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**Article (Accepted version)
(Refereed)**

Original citation: Khan, Jahangir A. M. and Ahmed, Sayem and MacLennan, Mary and Sarker, Abdur Razzaque and Sultana, Marufa and Rahman, Hafizur (2016) *Benefit incidence analysis of healthcare in Bangladesh – equity matters for universal health coverage*. [Health Policy and Planning](#). czw131. ISSN 0268-1080
DOI: [10.1093/heapol/czw131](https://doi.org/10.1093/heapol/czw131)

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Available in LSE Research Online: July 2017

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Benefit incidence analysis of healthcare in Bangladesh – equity matters for universal health coverage

Jahangir A.M. Khan, Sayem Ahmed, Mary MacLennan, Abdur Razzaque Sarker, Marufa Sultana, Hafizur Rahman

Abstract

Background: Equity in access to and utilization of healthcare is an important goal for any health system and an essential prerequisite for achieving Universal Health Coverage for any country.

Objectives: This study investigated the extent to which health benefits are distributed across socioeconomic groups; and how different types of providers contribute to inequity in health benefits of Bangladesh.

Methodology: The distribution of health benefits across socioeconomic groups was estimated using concentration indices. Health benefits from three types of formal providers were analysed (public, private and NGO providers), separated into rural and urban populations. Decomposition of concentration indices into types of providers quantified the relative contribution of providers to the overall distribution of benefits across socioeconomic groups. Eventually, the distribution of benefits was compared to the distribution of healthcare need (proxied by 'self-reported illness and symptoms') across socioeconomic groups. Data from the latest Household Income and Expenditure Survey, 2010 and WHO-CHOICE were used.

Results: An overall pro-rich distribution of healthcare benefits was observed (CI = 0.229, t -value = 9.50). Healthcare benefits from private providers (CI = 0.237, t -value = 9.44) largely favoured the richer socioeconomic groups. Little evidence of inequity in benefits was found in public (CI = 0.044, t -value = 2.98) and NGO (CI = 0.095, t -value = 0.54) providers. Private providers contributed by 95.9% to overall inequity. The poorest socioeconomic group with 21.8% of the need for healthcare received only 12.7% of the benefits, while the richest group with 18.0% of the need accounted for 32.8% of the health benefits.

Conclusion: Overall healthcare benefits in Bangladesh were pro-rich, particularly because of health benefits from private providers. Public providers were observed to contribute relatively slightly to inequity. The poorest (richest) people with largest (least) need for healthcare actually received lower (higher) benefits. When working to achieve Universal Health Coverage in Bangladesh, particular consideration should be given to ensuring that private sector care is more equitable.

Introduction

Equity in access to and utilization of healthcare is an important goal for any health system and an essential prerequisite for achieving Universal Health Coverage (UHC) for any country. However, in many low- and middle-income countries (LMICs), socioeconomically disadvantaged people, despite generally higher need, utilize healthcare to a lesser extent than higher income individuals, resulting in healthcare inequity (Akazili *et al.* 2012; Mtei *et al.* 2012).

Both the supply and demand sides of a health system can contribute to inequity in the distribution of health benefits. Healthcare in low- and middle-income countries is generally provided jointly by a mix of healthcare providers. In Bangladesh, health services are formally organized by a mix of public, private for profit and NGO providers (MoHFW 2014). For healthcare provision in public facilities, care-seekers often pay a small user-charge. Care-seekers from private for-profit providers are required to pay relatively large out-of-pocket payments and, as such, these providers are not accessible to many low-income people. This mix of different providers creates a number of supply side factors which may create conditions that increase inequity.

On the demand side, healthcare-seeking behaviour often varies across socioeconomic groups. This is often linked to a variation in the degree of health awareness, physical access to healthcare facilities, economic hardship etc. (Gwatkin *et al.* 2005; Amin *et al.* 2010; Muriithi 2013). Bangladesh is a country with a large economic disparity, where 31.5% of the country's 152 million people live below the poverty line (BBS 2011). Additionally, 56% of people are dependent on the informal sector of the economy with unstable incomes, and only 12.8% of the total population are connected to the formal sector of the economy (BBS 2011). Given the supply and demand conditions of the health system of Bangladesh, there is strong reason to believe that the inequity in healthcare benefits may be considerable.

In order to achieve Universal Health Coverage, all people should have equitable access to healthcare considering the need without financial hardship. One dimension of the progress toward achieving UHC is the degree of inequity in

health benefits across socioeconomic groups. Since the poorer segments of society are generally in need of more healthcare, the actual distribution of benefits should likely favour this group. Therefore, the degree of UHC progress is reflected not only in the relative distribution of benefits, but also the actual benefit accrued in relation to the absolute need for healthcare in all socioeconomic segments.

Therefore, the scope of this study is to investigate the relative difference in health benefits across socioeconomic groups with the goal of identifying equity-related weaknesses in the health system, thus informing policies and programmes in order to achieve Universal Health Coverage.

Benefit incidence analysis

Benefit Incidence Analysis (BIA) has been used to estimate the equity of healthcare benefits accrued to individuals across socioeconomic groups (McIntyre and Ataguba 2012). The methodology has been historically used to analyse public health system expenditure and performance in terms of equity; and in practice, to improve efficiency and equity with the aim of correcting for market failures and increasing social welfare (De Walle and Kimberly Nead 1995). However, more recently BIA is starting to be applied to assess the overall equity of healthcare systems, with respect to both public and private providers (Ataguba and McIntyre 2012). This study aims to investigate the extent to which benefits from health services, in monetary terms, are distributed across socioeconomic groups; and how benefits from different types of providers ultimately contribute to the health system equity of Bangladesh.

Bangladesh's health system

Below we briefly describe the health system of Bangladesh in order to provide a contextual understanding of the distribution of healthcare benefits across socioeconomic groups and its contribution to equity and thus to movement towards Universal Health Coverage. Article 15 of the constitution of Bangladesh stipulates that the state has a fundamental responsibility to secure for its citizens the

provision of the basic necessities of life, including food, clothing, shelter, education and medical care (IGS 2012). The health sector of Bangladesh was developed under the leadership of the Ministry of Health and Family Welfare keeping this legal obligation in mind (Bangladesh health system review 2015).

The health system of Bangladesh is pluralistic, which means that multiple actors are performing diverse roles and functions through a mixed system of medical practices. There are four key actors that define the structure and functioning of the broader health system: Government or public sector, the private sector, NGOs and donor agencies. Government, the private sector and NGOs organize most of the service delivery, financing and employment of health staff. Donors, along with the government, play a key role in planning health programmes. Donors also contribute to healthcare financing, in addition to roles played by government and individuals/households. Overarching all of this work, it is the responsibility of the government to regulate the functions of public, private and NGO providers through legislation and regulation.

Public sector healthcare includes mostly curative, preventive, promotive and rehabilitative services, whereas the private sector provides mostly for-profit curative services. NGOs provide mainly preventive and basic care to underserved populations. The private sector, despite limited infrastructure, employs more care providers than the public sector. These employees are diverse and include their own doctors, as well as traditional healers, unqualified allopaths, and doctors who are already employed by the Government (Bangladesh health system review 2015).

Healthcare financing is heavily influenced by out-of-pocket payment, which is 63.3% of the total health expenditure of the country (MoHFW 2015). Public facilities are accessible to all people in principle. However, different socioeconomic patterns in healthcare utilization are observed by public, private and NGO providers, which may relate to the distribution of benefits from health services across different socioeconomic groups (BDHS 2014). This study aims to understand the extent to which benefits from health services are distributed across socioeconomic groups and how benefits from different types of providers contribute to inequity in Bangladesh's health system.

Methods

Benefit incidence analysis

Benefit Incidence Analysis (BIA) describes the distribution of benefits, in monetary terms, derived from the delivery of health services across socio-economic groups. BIA methodology involves four steps (McIntyre and Ataguba 2011):

- i. measuring the living standard or socio-economic status of population;
- ii. estimating the utilization rates of various health services, and the unit cost attached to each service;
- iii. estimating the monetary value of the benefits accrued to each socio-economic group through multiplying the utilization rates by unit costs of relevant services; and
- iv. summing total benefits within socio-economic groups resulting in total benefits for each quantile.

Completing these four steps results in calculations of inequity in benefits and benefit progressivity.

Data

Secondary data from the nationally representative Household Income and Expenditure Survey (HIES) (2010) in Bangladesh (BBS 2011) were used in this study. A total of 12 240 households, consisting of 55 993 individuals, were included in the sample through a two-stage stratified random sampling technique. In the first stage, 612 primary sampling units (PSUs) were selected from 1,000 PSUs throughout the country (which were divided into 16 strata: 6 rural, 6 urban and 4 Standard Metropolitan Areas or SMAs). Each PSU consists of 200 households. In the second stage, 20 households were randomly selected from each PSU making up the total sample (BBS 2011).

The HIES data contain socio-demographic variables, household consumption expenditure, healthcare utilization of individuals and expenditure on health, along with other key variables. This data provided us with the opportunity to observe the

distribution of health service utilization across socioeconomic groups. In order to estimate the benefits in the public sector, the unit costs of out-patient and inpatient service utilization were obtained from WHO-CHOICE (World Health Organization 2013). Costs of services from the private sector were captured from self-reported health expenditure by individuals in HIES.

Defining and estimating the variables

Socioeconomic groups

Households were ranked from the poorest to richest according to their consumption expenditure. Health expenditure was not included in this ranking of households since healthcare is not always solely financed with regular income. (The out-of-pocket payment portion of consumption expenditure may have a positive relationship with the total consumption expenditure if healthcare is funded from savings, credit or the sale of assets rather than from current consumption (van Doorslaer *et al.* 2007). In such a situation, the total household consumption expenditure will be above the permanent income. If a household chooses to spend sufficiently excessive amount on health care, the relative ranking of the households will go up. Further, if any household borrows to cover healthcare expenses, its total consumption expenditure will be greater than its available resources (van Doorslaer *et al.* 2006). In both cases, inclusion of out-of-pocket payments, may change the relative ranking of the households. It is observed that out-of-pocket payments in some low-income countries account a large share of total healthcare financing and Bangladesh is not an exception with 63.3% of its funding through OOP spending (van Doorslaer *et al.* 2006; MoHFW 2015; Mtei *et al.* 2015). It implies that inclusion of OOP healthcare spending in consumption expenditure may have a detrimental effect on the socioeconomic ranking of households. In an empirical investigation, van Doorslaer *et al.* (2007) found that the share of OOP payment (of total consumption expenditure) in richer households was much lower than the poorer households (Van Doorslaer *et al.* 2007). It can thus be argued that the possibility of poorer people to get an upper relative ranking is much high as a consequence of OOP healthcare payment.

The households were classified into quintiles, corresponding to five socioeconomic groups based on total household expenditure (Ataguba and McIntyre 2012). The 'place of residence' of the households was used for classifying them into rural and urban populations.

Healthcare utilization

Healthcare utilization data are available in the HIES at the individual level over the 30 days prior to the survey date. A maximum of two visits for healthcare were recorded in the survey. No distinction of out- and inpatient visits was made in the survey. For NGO providers, all services were assumed to be outpatient.

Provider categories

In the HIES survey, thirteen categories of providers were recorded. In this study, those providers have been recoded into three broader categories, namely: i) public, ii) private and iii) NGO. Services from health workers and medical doctors in public hospitals and clinics were considered as public provision. Healthcare from medical doctors, practicing in private facilities (like, GP chambers, hospitals, clinics) were regarded as private provision. Finally, any services from medical staff (like, health workers, doctors) from NGO health facilities were classified as NGO provision.

Healthcare benefits

Different methods have been applied for estimating the healthcare benefits from different providers. For public facilities, the number of utilized services was multiplied by the weighted unit cost (from WHO-CHOICE) of such utilization (World Health Organization 2013). In estimating healthcare benefits for the private and NGO providers, self-reported out-of-pocket payments were used in order to reflect the prices of the respective services.

Healthcare need

We used ‘self-reported illness and symptoms’ as the indicator of healthcare need. The HIES includes information on self-reported illness or symptoms in the previous 30 days. Prevalence of illness or symptoms per 1,000 people was estimated as a total as well as across socioeconomic groups.

Benefit incidence analysis

Concentration indices (CI) were used to estimate the socioeconomic inequality in utilization of healthcare and associated benefits. The concentration index is a relative measure of inequity that indicates the extent to which healthcare benefits are concentrated in different socioeconomic groups, ranging from the poorest quintile to richest quintile.

The concentration index was estimated using the concentration curve. The concentration curve represents the cumulative proportion of healthcare benefits against the cumulative proportion of population, ranked by household consumption expenditure (excluding out-of-pocket healthcare payments). The concentration index captures twice the area between the concentration curve and the diagonal (Wagstaff *et al.* 1991; Kakwani *et al.* 1997a; O’Donnell *et al.* 2008).

The concentration index can range between -1 and $+1$. When there is no inequality in healthcare benefits the concentration index is 0. A positive value of concentration index implies that the benefits are more concentrated in the higher socio-economic quintiles than lower and vice versa (Kakwani *et al.* 1997b; Koolman and van Doorslaer 2004).

After gaining an understanding of the overall inequality, the relative contributions to inequality of public, private and NGO providers were estimated. The total benefits in the healthcare sector were calculated as the sum of the benefits generated by these providers. Therefore, the total inequality in healthcare benefits, reflected in the concentration index can be decomposed into these components (types of healthcare providers). We decomposed the contribution of each component into its weight in the total healthcare benefits and its association with

the socioeconomic rank. The absolute contribution of each component was calculated by multiplying the CI with the weight of benefits. Absolute contribution was then used to estimate relative contribution as the percentage of total CI (Yao 1999; Khan *et al.* 2002).

Results

The concentration indices of total health benefits demonstrate that the benefits were pro-rich for all types of providers (Table 1). The public providers appeared to be close to equality (CI = 0.044 and t -value = 2.98). Private providers favoured the richer people significantly as shown in the concentration index of 0.237 (t -value = 9.44). NGO providers were slightly pro-rich (CI = 0.095), but not statistically significant (t -value = 0.54). Contributions of types of healthcare providers varied largely, where the private sector alone contributed with 95.9% to total inequality in healthcare benefits. Public and NGO sectors contributed to inequality with 3.5% and 0.65%, respectively.

Table 1. Concentration indices of healthcare benefits in different types of healthcare providers in rural and urban Bangladesh, 2010

Area	Rural			Urban			Total		
Provider	CI ¹⁾	t-test(CI)	Relative contribution	CI	t-test(CI)	Relative contribution	CI	t-test(CI)	Relative contribution
Public	0.032	1.73	3.0%	0.006	0.26	4.5%	0.044	2.98	3.5%
Private	0.235	6.93	96.4%	0.232	7.71	94.7%	0.237	9.44	95.9%
NGO	-0.063	0.54	0.58%	0.338	1.26	0.80%	0.095	0.54	0.65%
All providers	0.227	6.93	100.0%	0.223	7.75	100.0%	0.229	9.50	100%

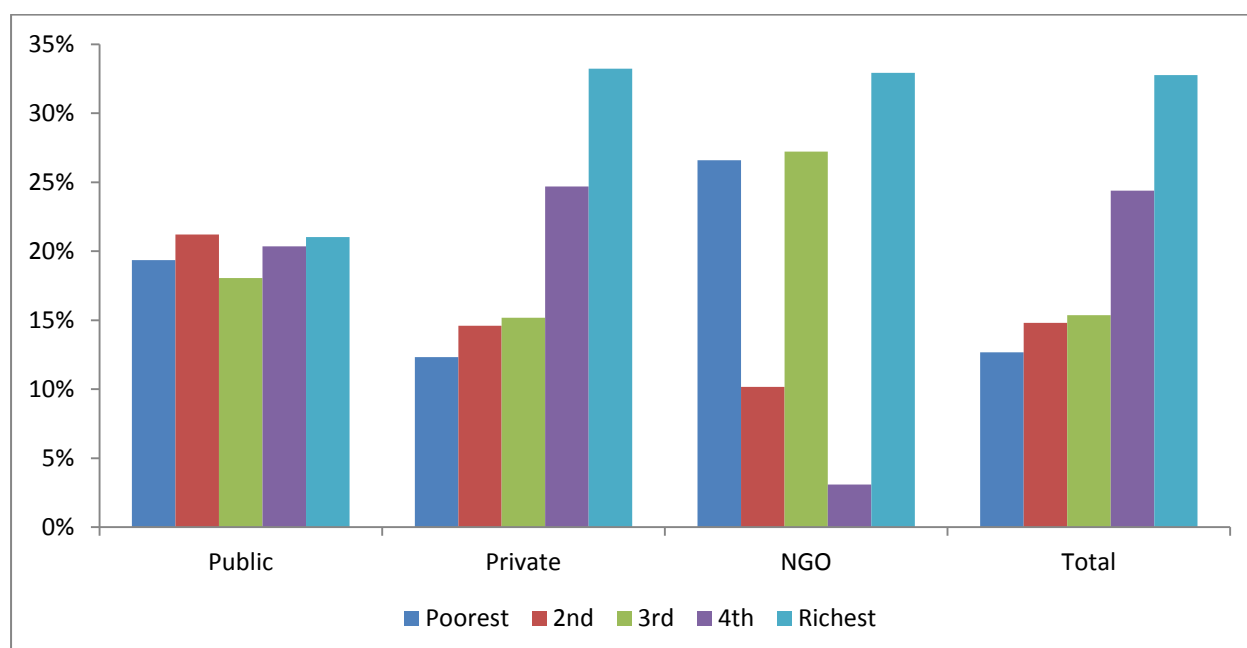
¹⁾Concentration index

Though the difference in inequality in healthcare benefits between rural and urban populations was much similar in total (CI = 0.227 and 0.223 in rural and urban populations, respectively), remarkable differences were observed when the concentration indices were disaggregated into provider types. In the rural population no notable evidence of inequality in healthcare benefits was found in

public providers (CI = -0.032, t -value = 1.73). The analysis of the rural NGO (CI = -0.063) sector resulted in a negative concentration index, but not statistically significant (t -value = 0.54). No considerable difference in inequality was observed in the private sector between rural (CI = 0.235) and urban (CI = 0.232) populations. In the urban population, the public sector did not show inequality in benefits (CI = 0.006, t -value = 0.26) and the NGO sector appeared to be largely and significantly pro-rich (CI = 0.338, t -value = 1.26). The relative contributions to inequality in rural and urban populations were mostly influenced by the private sector (96.4% and 94.7%, respectively). However, public sector providers caring for urban populations contributed slightly more to inequality (4.5%) than that in rural population (3.0%).

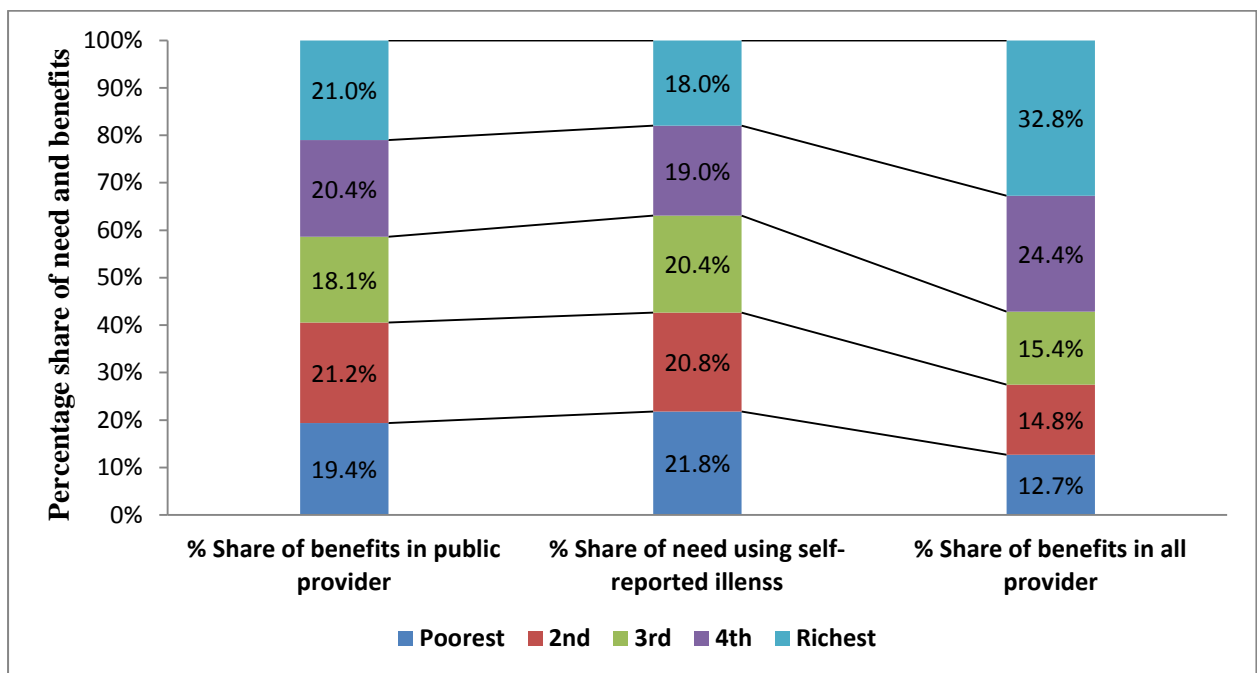
Figure 1 presents the share of benefits from different types of providers across all socioeconomic groups, not disaggregated into rural and urban populations. The distribution of benefits from public and NGO providers did not show any socioeconomic gradient. Use of private providers, however, was remarkably skewed to the richest two groups. Benefits from NGO providers showed no socioeconomic gradient. However, total benefits showed a pro-rich socioeconomic ingredient, influenced by the socioeconomic gradient of benefits from the private providers.

Figure 1. Healthcare benefits per 1,000 people (in BDT) across socioeconomic quintiles and healthcare providers in Bangladesh, 2010



Distribution of health benefits in relation to need for healthcare across five socioeconomic groups is presented in Figure 2. Distribution of healthcare need proxied by “self-reported illness and symptom” showed that the poorest socioeconomic group accounted for 21.8% of total healthcare need, but accrued only 12.7% of total healthcare benefits. On the contrary, the richest socioeconomic group while was in need of 18.0% healthcare utilized 32.8% of total benefits.

Figure 2. Distribution of healthcare benefits from public and all providers in relation with healthcare need across socioeconomic groups in Bangladesh, 2010



Observations across all socioeconomic groups showed that the need for healthcare reduced, but health benefits increased with better socioeconomic position, which demonstrates the inequitable health system in Bangladesh from the view point of values of consumed care.

Discussion

Making healthcare affordable to all populations based on need and irrespective of socioeconomic status is fundamental to achieving Universal Health Coverage. One key measure of the extent to which a country has progressed toward Universal Health Coverage is the pattern of healthcare utilization across socioeconomic groups. It is often expected that such utilization should be greater in poorer groups as a greater need for healthcare is generally more concentrated in these groups.

This study examined the healthcare benefit incidence. It analysed the difference across socioeconomic groups and also the relationship of specific healthcare provision, such as public and private sectors, to the overall equity in the health system of Bangladesh.

The Bangladesh health system has three broad categories of healthcare providers: public, private and NGOs. Along with these providers, people can also seek care from drug sellers and informal providers directly. Given our focus on working toward ameliorating the formal health care system to achieve Universal Health Coverage, our results and discussion focus on three types of formally recognized healthcare providers in Bangladesh.

Healthcare benefits in Bangladesh were concentrated in richer groups (CI = 0.229). There was little difference in these findings between rural (CI = 0.227) and urban (CI = 0.223) populations. It was further observed that the benefits received from public providers were more equitable than from private and NGO providers. While it was expected that benefits from private providers would be pro-rich, such a pattern might have not been anticipated in benefits from NGO providers, which in principle, do not make profit, but recover the costs from the revenue they generate from services. The pro-rich distribution of benefits from NGO providers, however, may be explained by the payment method of care-seekers. NGO providers often provide services to both poor and rich people, but at different prices. Poor people often get the services free or at a lower price, while the rich people pay a higher price for the same services. Concentration indices of benefits from NGOs showed that the benefits were concentrated in richer groups in general and among urban

population in particular. Such concentration was influenced by the benefits incurred by the people in middle socioeconomic quintile (Figure 1).

In urban populations, the benefits from NGOs were more concentrated in richer groups while they were found to be slightly pro-poor in the rural populations. The relative contribution of each provider was influenced by both their share of benefits out of total benefits and the concentration of benefits across socioeconomic groups. A large share of privately provided benefits in the sample may explain the remarkably large contribution of private providers to overall inequity and to rural and urban inequity. This is in the line with the healthcare financing experience of Bangladesh (i.e. 63.3% of total health expenditure comes from out-of-pocket payments (MoHFW 2015)). Despite a large concentration of benefits coming from NGO providers, the contribution to inequality overall (0.54%) as well as rural (0.58%) and urban (0.80%) was low due to a very small share of NGO benefits out of the total healthcare benefits. Our [supplementary data](#) on healthcare utilization from different healthcare providers shows that the utilization of services from private providers was the most pro-rich (not presented in the paper). The utilization from public providers was also pro-rich, but the magnitude was smaller. NGO utilization, however, was pro-poor.

In comparison to healthcare need, benefits from public providers were more equitable than the total benefit distribution (Figure 2). Large pro-rich benefits in private and NGO sectors contributed to more inequity in the health system outcomes. For moving towards Universal Health Coverage, it is important to emphasize here that the public sector contributes to risk- and fund-pooling mechanisms, which reduce reliance on out-of-pocket payments (WHO 2005). Conversely, the private sector may not be affordable to people in lower socioeconomic quintiles and a large share of private sector in health system may contribute to more inequity in healthcare benefits. The role of NGOs is currently limited to a few services (mostly maternal, neonatal and child health, preventive and promotive care). Inclusion of more services with NGO providers may bring additional poorer groups into health coverage, which may contribute to increased equity in the context of Universal Health Coverage.

The findings of this study were very much in the line with other studies in Africa. Mtei *et al.* (2012) found in Tanzania that the total outpatient care benefits from the public sector were marginally concentrated in richer groups (CI = 0.010), while such benefits from the private sector were highly concentrated in richer groups (CI = 0.370). Inpatient care benefits from public providers slightly favoured the richer groups (CI = 0.027), but such benefits from private providers were largely concentrated to richer groups (CI = 0.680). In another study on Ghana, Akazili *et al.* (2012) found that public providers favoured the richer groups for both outpatient (CI = 0.1166) and inpatient (CI = 0.0784) care benefits. Such benefits from private providers were more concentrated in richer groups with concentration indices of 0.1807 and 0.4086 respectively. In a study on South Africa (McIntyre and Ataguba 2012), it was found that in the public sector, outpatient care benefits were concentrated on poorer populations (CI = -0.021), though inpatient care benefits on richer groups (CI = 0.383). Inpatient care benefits from both public (CI = 0.112) and private (CI = 0.532) providers favoured the richer populations. Wagstaff (2012) also observed pro-rich distribution of health benefits in Vietnam (Wagstaff 2012). A report on Benefit Incidence Analysis, conducted earlier in Bangladesh found that the benefits in public facilities were pro-poor (Begum *et al.* 2001). Unlike this study, that report included patients only from public facilities using data from exit interviews.

Comparison between the distribution of healthcare need and benefits showed a similar pattern in the current study and the other studies in Ghana, Tanzania and South Africa (i.e. the poorer socioeconomic groups accrued fewer benefits than needed). In this study, we applied 'self-reported illness and symptoms' as the indicator of healthcare need. Sauerborn *et al.* (1996) argued that self-reported illness can be a poor measure of health need considering the fact that the poor cannot 'afford' to be ill (either in terms of the large opportunity cost of lost work time or due to poor health service access), while high-income groups are likely to have relatively good access to health services as well as sick leave benefits in their formal sector jobs (McIntyre and Ataguba 2011). In this study, we employed data on healthcare need and healthcare utilization from same source i.e. HIES (BBS 2011). If we assume that the need for healthcare was under-reported, the distribution in benefits in relation to need across poor and rich socioeconomic

groups is still large and demonstrates a similar pattern to what was found in previous similar studies.

Compared to previous studies (Akazili *et al.* 2012; Ataguba and McIntyre 2012; Mtei *et al.* 2012), this study has additionally measured the relative contribution of different healthcare providers and geographic locations (rural and urban) to overall disparity in benefits. This analysis provides more nuanced insight into where to intervene to potentially reduce such inequity in the health system of Bangladesh.

The country is still far from achieving Universal Health Coverage when considering the distribution of healthcare benefits in relation to the need for care. The results show that private providers are a major contributor to such disparity. A non-regulated market for healthcare which although is supposed to create market competition consequently reducing prices and increasing quality of care has perhaps contributed to healthcare inequity in Bangladesh. How healthcare from private providers could be more accessible and useful for people in low- and middle-income groups in Bangladesh should be considered in planning the supply of healthcare providers. The public sector providers still, though at a lower margin, favour the richer groups and this too should also be taken into consideration when planning healthcare.

This study is an attempt to perform a benefit incidence analysis using the latest available nationally representative data on healthcare utilization *i.e.* Household Income and Expenditure Survey, 2010 in Bangladesh and WHO-CHOICE data on unit cost of healthcare from different types of providers. While HIES and WHO-CHOICE provided a great opportunity to perform the benefit incidence analysis of healthcare of Bangladesh, there were some limitations that should be mentioned. The nature of the data on healthcare utilization did not allow us to analyse the benefit incidences separately for out- and inpatient care unlike the South African study (McIntyre and Ataguba 2012). Our data included utilization of healthcare in last 30 days and recorded a maximum of two healthcare visits for during this period, which might have affected the inequity estimation of the Bangladesh health system to some extent. For estimating inequity in care from private providers, we used self-reported out-of-pocket payments. The use of OOP payments data could

be justified since 97.4% of private expense in the country was incurred from OOP payments of households (MoHFW 2015) and cost-sharing by any insurance mechanism is negligible as it accounts for only 0.1% of total health expenditure of the country (MoHFW 2015).

This study addressed the distribution healthcare benefits as well as decomposition of the disparity into types of care and care providers. However, further study would be useful to estimate the gap in the absolute amount of benefits required in relation to need.

Conclusions

Overall, in Bangladesh healthcare benefits were found to be pro-rich, particularly with respect to care from private and NGO providers. This disparity was most pronounced in urban populations. This inequity in healthcare benefit distribution, which is a marker of overall health system performance and progress towards achieving Universal Health Coverage, highlights that particular consideration should be given to ensuring that private sector care is more equitable and provision such as that in the public system be further explored.

Ethical consideration

This article has been prepared using secondary data (Household Income and Expenditure Survey of Bangladesh) from the Bangladesh Bureau of Statistics. Thus, this study doesn't require separate ethical approval.

Acknowledgements

The authors thank the Rockefeller Foundation for funding this study. icddr,b acknowledges with gratitude the commitment of the Rockefeller Foundation to its research efforts. icddr,b is also thankful to the Governments of Australia,

Bangladesh, Canada, Sweden and the UK for providing core/unrestricted support. Gratitude goes to Dr. Timothy G. Evans and Dr. Abbas Bhuiya for their cordial cooperation for conducting this study. The authors are very grateful to Dr. Jocalyn Clark for her valuable comments.

Funding

The project has been funded by the Rockefeller Foundation and also some staff-time have been compensated by icddr,b.

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