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Delhi's health system exceptionalism: inadequate progress for a global capital city



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ABSTRACT

Objectives: India has proclaimed commitment to the goal of Universal Health Coverage and Delhi, the National Capital Territory, has increased investment in public health and other health services over the past decade. The research investigates whether Delhi's increased investment in health over this period is associated with a reduction in premature deaths, after the age of 1 year, which could have been avoided with better access to effective health care interventions (amenable mortality).

Study design: A population-based study of changes in amenable mortality (AM) in Delhi over the 2003–2013 period.

Methods: To calculate AM, a list of International Classification of Disease (ICD) codes from the published literature was relied upon. In defining AM in India, an upper age limit of 69 years was adopted, rather than the more common limit of 74 years. Population estimates and vital statistics were downloaded from the Delhi Statistical Handbook. Deaths by cause and age, including medical certification, are from the Vital Statistics site of the Delhi Government. To age-adjust these data, the direct method was employed, using weights derived from the 2010 United Nations world standard population.

Results: The research found that, between 2004 and 2013, the age-adjusted rate of AM rose from 0.87 to 1.09. The leading causes of death in both years were septicemia and tuberculosis. Maternal mortality is well above the global level for middle-income countries.

Conclusion: Recent investments in public health and health care and the capacity to leverage them to improve access to effective care have not been sufficient to overcome the crushing poverty and inequalities within Delhi. Large and growing numbers of residents die prematurely each year due to causes that are amenable to public health and health care interventions.

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Introduction

Delhi, the National Capital Territory (NCT) of India, with more than 16 million inhabitants is the second most populous city of the nation, one of the largest cities in the world, and it continues to grow, primarily due to internal migration from rural areas. Delhi is part of India's wealthiest territory whose population includes a rising number of people in high- and middle-income groups; yet half of its population lives in slums and other substandard housing. As with other global cities, overcrowding and poverty create tremendous public health challenges, and Delhi has responded by increasing public health and health care expenditures as a percent of the NCT's budget from 7 to 12 over the period from 2001 to 2011.¹ In addition, the availability of hospital beds in Delhi almost doubled between 1998 and 2013.² This is consistent with India's more recent 'aspirations' for Universal Health Coverage (UHC).³

The extent to which Delhi authorities have achieved public health and health care improvements is investigated, over the period between 2004 and 2013, as measured by the evolution of premature deaths, after the age of 1 year, which are amenable to health care interventions—amenable mortality (AM). This focus on Delhi is for two reasons. First, there exists a standard of comparison as other global cities from so-called BRIC nations (Brazil, Russia, India, and China) have succeeded in reducing AM through investments in public health and health care.⁴ Second, Delhi's mortality statistics are more complete than those in India as a whole. Since 2003, medical certification of death was made compulsory for public and private hospitals in Delhi.⁵ A 2016 study from the *Bulletin of the World Health Organization* found that only 16.8% of death records in India, in 2011, included a medically certified cause of death because there were not enough physicians available to review deaths that occurred outside the hospitals.⁶ In contrast, just over 62% of the death records in Delhi (between 2004 and 2013) include cause of death.⁷

Delhi's health system

Delhi's health system reflects the contradictions of what Drèze and Sen have called the 'uncertain glory' of India.⁸ The country is characterized by poor population health outcomes co-existing with a booming economy, the world's largest generic drug industry, thriving medical tourism, significant innovations in the delivery, financing and manufacturing of health care services and products,⁹ yet failure to assure minimal standards of sanitation and public health. Public financing of health amounts to only 1% of gross domestic product (GDP) and out-of-pocket health spending represents 59% of health care expenditures of which 70% is spent on medicines alone, leading to indebtedness and poverty.¹⁰ Moreover, the challenge extends beyond leveraging additional resources to improving policy capacity, governance, and implementation of government programs.

Some consequences of India's distribution of health care expenditure are well illustrated in Delhi where the private sector maintains a dominant position in the delivery of outpatient as well as inpatient health care services, including

medical technology, diagnostic procedures, pharmaceuticals, and hospital construction.¹¹ Primary health centers (PHCs) are supposed to be responsible for providing primary and preventive care in the public health sector and medical professionals working at PHCs are salaried local government employees. In reality, PHCs are unable to meet the health care needs of most poor people living in Delhi and other urban areas of India. On average, there are only two medical officers responsible for providing care to as many as 400 patients a day.⁵ Overall, in India, about 80% of outpatient and 60% of inpatient care is provided by the private sector.³ This large private primary care sector, accounting for as much as 40% of services,¹² is made up of registered physicians in private practice and a range of unregistered health care providers, that the government considers 'unqualified'. Patients pay out-of-pocket for the services in the private sector, and there is no regulation of fees.¹³ This severely limits access to care for the poor and puts those with lower incomes at risk of financial distress.

Specialty care, in the public sector, is available at publicly financed Community Health Centers and district hospitals. As with PHCs, medical professionals at these facilities are also salaried government employees. With the exception of the All India Institute of Medical Sciences and a few other public sector specialty hospitals, in Delhi, most public hospitals and other clinical facilities are in poor shape.¹⁴ All India Institute of Medical Sciences is often left to care for low-income patients who could otherwise be treated at primary and secondary levels. The underfunding of the public hospital sector leaves enormous responsibility to the private sector which ranges from world class institutions such as the Fortis Escorts Heart Institute or Max Super Specialty Hospital to virtually unregulated private institutions that leave patients 'at the mercy often enough, of unscrupulous practitioners'.⁸ The High Level Expert Group on UHC, in 2010, recommended that the government should increase spending on health care, strengthen the primary care workforce, and improve quality, governance, and accountability. These recommendations were adopted, but never implemented.³

The Delhi health authorities have made considerable efforts to respond to their population health and health care system challenges, but the multiple levels of government involved makes regulatory policies exceedingly complicated. The Federal government's ministries and departments, the Delhi NCT, and local government authorities (Municipal Corporation of Delhi, the New Delhi Municipal Corporation, and the Delhi Cantonment Board) share responsibility for different aspects of the system. As a result, governance and health care are fragmented and complex.

The Health and Family Welfare Department has extensive health care responsibilities, not only for the registered residents but also shares in caring for the migrant population. There are some 39 Delhi Government hospitals charged with inpatient care as well as outpatient services, including preventive care and health worker training.¹⁵ The Family Welfare Directorate is also involved along with other agencies of Delhi Government, as well as non-governmental organizations (NGOs) in primary health care activities,¹⁶ schemes to provide financial assistance as well as free services to pregnant women, and adolescent health clinics. The extensive plans and projects of the Health Department, including an inventory

of available health care infrastructure, are well summarized on its website.¹⁷ There has been substantial growth in health and education infrastructure since 2000. In addition, the Delhi NCT has strengthened partnerships with community groups. For example, the ‘Bhagidari’ Partnership Program, started in 2000, represents an initiative to build community capacity for the improvement of education, health, and civic amenities in Delhi, together with resident welfare associations.¹⁸ The goal of the Bhagidari program was to create greater citizen participation in urban governance.¹⁹ Similarly, the new government in Delhi, which came into power in February 2014, started the Mohalla (neighborhood) clinics. The goal of these clinics is to provide primary care consultations, free essential drugs, immunization for children, and basic diagnostic tests.²⁰ The hope is that they will alleviate overcrowding in other public clinics and expand access to care for the poor and middle class, but their impact has not yet been evaluated.²¹

Methods

This analysis of public health and health care improvements in Delhi relies on a precise definition of a well-recognized indicator (AM) and publicly available data sources. Examination of this indicator can improve our understanding of whether the recent economic growth in India and Delhi and some of its investment in the public health and the broader health care system has improved Delhi’s population health status.

While it is evident that population health is largely determined by social and economic factors, health care does have a role. There is solid clinical evidence that some causes of premature death are amenable to interventions. The concept of AM is based on evidence that public health services, as well as health education, screening, primary care, and many specialty services, contribute to mortality declines for selected diagnoses.²² For example, maternal mortality can be prevented with antibiotics, safe blood transfusions and emergency surgical care and premature death due to breast cancer can be reduced through screening and early detection and appropriate drug therapy.²³ Cross-national analysis of AM trends, including evidence from other middle-income countries, indicates that these deaths have declined faster, over the last three decades, than other causes of mortality lending credence to the validity of AM as an indicator for the effectiveness of public health interventions and medical care.

To calculate AM, this research relied upon a previously published²⁴ modified version of the definition by Nolte and McKee²² and their list of causes of premature death is, in turn, a modification of the work of Rutstein,²⁵ Tobias and Jackson,²⁶ Mackenbach,²⁷ and Charlton et al.²⁸ Hoffman et al.²⁹ have provided further validation for most of the causes of death noted by Nolte and McKee, which has been applied to both wealthy and middle-income countries.³⁰ In measuring AM, along with Nolte and McKee, only 50% of deaths from ischemic heart disease (IHD) were counted. The inclusion of 50% of IHD deaths is now a broadly accepted approach, but whether none, all or 50% of these deaths are included, our results do not change.

In defining AM in India, an upper age limit of 69 years was adopted, rather than the more common limit of 74 years.

There were two reasons for this alteration of the standard definition. First, mortality statistics in Delhi are collected by age cohort to age 69, and all deaths at 70 and over are combined, so it is not possible to identify deaths among those aged 70–74 only. Second, overall life expectancy at birth is lower in India than among higher- and middle-income nations for which the original age cut off was established. As discussed below, the use of a lower age cut off, in Delhi, results in a lower rate of AM than would be found using the original definition, but it is unlikely to change the direction of change in this measure over time.

Population estimates and vital statistics were downloaded from the Delhi Statistical Handbook.³¹ Deaths by cause and age, including medical certification are from the Vital Statistics site of the Delhi Government.³² To age-adjust these data, the direct method was employed, using weights derived from the 2010 United Nations world standard population.

Results

The age-adjusted rates of total medically certified deaths, per 1000 people, among those through age 69 years, as well as AM increased over the period, 2004–2013 (Fig. 1). The age-adjusted rate of total medically certified deaths increased from 3.39 to 3.89. The age-adjusted rate of AM rose from 0.87 to 1.09. The 10 most frequent causes of AM for 2005 and 2013 are shown in Table 1. The leading causes of death in both years were septicemia and tuberculosis (TB). Maternal mortality is still well above the global level for middle-income countries, but fell significantly during this time period.

Discussion

AM is typically used as an indicator of overall health system performance. Rates of AM can be influenced by investments in public health e.g. the development of better water and sewage systems, as well as improvements in primary and specialty health services. Because this indicator allows researchers and policymakers to assess a range of public health and health services investments in the field, it is particularly useful for assessing health interventions among middle- and lower-income countries that face the dual challenges of improving public health infrastructure to address social and economic determinants of health, while extending access to health care services.

Despite the commitment to UHC, an increase in the Delhi NCT budget for health, declines in infant mortality (2005–13), and increases in life expectancy at birth (2004–10), there was no decline in AM over the 2004–13 period.³³ The age-adjusted rate of AM actually increased by 25.3%. This stands in stark contrast to other global cities in BRIC nations – São Paulo, Moscow, and Shanghai—all of which experienced 20–30% declines in AM over the 2000–10 period.⁴ Delhi also presents a striking contrast to these other global cities because acute illnesses—sepsis (a potentially life-threatening complication of an infection), TB, and pneumonia—still predominate.³⁴ Although cerebrovascular disease is one of the leading

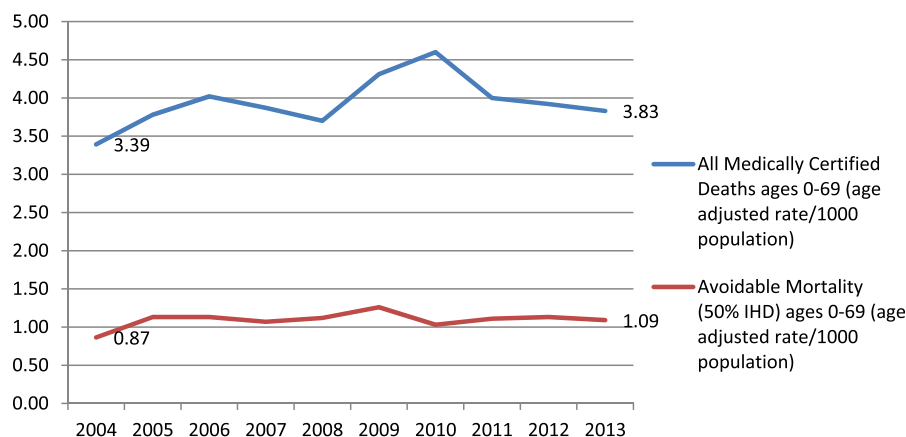


Fig. 1 – Medically certified amenable mortality in Delhi, 2004–2013. Sources: Population—Delhi Statistical Handbook; deaths—vital statistics, Delhi NCT government: ‘annual report of births and death in Delhi’.

Table 1 – Ten most common certified causes of death, 2005 and 2013.

2005		2013	
Cause	Number of deaths	Cause	Number of deaths
Septicemia	3975	Septicemia	4370
Tuberculosis	3309	Tuberculosis	2896
Cerebrovascular disease	1251	Cerebrovascular disease	1677
Hypertension	1246	Endocrine diseases, including diabetes mellitus	1533
Pneumonia	1214	Ischemic heart disease	1380
Ischemic heart disease	1208	Pneumonia	1245
Endocrine diseases, including diabetes mellitus	1192	Nephritis and nephrosis	1113
Nephritis and nephrosis	941	Hypertension	743
Leukemia	536	Leukemia	625
Maternal death	479	Maternal death	196

Source: Vital Statistics, Delhi NCT Government.

causes of AM in these other global cities, neither sepsis nor TB are among the top two causes of their AM deaths.

High rates of premature deaths due to TB are not surprising given what we know about poor access to primary and specialty care among low- and middle-income residents of Delhi. TB is seldom asymptomatic. Patients usually present with persistent productive cough and fever and need an evaluation including a chest X-ray and sputum examination; but these are often not available to poor residents of Delhi. Furthermore, once people are diagnosed, they need to be treated and followed aggressively. Drug resistant strains of TB require particularly long and aggressive treatments that are often not available to residents in Delhi.³⁴ Beyond access to health care, high rates of premature mortality due to TB also reflect environmental conditions in the city's slums and high rates of HIV. Living in the crowded conditions is conducive to the spread of TB because droplet inhalation occurs with prolonged contact with an untreated or inadequately treated individual. Spread is made worse by being immuno-suppressed, so high rates of HIV also contribute to the problem.³⁵

The high rate of sepsis may be explained, in part, by a failure to recognize and treat infections properly, early in their course, in the outpatient setting, including gastrointestinal, respiratory, and urinary tract infections. This reflects problems in access to appropriate care, including

inadequate diagnostic capability in the ambulatory care as well as in hospitals. One of the challenges associated with appropriate treatment of sepsis is timely diagnosis. If patients do not have access to adequate laboratory and X-ray facilities and appropriate antibiotics, they are more likely to develop and die from the sepsis. Proper management of sepsis at a minimum requires early intensive inpatient care, including antimicrobial agents given as soon as possible, targeted to the most likely pathogens, as well as correction of life-threatening metabolic, circulatory, and respiratory abnormalities.³⁶

Many of the other major contributing factors to the increase in AM in Delhi—cerebrovascular disease, endocrine diseases (diabetes mellitus), and IHD—are associated with population aging and changes in lifestyle that lead to greater obesity.³⁷ The growth of premature mortality associated with these conditions suggests that public health policies have not been effective at combating growth of non-communicable disease, and that the health care system in Delhi has not addressed the consequences of these changes. As the Delhi Human Development Report noted, ‘a large contributor to the growing burden of chronic diseases in Delhi is the poor, less-educated population residing in slums and other low-income localities, with limited means to afford the economic impacts of chronic ailments.’³³

Although the Delhi health system has achieved important reductions in maternal mortality, as the population ages and the prevalence of non-communicable disease increases, Delhi and the broader Indian health system will need to adapt to the changing needs of the population. For example, many residents of Delhi do not have access to mammography screening or the drugs and other interventions that are capable of reducing premature death due to breast cancer. Ideally, Delhi will expand access to these services for its poor- and middle-income residents. Studies have found that increasing breast cancer screening in India would be highly cost-effective.³⁸ Yet, even without an expansion of expensive technologies, it is possible to reduce deaths due to breast, and other forms of cancer. As Shulman et al. argue, ‘there were substantial improvements in survival in the USA even before these technological and diagnostic advances, suggesting important opportunities for early detection and treatment in low- and middle-income countries where these options are often unavailable and/or unaffordable.’⁴⁰ An improved primary care system and better referrals ‘for basic surgical and hormonal treatment’³⁹ would improve the outcomes we observe in Delhi.

Finally, the use of several low-cost drugs, including tamoxifen and generic first-line chemotherapy drugs have been used to reduce rates of premature mortality in other middle- and low-income countries.⁴⁰ India should act on the recommendations of the Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries, led by Dr. Paul Farmer.⁴⁰ This task force highlighted the immediate need for cancer treatment, strengthening health systems, particularly primary care, and addressing inequalities in the distribution of health care resources in low- and middle-income countries. India’s failure to implement these recommendations is reflected in Delhi’s increasing rates of AM that are documented in this article.

In interpreting Delhi’s inadequate progress, in comparison to other global capital cities among BRIC nations, one must, of course, acknowledge that India’s and Delhi’s per capita GDP are far lower than the BRIC nations and cities to which we are comparing them. Nonetheless, the contrast is striking because economic growth in India and Delhi has been strong. Although Delhi’s failure to achieve a decline in AM suggests that it is not doing as well as other BRIC global cities, it should be acknowledged that the comparability of these findings is limited because this article’s definition of AM is not identical. As noted earlier, this analysis does not include deaths in the 69–74 age bracket because Delhi aggregates deaths into a single group for the population over age 69. As a result, the comparison with other BRIC global cities should be interpreted with caution. Nevertheless, it seems unlikely that the inclusion of deaths among those aged 69–74 would have resulted in a decline in AM rates during this time period.

The ability to monitor health system performance is dependent on there being comprehensive civil registration and vital statistics system.⁴¹ This analysis highlights India’s paucity of health information and analysis of basic vital statistics. In its National Health Policy of 2002, the Government of India acknowledged the absence of systematic and scientific population health statistics as a major deficiency.⁴² Although there have been some attempts to improve data sources,^{43,44} there are still large gaps in vital statistics.⁴⁵ The national

birth and death registration system is estimated to cover only about half to two-thirds of deaths,⁴⁶ and far fewer include medically certified causes of death.

Focusing on Delhi, overcame the problem of severely inadequate mortality data in India, but only captured about 63% of deaths over the time period examined. It seems likely that the deaths for which there was no medical certification are concentrated among poor people who die at home or in under-funded public facilities. Because morbidity is higher and access to health care is more difficult for the poor, it is likely that their rate of AM is higher, which suggests that the health system in Delhi, according to this measure, is even worse than these findings suggest.

Further use of the AM indicator in India will depend on government capacity to improve its death registration system and vital statistics. Initial estimates of AM trends were generated in Delhi because its public health information system is more complete than the rest of the country, but even in this relatively wealthy, politically important, and rising global city, estimates that allow for direct international comparisons cannot be produced. As India increases its spending on public health and health services, it will be critical for the government to develop capacity to assess the effects of these investments. While the establishment of a proposed national health information system, launched in 2008, based on a unique health card to all citizens and the creation of a health information center is valuable, simply improving the death registration system and vital statistics would be a good place to begin.⁴⁷

Despite the limitations noted, the preliminary findings suggest that recent investments in public health and health care, and the capacity to leverage them to improve access to effective care have not been sufficient to overcome the crushing poverty and inequality in Delhi. Large and growing numbers of residents die prematurely each year due to causes that are amenable to public health and health care interventions. Delhi, and the rest of India, are unlikely to make substantial improvements in these outcomes unless they substantially increase public health spending, monitor health system performance, and improve government capacity to adopt policies and implement a range of programs that address the causes of extreme deprivation.

Author statements

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Ethical approval

This research did not require IRB approval because we relied exclusively on publicly available administrative data.

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Competing interests

None declared.

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