and lowest rate for the Skilled Birth Attendance (SBA). Bangladesh shows the highest Maternal Mortality figure and the lowest figure for the skilled birth attendance. Figure 19 shows the relationship between Doctor Density and Neonatal Mortality. Accordingly, Bangladesh has the lowest Doctor Density and the Neonatal mortality is high. Maldives has the highest Doctor Density and a comparably low Neonatal Mortality. Pakistan is the country with the highest Neonatal Mortality but its Doctor Density is comparably higher than Bangladesh and lower than Maldives. Sri Lanka is the country that shows the lowest figure for Neonatal Mortality with low Doctor Density.

Figure 18: Health Outcomes in different countries

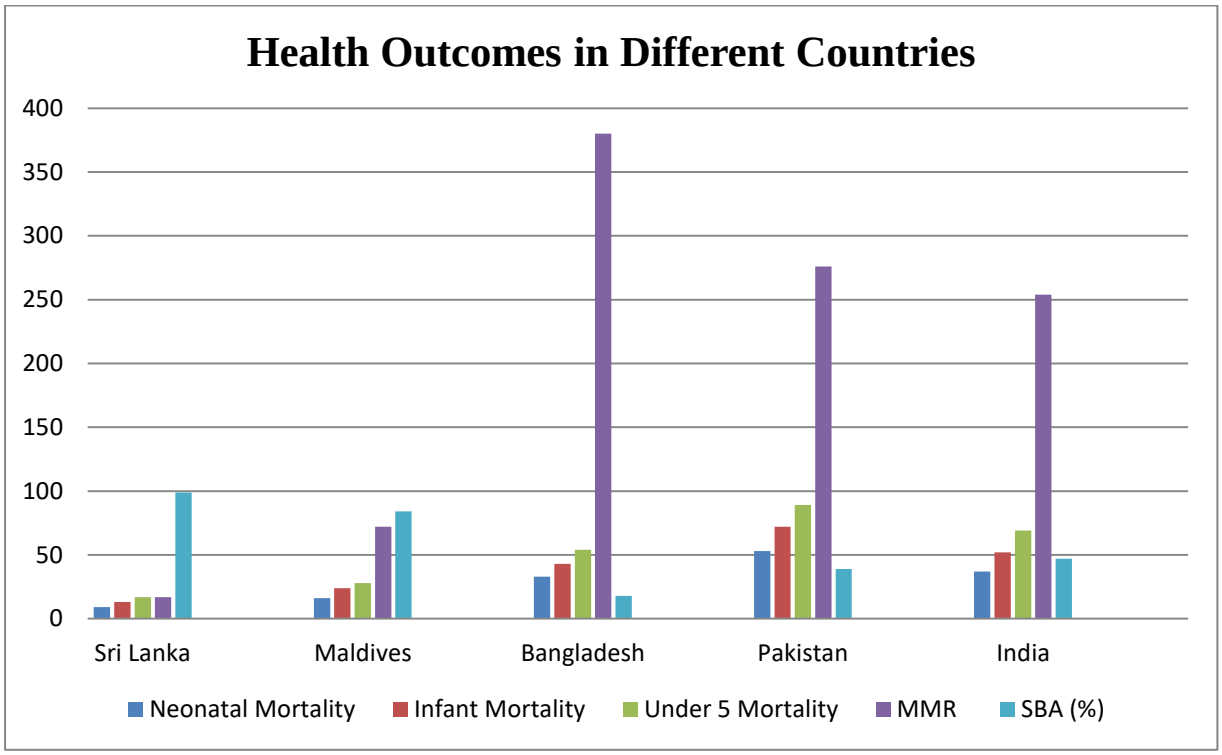
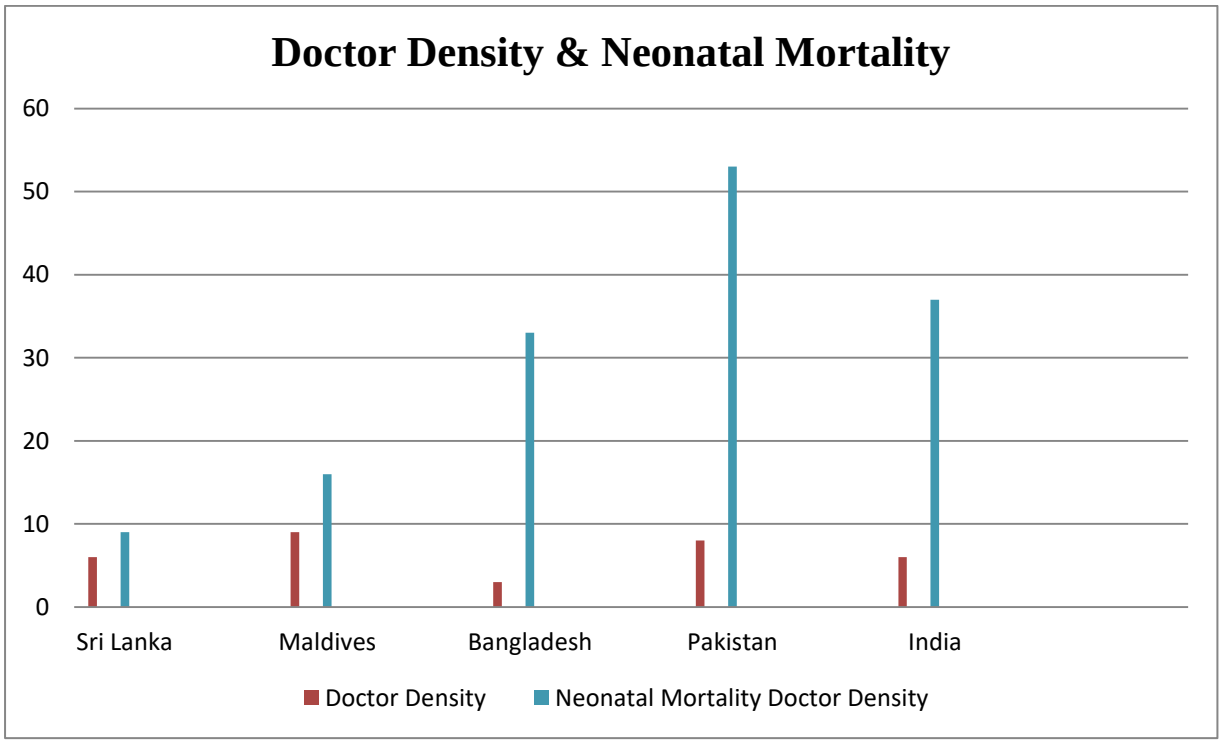


Figure 19: Relationship between Doctor Density & Neonatal Mortality



When Infant Mortality, Under 5 Mortality & Maternal Mortality are analyzed with Doctor Density, it is evident that, Pakistan has the highest figure for Infant Mortality while Sri Lanka having the lowest figure. But Sri Lanka's doctor Density is much lower than that of Pakistan. While Bangladesh is having the lowest density of doctors, their Infant Mortality figure is lower than that of Pakistan. Under 5 Mortality figure also show a similar variation with Pakistan showing the highest figure while Bangladesh showing a lower figure with the lowest density of doctors. Again Sri Lanka shows the best figures in this respect. When Maternal Mortality Rate is considered, Bangladesh shows the highest figure with the lowest density of doctors while Sri Lanka shows the Lowest Figure with a low density of doctors. (Figures: 20,21, & 22).

Figure 20: Relationship between Doctor Density & Infant Mortality

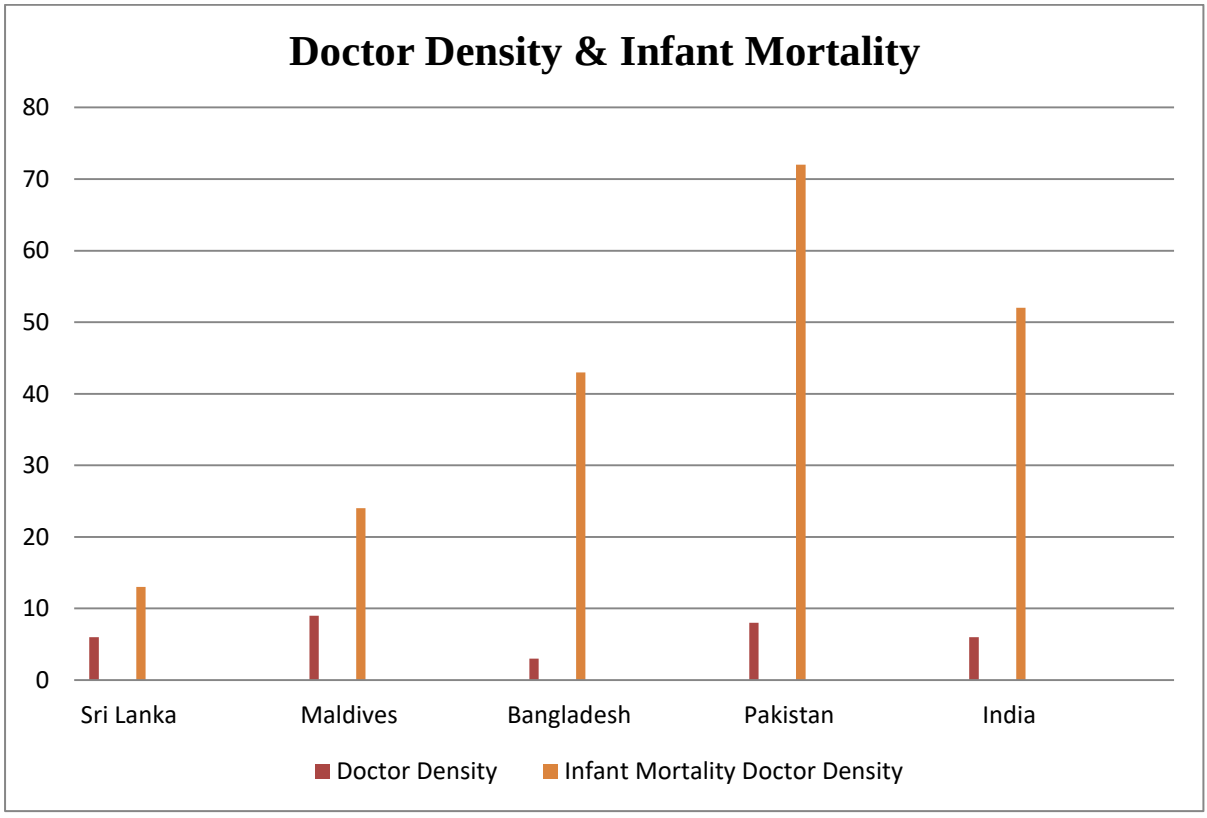


Figure 21: Doctor Density & Under 5 Mortality

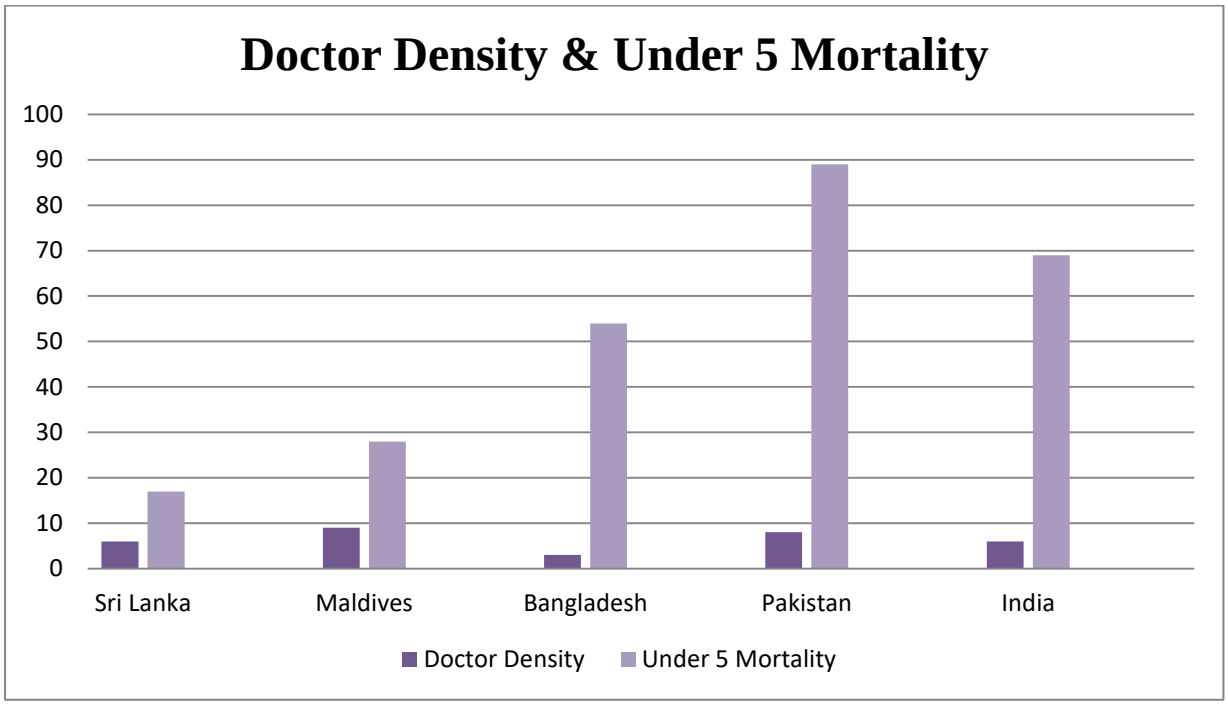


Figure 22: Doctor Density & Maternal Mortality

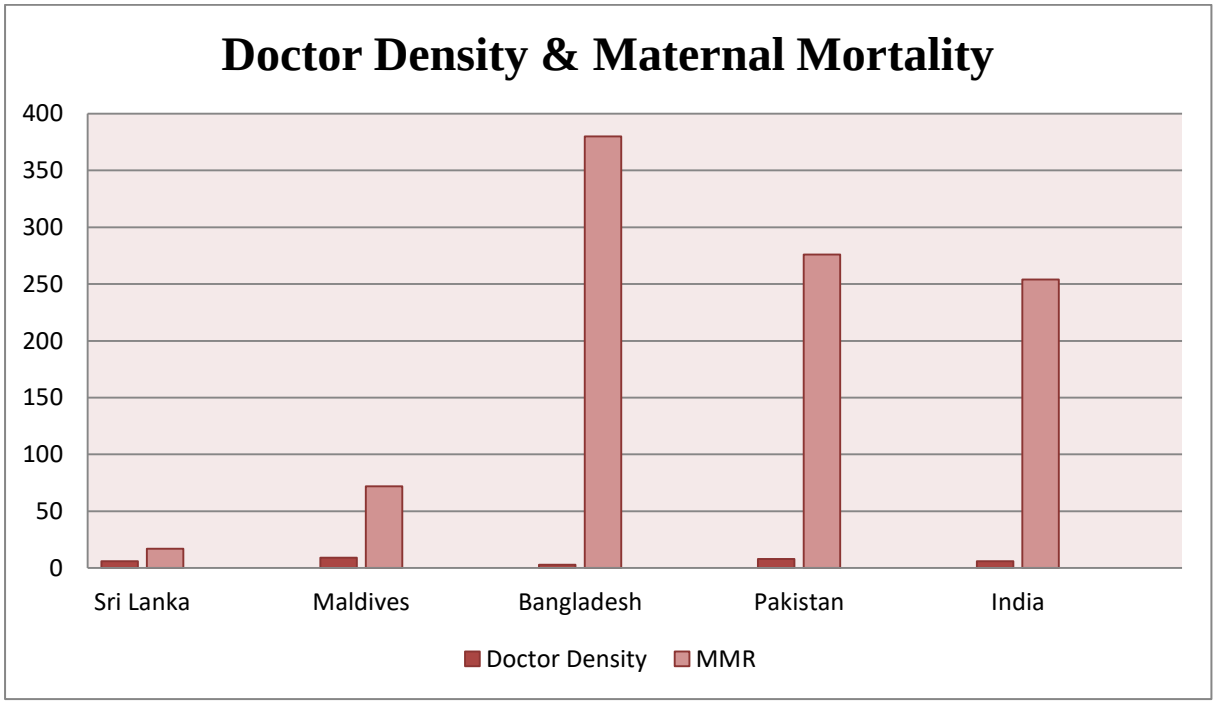


Table 9: Literacy rate, Per-Capita income, & Total Health Expenditure Per-Capita of comparison countries

Country	Level of Income	Region	Literacy Rate* (2008-2012)	Per-Capita Income (GNI-USD)**	THE (Per Capita) USD***
Sri Lanka	Lower Middle	South Asia	91.2	3440	179
Maldives	Lower Middle	South Asia	98.2	6410	514
Bangladesh	Low income	South Asia	57.5	1080	42
Pakistan	Lower Middle	South Asia	54.9	1400	64
India	Lower Middle	South Asia	62.8	1570	109

Table 10: Literacy rate, GNI Per-Capita, & THE Per-Capita in descending order

Country	Literacy Rate* (2008-2012)	GNI Per-Capita** (2014)	THE (Per-Capita)*** (2010)
Maldives	98.4	6410	514
Sri Lanka	91.2	3440	179
India	62.8	1570	109
Pakistan	**54.9**	1400	64
Bangladesh	**57.7**	1080	42

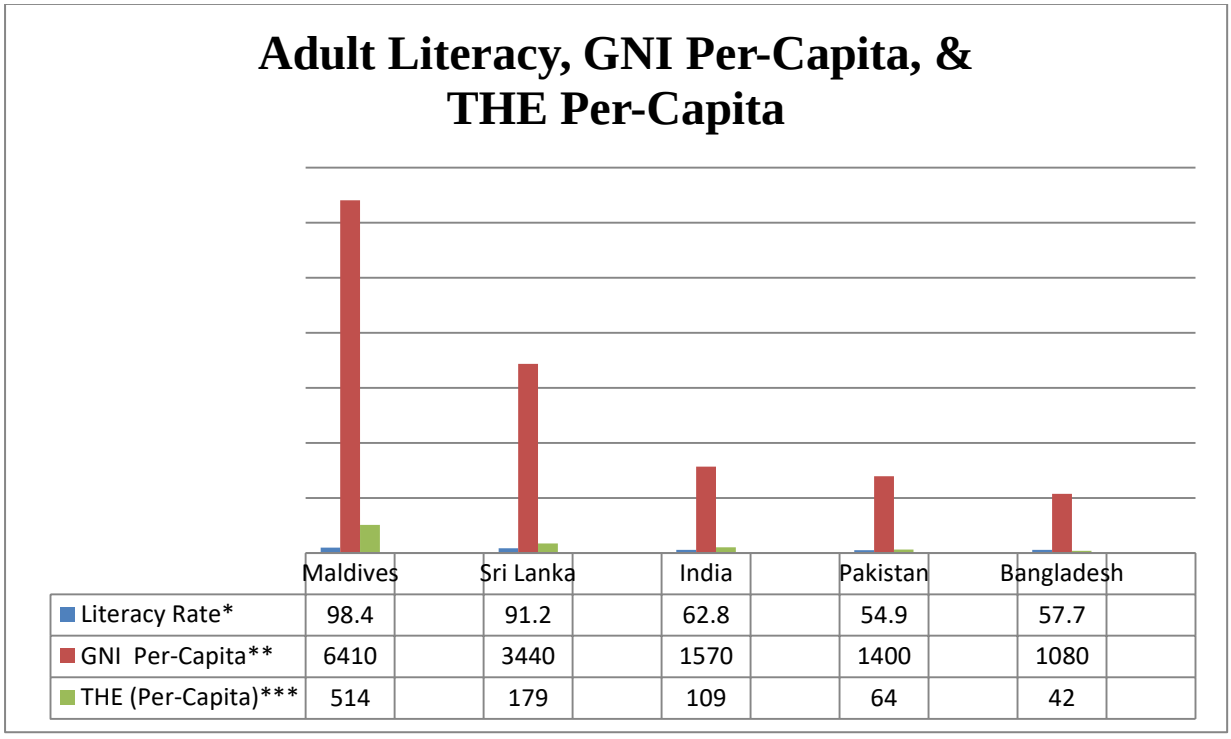
***** http://www.unicef.org/statistics.

****** GNI per capita (2014), Atlas method (current US$), The World Bank.

******* World Health Statistics 2010.

Table 9 & 10 shows the three important variables that would have a possible relationship with health outcomes. Those are adult literacy, GNI per-capita and THE per-capita. When these three important variables are considered, it is evident that Maldives has the highest literacy rate among the five countries considered and Pakistan has the lowest. When the GNI per-capita is considered, Maldives has the highest GNI whereas Bangladesh has the lowest. Similar pattern is seen with the per-capita total health expenditure with Maldives having the highest figure and Bangladesh having the lowest figure.

Figure 23: Adult Literacy, GNI Per-Capita, & Total Health Expenditure Per-Capita



	Maldives	Sri Lanka	India	Pakistan	Bangladesh
Literacy Rate*	98.4	91.2	62.8	54.9	57.7
GNI Per-Capita**	6410	3440	1570	1400	1080
THE (Per-Capita)***	514	179	109	64	42

Table 11: Literacy Rate & Health Outcomes

Country	Adult Literacy Rate (2008-2012)	Health outcomes				
		NMR	IMR	>5MR	MMR	SBA
Maldives	98.4	16	24	28	72	84
Sri Lanka	91.2	09	13	17	17	99
India	62.8	37	52	69	254	47
Pakistan	54.9	53	72	89	276	39
Bangladesh	57.7	33	43	54	380	18

When Adult Literacy Rate & Health Outcomes are considered, it can be observed that, Maldives has the best figure for adult literacy among the five countries considered. At the same time Maldives has better health outcomes as well. In contrast Pakistan has the lowest figure for Adult literacy with poor health outcomes. Sri Lanka's Ault Literacy Rate is below than Maldives but Sri Lanka's Health outcomes are better compared to Maldives. In terms of maternal mortality, Bangladesh has the highest figure but its literacy rate is much better than Pakistan (Figure: 24).

Figure 24: Adult Literacy & Health Outcomes

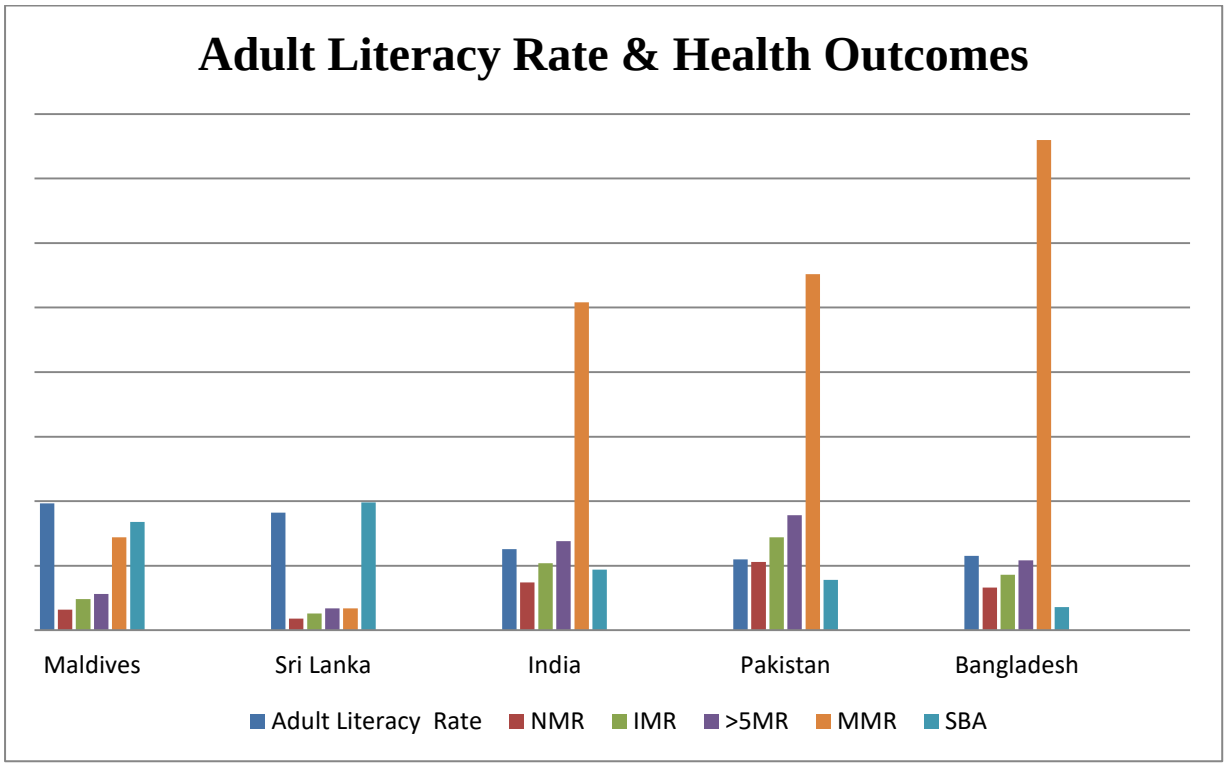


Table 12: GNI Per-Capita & Health Outcomes

Country	GNI Per-Capita** (2014)	Health outcomes				
		NMR	IMR	>5MR	MMR	SBA
Maldives	6410	16	24	28	72	84
Sri Lanka	3440	09	13	17	17	99
India	1570	37	52	69	254	47
Pakistan	1400	53	72	89	276	39
Bangladesh	1080	33	43	54	380	18

When GNI per- capita and health outcomes are considered, it is evident that Bangladesh has the highest GNI per-capita. At the same time it shows better health outcomes. In contrast, Bangladesh has lowest GNI per-capita and its health outcomes are also comparably low. But, Bangladesh performs well compared to Pakistan & India except for the case of Maternal Mortality Ratio and Skilled Birth Attendance (SBA). Sri Lanka's GNI per-capita is lower than that of Maldives, but Sri Lanka performs well in terms of its health outcomes compared to Maldives. GNI per-capita for India is higher than that of Pakistan with India showing better figures than that of Pakistan. (Figure: 25)

Figure 25: GNI Per-Capita & Health Outcomes

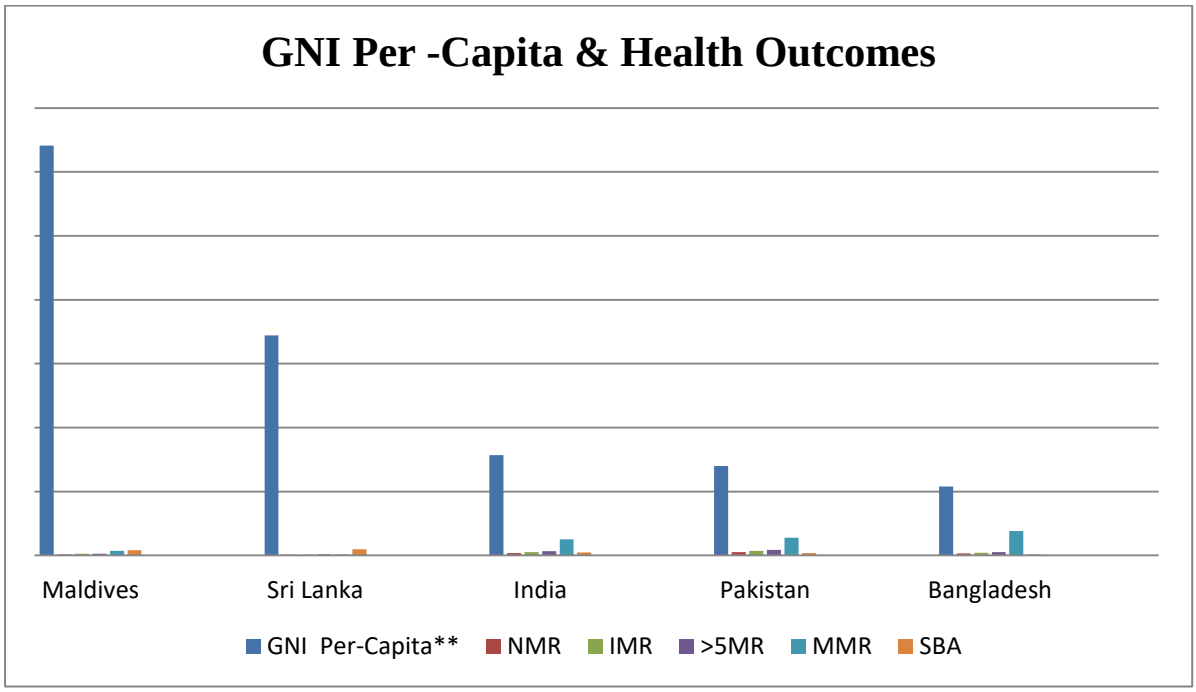


Table 13: Total Health Expenditure (THE) Per-Capita & Health Outcomes

Country	THE (Per-Capita)*** (2010)	Health outcomes				
		NMR	IMR	>5MR	MMR	SBA
Maldives	514	16	24	28	72	84
Sri Lanka	179	09	13	17	17	99
India	109	37	52	69	254	47
Pakistan	64	53	72	89	276	39
Bangladesh	42	33	43	54	380	18

When the Total Health Expenditure (THE) per-capita is compared with health outcomes again it is evident that Maldives has the highest per-capita health expenditure with better health outcomes and Bangladesh having the lowest THE per-capita with poor health outcomes. Sri Lanka's per-capita THE is much less than that of Maldives. But Sri Lanka performs better than Bangladesh. When both India & Pakistan are considered Pakistan has a low THE and its health outcomes are also poor (Figure: 26).

When health care expenditure is considered as a percentage of GDP (Table 14), again Maldives has the highest share with 9.8% and Pakistan has the lowest with 3.4%. Sri Lanka has a share of 4.2% of its GDP. Although Maldives has a higher share of GDP for its health care its health outcomes are lower than that of Sri Lanka. India has a higher share than that of Pakistan and their health outcomes are better than Pakistan.

Figure 26: Total Health Expenditure Per-Capita & Health Outcomes

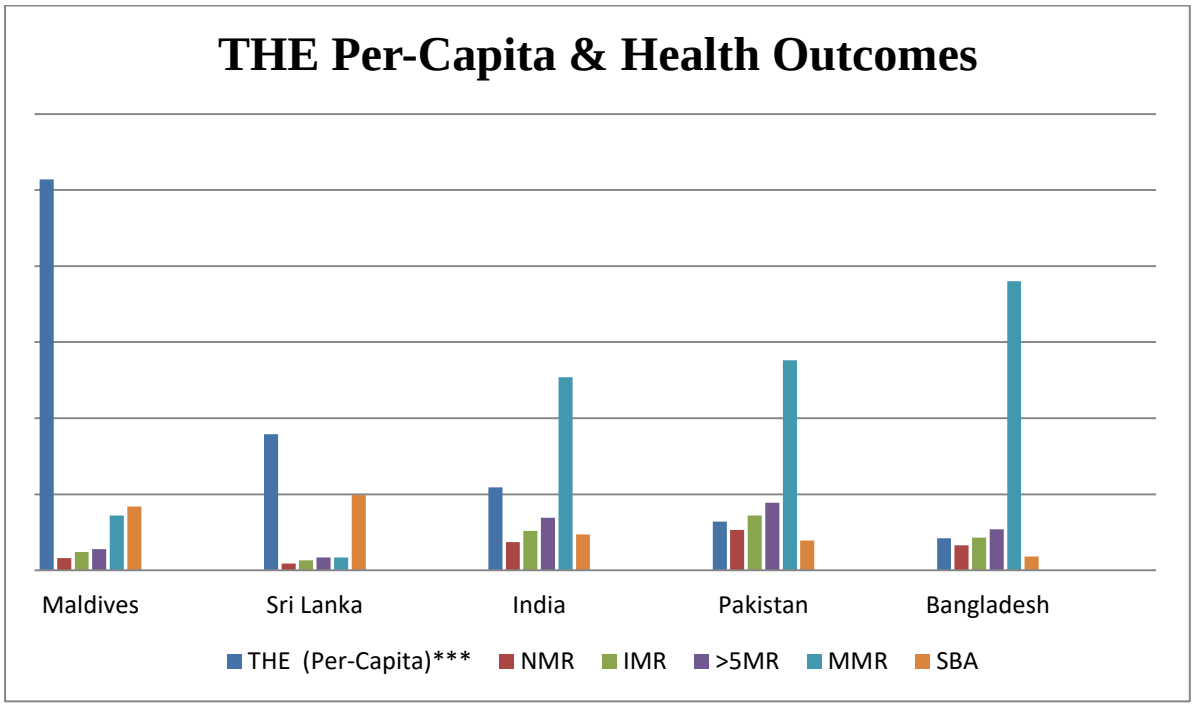


Table 14: Health Care Expenditure & Health Outcomes

Country	Health Care Expenditure (At average exchange rate USD)			Health outcomes				
	% of GDP	Govt.	Total	NMR	IMR	>5MR	MMR	SBA
Maldives	9.8	336	514	16	24	28	72	84
Sri Lanka	4.2	85	179	09	13	17	17	99
India	4.1	29	109	37	52	69	254	47
Pakistan	2.7	19	64	53	72	89	276	39
Bangladesh	3.4	14	42	33	43	54	380	18

Source: World Health Statistics 2010

4. Summary & Conclusions

Health Human Resources are an important part of a Health System. Although a competent health work force is considered to be the heart of well-functioning health systems in the world, distribution of health workforce is not universal around the world. Developed world has the advantage of harboring a larger portion of the health workforce compared to the developing countries. This is considered to be one reason for the vast difference between the health outcomes between the developed and developing regions of the world. Defined as the number of health workers per ten thousand people, health workforce density is considered to be the most commonly reported health workforce indicator throughout the world.

Health Outcomes are defined as a change in the health status of an individual, group or population which is attributable to a planned intervention or series of interventions, regardless of whether such an intervention was intended to change health status. Out of the five countries considered in this study, Sri Lanka and Maldives have an outstanding performance compared to India, Pakistan & Bangladesh with regard to health outcomes although there are differences in their socio-economic status. Even though Maldives has a comparably sound economy, Sri Lanka performs much better in terms of its health outcomes.

Even though Sri Lanka performs extremely well in terms of its health outcomes, she experiences a wide variation of them within different provinces. This is partly related to the distribution of health workforce in different provinces. In Sri Lanka, most of the human resources are concentrated in the Western Province in which the capital city “Colombo” is located. With regard to the health outcomes considered, Western Province performs extremely well compared to the other provinces. In contrast, North Western Province has comparably poor outcomes with low density of health work force. Northern Province has the lowest density of Doctors & Nurses. But their outcomes are comparably better than North

Western Province. Central Province also performed well except for the Maternal Mortality Ratio with the second highest density of Doctors & Nurses. Southern province is the next well performing province with a reasonable number of health workforce. With these results, in case of Sri Lanka, it can be concluded that health outcomes are mostly related to the health workforce density.

Among the five countries considered in this study, Sri Lanka shows the best outcomes followed by Maldives. India, Pakistan, & Bangladesh show comparably low outcomes. When the number of doctors is considered, India shows the highest number followed by Pakistan & Bangladesh. When the doctor density is taken into account, Maldives has the highest density followed by Pakistan. Bothe Sri Lanka & India share the same density whereas Bangladesh has the lowest density. When it comes to the Nurses& Midwives, again Maldives has the highest density followed by India, Pakistan & Bangladesh.

While looking into health outcomes, it can be observed that Sri Lanka has the best outcomes followed by Maldives. India, Bangladesh & Pakistan have comparably low outcomes. With regard to all mortality figures, Sri Lanka has the lowest numbers. Maldives also has low numbers except for the Maternal Mortality Ratio (MMR). Pakistan has very high mortality figures and Bangladesh shows the highest value for Maternal Mortality. While Sri Lanka shows the best Skilled Birth Attendance, Bangladesh has the lowest value.

When these health outcomes are taken separately, it can be observed that both Neonatal Mortality and Infant Mortality show a similar pattern in the five different countries observed. While Sri Lanka shows the lowest value for both of these indices, Pakistan shows the highest value. While Maldives is having a higher doctor density its outcomes are comparably lower than that of Sri Lanka. At the same time Bangladesh has the lowest doctor density but its outcomes are much better than Pakistan & India. A different observation was

made with regard to under-five mortality & maternal mortality. Pakistan shows the highest value of under-five mortality with a considerably high density of doctors while Sri Lanka showing a low figure of under-five mortality with a comparably low doctor density. With regard to Maternal Mortality Bangladesh shows the highest figure with the lowest density of doctors while Sri Lanka has the lowest figure with a considerably high doctor density.

Finally three important factors which might have a direct or indirect relationship with health outcomes were considered. Three factors which considered were Adult Literacy, Per-Capita Income and The total Health Expenditure (THE) per-capita. When adult literacy rate is considered with health outcomes, Maldives has the highest literacy rate and Pakistan has the lowest among the five countries considered. With a high literacy rate, Sri Lanka shows better outcomes while Pakistan outcomes are poor. Out of the four mortality rates considered, Bangladesh has the highest value for maternal mortality even though its literacy rate is better than Pakistan. Maldives has the best literacy rate but its outcomes are below than those of Sri Lanka.

When GNI per-capita I s compared with health outcomes, it is evident that, Maldives has the highest GNI per-capita while Bangladesh having the lowest. Consequently, Maldives shows better health outcomes compared to Bangladesh. Again in the case of Sri Lanka, health outcomes are much better even though the GNI per-capita is less than Maldives. Both India and Pakistan has GNI per-capita of a closer figure but India showing comparably better outcomes. While considering the Total Health Expenditure (THE) per-capita with health outcomes similarly Maldives has the best figure and Bangladesh has the lowest figure. Sri Lanka's THE per-capita is less than that of Maldives but Sri Lanka has better health outcomes. When India and Pakistan is taken separately India has a high THE per-capita with better health outcomes than Pakistan.

Considering all these factors, it can be concluded that health outcomes have a direct relationship with health human resources. But they are not only related to human resources but there are some other factors that have an influence on health outcomes such as Adult Literacy, GNI per-capita and Total Health Expenditure (THE) per-capita. In addition there can be some other factors that could influence on health outcomes which were not considered in this study. Those are education and training of health workers, performance of the health workforce and the compensation they receive. These factors need to be studied in further studies in the future.

Bibliography

Anand Sudhir and BarninghausenTill, Human resources and health outcomes: cross country econometric study, *The Lancet* Volume 364, October 2004, 1603-09.

Berman, P., Britan, R. *Health System Analysis for better Health System Strengthening*. iii. HNP Discussion Paper, International Bank for Reconstruction & Development/ World Bank http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/HealthSystemsAnalysisForBetterHealthSysStrengthening.pdf

Central Bank of Sri Lanka; Statistics Department, *Economic and Social Statistics of Sri Lanka* 2014. http://www.cbsl.gov.lk/pics_n_docs/10_pub/_docs/statistics/other/econ_&_ss_2014_e.pdf

Chen et al, Human resources for health: overcoming crisis. The Lancet volume 364, November 27, 2004, 1984-1990. http://www.globalsurgery.info/wp-content/uploads/2014/01/Human-Resources-for-Health.pdf

E Kruk Margaret, R Prescott Marta, De Pinho Helen and Galea Sandro. Are doctors and nurses associated with coverage of essential health services in developing countries? A cross sectional study. *Human Resources for Health*, March 2009. http://human-resources-health.biomedcentral.com/articles/10.1186/1478-4491-7-27

Haththotuwa Rohana, Senanayake, Lakshmen, Senarath, Upul and Atygalle Deepika. Modells of care that have reduced maternal mortality and morbidity in Sri Lanka. *International Journal of Gynecology & obstetrics*. 119 (2012) S45-49. http://www.ijgo.org/article/S0020-7292(12)00157-9/pdf

Hazarika, Indrajith Health workforce in India: assessment of availability, production and distribution, *WHO South-East Asia Journal of Public Health* , 2013 April–June. http://www.searo.who.int/publications/journals/seajph/seajphv2n2_p106.pdf

Mcnay Kirsty, Keith Regina and Penrose Angela, *Bucking the Trend: How Sri Lanka achieved good health at low cost-challenges and policy lessons for the 21st century* Save the Children 2004, 4.

Ministry of Health & Family Welfare, *Demographic and health Survey 2014, Key Indicators:* National Institute of Population Research & Training, Bangladesh, 2014. https://www.k4health.org/sites/default/files/bdhs_2014.pdf.

Ministry of Health & Gender , *Maldives Health Profile* 2014.http://www.health.gov.mv/publications/13_1395305886_Maldives_Health_Profile_2014_final_final.pdf

Ministry of Health Sri Lanka, *Annual Health Bulletin 2012*, Medical Statistics Unit, Ministry of Health, 2012.

Ministry of Health , Sri Lanka, Health Facility Survey: District Profiles, Management Development & Planning Unit, Ministry of Health Sri Lanka,2011, 1

Ministry of Statistics and Programme Implementation , *Manual on Health Statistics in India*, Central Statistical Office, Government of India, New Delhi, May, 2015. 8. http://mospi.nic.in/Mospi_New/upload/Manual-Health-Statistics_5june15.pdf

Ministry of Statistics, *Manual on Health Statistics in India, Central Statistics Office, Ministry of Statistics & Program Implementation*, Government of India, New Delhi 2015. http://mospi.nic.in/Mospi_New/upload/Manual-Health-Statistics_5june15.pdf

Nandan, Deoki, and Agarawal, Dinesh., Human Resources for Health in India: Urgent Need for Reforms.Indian Journal of Community Medicine, 2012 Oct-Dec; 37(4): 205–206. Accessed on 2/03/2016 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3531009/

Rao Mohan et-al India: Towards Universal Health Coverage 5, Human resources for health in India *The Lancet* online January 12, 2011. http://environmentportal.in/files/Human%20resources%20for%20health.pdf

Reddy Srinath et-al, India: Towards Universal Health Coverage 7, Towards achievement of universal health care in Indiaby 2020: a call to action, *Lancet* 2011; 377: 760–68. http://www.human-resources-health.com/content/7/1/27

Sousa Angelica, Tandon,Ajay, R. Dal Poz Mario, Prasad Amit and B. Evans David, Measuring the efficiency of human resources for health for attaining health outcomes across subnational units in Brazil, Background paper prepared for The world health report 2006 - working together for health, World Health Organization, Geneva 2006. http://www.who.int/hrh/documents/measuring_efficiency_Brazil.pdf

Speybroeck Niko, Kinfu Yohannes, R.Dal Poz Mario,and B. Evans, David ., *Reassessing the relationship between human resources for health, intervention coverage and health outcomes. Evidence and Information for Policy*, World Health Organization, Geneva 2006. 11 http://www.who.int/hrh/documents/reassessing_relationship.pdf

Sustainable Development Solutions Network, *Open Working Group Proposals for Sustainable Development Goals* ,2014 https://sustainabledevelopment.un.org/sdgsproposal

The Economist, Sri Lanka's health care challenges..Retrieved on 23/09/2015 http://webcache.googleusercontent.com/search?q=cache:r9QDNFKFPZUJ:country.eiu.com/article.

World Health organization, Toolkit on monitoring health systems strengthening: Human Resources for Health, May 2009 http://www.who.int/healthinfo/statistics/toolkit_hss/EN_PDF_Toolkit_HSS_HumanResources_oct08.pdf

World Health Organization, *"Everybody's Business," Strengthening Health Systems to Improve Health Outcomes*: WHO's Framework for action , World Health Organization, 2007, 3. http://www.who.int/healthsystems/strategy/everybodys_business.pdf

World Health Organization, *Bangladesh Health System Review:Health Systems in Transition Asia Pacific Observatory on Public Health Systems and Policies.* Vol. 5 No. 3, 2015. 90-92. http://www.wpro.who.int/asia_pacific_observatory/hits/series/bgd_health_system_review.pdf

World Health Organization, *Country Cooperation Strategy, Bangladesh 2014-2017*, World Health Organization Country Office for Bangladesh, 2014. http://www.who.int/countryfocus/cooperation_strategy/ccs_bgd_en.pdf

World Health Organization, *Country Cooperation Strategy*, Republic of Maldives 2013-2017, 2013, p16. http://www.who.int/countryfocus/cooperation_strategy/ccs_mdv_en.pdf

World Health Organization, *Human Resources for Health: Foundation for Universal Health Coverage and the post 2015 development agenda. Report of the Third Global Forum on Human Resources for Health Brazil 2013*. (WHO, Geneva, 2014), 2 http://www.observatoriorh.org/uruguay/sites/observatoriorh.org.uruguay/files/webfiles/fulltext/ACTIVIDADES/programa_foro-2013.pdf

World Health Organization, *Pakistan, Country Cooperation Strategy at a glance*. 2013. http://www.who.int/countryfocus/cooperation_strategy/ccsbrief_pak_en.pdf

World Health Organization-Geneva, *World Health Report 2006 – Working together for Health*, 2006. http://whqlibdoc.who.int/publications/2006/9241563176_eng.pdf

Zhu Nina et-al, Lady Health Workers in Pakistan, Improving access to health care for rural women and families. Women and Health Initiative: Maternal Health Task Force Harvard School of Public Health May 2014. https://cdn2.sph.harvard.edu/wp-content/uploads/sites/17/2014/08/HSPH-Pakistan5.pdf