



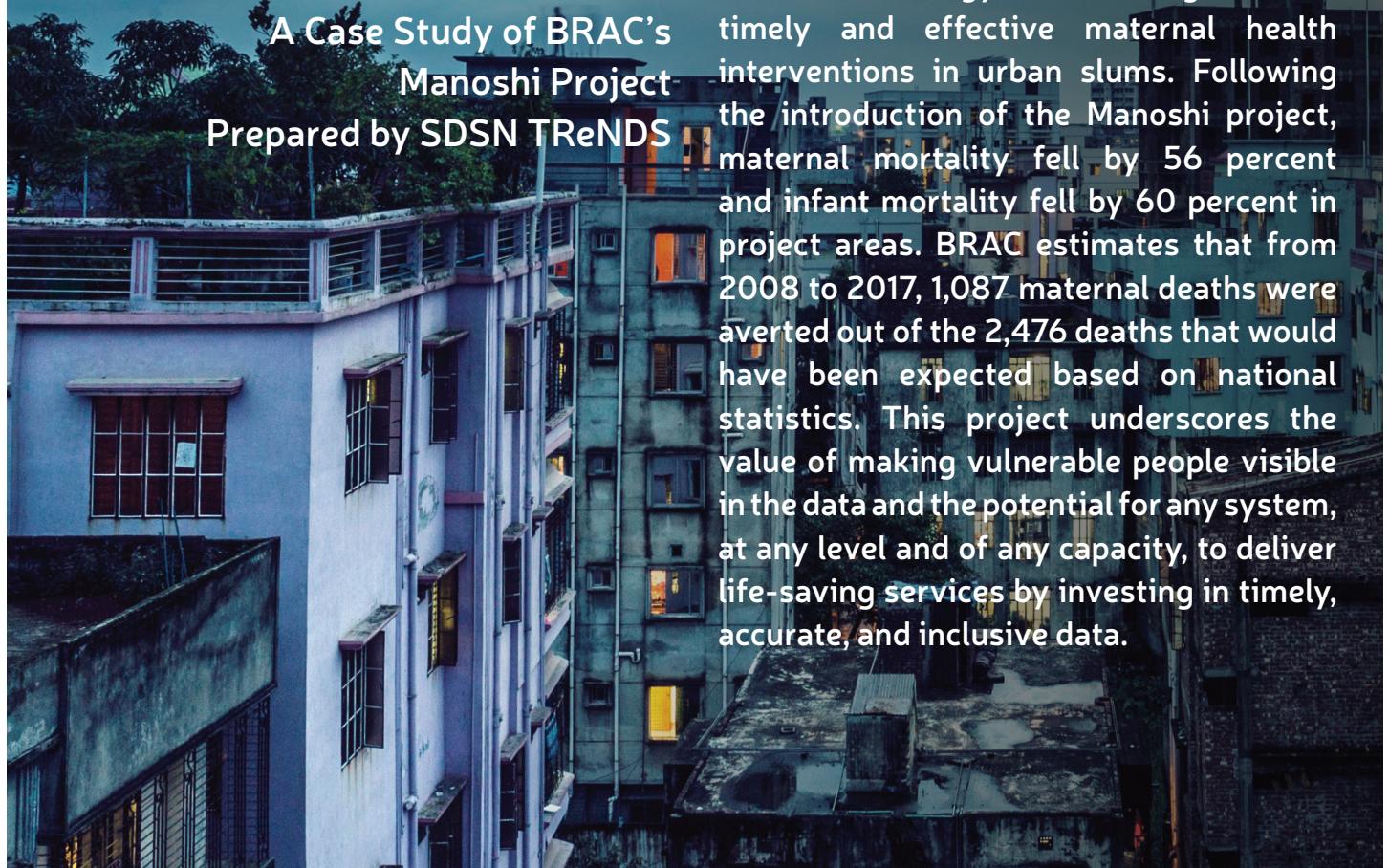
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Bangladeshi Slums Reduce Maternal and Infant Mortality with the Help of Innovative Health Data

A Case Study of BRAC's
Manoshi Project
Prepared by SDSN TReNDS

Nearly one billion people worldwide live in slums—unplanned communities that are overcrowded, highly impoverished, and hazardous to their residents. These people are at high risk of being left behind not only in official statistics, but also in receiving essential services like healthcare. International nonprofit BRAC developed a data-driven approach to account and care for mothers and young children in these communities through healthcare initiative Manoshi. Manoshi built the capacity of local health workers in Bangladesh to derive actionable data from social mapping, local censuses, and real-time data-sharing via mobile technology, contributing to more timely and effective maternal health interventions in urban slums. Following the introduction of the Manoshi project, maternal mortality fell by 56 percent and infant mortality fell by 60 percent in project areas. BRAC estimates that from 2008 to 2017, 1,087 maternal deaths were averted out of the 2,476 deaths that would have been expected based on national statistics. This project underscores the value of making vulnerable people visible in the data and the potential for any system, at any level and of any capacity, to deliver life-saving services by investing in timely, accurate, and inclusive data.





Context

According to UN-Habitat, approximately 1 billion people live in urban slums globally (UN-Habitat 2016), and slum conditions are particularly acute in developing countries. Poverty and limited sanitation in slums contribute to health issues, and the unorganized layout of slum communities also makes individual patients difficult to identify and monitor (Marcil, Afsana, and Perry 2016). In Bangladesh, slums have grown as people migrate from rural areas in search of economic opportunities.

According to 2017 estimates, Bangladesh has been urbanizing at an annual rate of 3.17 percent, with 36.6 percent of the country's 158 million population now living in urban areas (Central Intelligence Agency, n.d.). Slums have grown at a disproportionate rate (Adams, Nababan, and Manzoor Ahmed Hanifi 2015) and they struggle with sanitation, water access, and waste disposal services (Uddin 2018).

In the project areas, maternal mortality rates fell by 56 percent and infant mortality fell by 60 percent between 2007 and 2013 (Roy et al, 2014).

Although Bangladesh has made progress in the provision of healthcare, with national neonatal mortality rates cut by more than half between 1990 and 2010 (Hoope-Bender et al. 2014), significant challenges persist. Health outcomes are historically worse in slums, where fewer women receive antenatal care and many give birth at home (Hoope-Bender et al. 2014). In 2007, around 86 percent of slum births took place at home, where multiple families might share a confined space in unhygienic conditions (Afsana 2018). At this time, calculations found Bangladeshi slums had a maternal mortality rate of 294 deaths per 100,000 live births and a neonatal mortality rate of 43 deaths per 1,000 live births (Marcil, Afsana, and Perry 2016).

BRAC—the world's largest non-governmental development organization as measured by number of employees—developed an intervention to improve maternal and neonatal health in Bangladeshi



slums (Hoope-Bender et al. 2014). The Manoshi project created a network of health workers armed with information about the communities they serve.

Description of Data Solution

The Manoshi project developed a multimodal data solution to address the unique challenges faced by women in slum conditions. BRAC had existing maternity programs in rural Bangladesh, but this model could not translate directly to the urban context (Afsana 2018). A comprehensive map of slum communities was created to locate pregnant women, mothers, and their children. This information was then used to guide healthcare workers and increase the availability of health services. Additional data was collected on individual patients using mobile technology.

Social Mapping and Census

Data collection began with a social mapping exercise that located significant landmarks, including mosques, schools, markets, and bridges (Afsana, 2018). Community surveyors received specialized training and then systematically assigned a number to every house in the slum, using identified landmarks for reference (Hoope-Bender et al. 2014). Numbers were marked both on a hand-drawn map and on the front of the actual house. Different households sharing the same house were also assigned a letter code to distinguish them.

Following the social mapping, a local census was performed to understand the demographics and economic condition of all households (Roy et al. 2014). Households were randomly selected to be resurveyed as a check for census accuracy (Hoope-Bender et al. 2014). The census is updated every six months, enabling health workers to track households in the slum communities and identify pregnant women (Afsana 2018).

Mobile Data Collection

In addition to census data, health workers were provided with mobile phones for near-real-time reporting of standardized patient data.



Prior to the mobile intervention, the centralized Manoshi management team could only access data after manual submission at the end of the month, so resources were not optimally allocated (Alam, Khanam, and Khan 2010). Click Diagnostics (later renamed MPower-Health) developed a mobile module in Java for the Nokia 3110c. This allowed workers to view schedules, receive feedback, and automatically display data in a companion web module (Alam, Khanam, and Khan 2010). The tool was developed to improve the reporting process, perform remote risk screening, and better allocate staff according to advanced algorithms (Center for Health Market Innovations 2018). BRAC conducted a pilot of the application between July 2009 and January 2010 and found that health workers were able to use the application effectively to conduct the household census and submit data (Rahman 2018). Following on initial successes, BRAC continued to roll out the platform, and mobile phones were connected with a central support center at BRAC offices (Roy et al. 2014).

Implementation

The project was first piloted in a single slum community of Dhaka, the capital of Bangladesh, in 2007. It expanded to all Dhaka slums by the end of the year (Alam, Khanam, and Khan 2010). By 2012, the project covered 5.7 million Bangladeshi slum inhabitants (Afsana, 2018). As of 2014 it had extended to 6.9 million slum inhabitants, including 1.8 million women of reproductive age and over 191,000 newly pregnant women (Hoope-Bender et al. 2014).

The project operates in slums in ten city corporations and one municipality across Bangladesh, covering approximately 6.9 million inhabitants (Rahman 2018).

BRAC formed a package of interventions informed by the data collection. Pregnant and lactating women, as well as children under five, receive healthcare services through a community-based system managed by BRAC (Roy et al. 2014). The program works to ensure all pregnant women receive a comprehensive prenatal checkup focusing



on basic health concerns, including abdominal tests and blood pressure exams (Afsana 2018). Services are administered by a network of community health workers (CHWs) (Roy et al. 2014). Shasthya shebikas each visit an assigned group of 150 to 200 households every month, and they provide a range of basic services. Shashthya shebikas receive incentives based on the number of pregnancies they identify and deliveries they support, and they can sell medical and sanitation supplies to make a small profit. Shasthya kormis supervise the shashthya shebikas, visiting all 10,000 households they oversee at least once every three months (Roy et al. 2014).

BRAC developed trust within slum communities by incorporating traditional practices into the Manoshi program (Marcil, Afsana, and Perry 2016). Traditional birth attendants are women who lack formal training but have considerable experience with deliveries. BRAC provided these familiar community members with additional training and incorporated them as urban birth attendants. At the start of implementation, urban birth attendants were based at birthing huts—minimalist facilities located in slum communities, where women can deliver babies with privacy and support. Informed by the social maps, birthing huts were situated so that each would cover a population of around 10,000 and attend to one birth per day on average (Afsana 2018).

Yet the huts could not properly address bleeding and other serious complications, and the hospital delivery rate was increasing, especially in regard to the need for caesarean sections (Afsana 2018). As a result, BRAC created Maternity Centers, which are more advanced facilities staffed by trained paramedics. There are now 45 Maternity Centers operating in 10 city corporations and one municipality throughout Bangladesh (Afsana 2018). Accordingly, the number of birthing huts was reduced from a peak of 426 to approximately 45. As of 2018, Manoshi employs 4,500 shasthya shebikas and 450 shasthya kormis, along with 180 midwives across Bangladesh (Afsana 2018).

BRAC has also developed partnerships with local government hospitals, but these are not committed to under formal agreements (Afsana 2018). Urban primary healthcare in Bangladesh is provided by



a combination of government and NGO services, but the government does not officially recognize slums, and slum communities are not specifically addressed in health policies (Afsana 2018). BRAC has stationed referral staff at partner hospitals to assist Manoshi patients with navigating admission and treatment (Hoope-Bender et al. 2014), and women below a determined income level can be reimbursed for emergency care (Roy et al. 2014).

The collection of data and the clear assignment of CHWs to specific households allows BRAC to assess an individual's performance and iteratively improve the program. BRAC is alerted when a pregnant woman or child under five dies, and a Manoshi program officer visits the household to interview the family and conduct an autopsy (Roy et al. 2014). Manoshi then holds a community meeting to identify potential service issues and works to avoid similar fatalities.

Funding

BRAC received initial funding for the Manoshi project from the Bill & Melinda Gates Foundation, which provided \$25 million from 2007 to 2012 (Afsana 2018). Since the close of this funding, the UK Department for International Development (DFID) and the Australian Government have provided combined funds of \$3 to \$4 million annually (Afsana 2018).

The Bill & Melinda Gates Foundation provided US\$25 million in funding from 2007 to 2012. The UK and Australian governments have subsequently provided \$3 to 4 million annually.

Additionally, the Maternity Centers initiated fees in 2011 for services including antenatal care, delivery services, and various tests (Rahman 2018), supporting costs such as staffing (Afsana 2018). The fees are minimal in comparison to the wider competitive market, and BRAC provides free services for the ultra-poor (Rahman 2018), defined as those with a household monthly income under 5,000 taka (US\$64)



(Roy et al. 2014). Through this fee structure, a Maternity Center can become self-sustaining within 15 to 18 months (Afsana 2018).

Impact

The Manoshi project areas have observed an uptake of available health care services and an improvement in health outcomes for slum residents.

Logistical Improvements

The social mapping exercises provided accurate information about the community, allowing birthing facilities to be placed in more central and accessible locations. For example, overlaying population distributions with landmarks led to designs that reduced the need to cross a bamboo bridge when traveling to a birthing facility, which pregnant women in the community prefer to avoid (Roy et al. 2014). Also, BRAC was able to allocate an appropriate number of health workers to serve the local population, and women could be more easily directed to their nearest facility (Hoope-Bender et al. 2014). Social maps were of particular importance as BRAC established a presence in slums, but these maps became less significant as workers grew familiar with the communities (Afsana 2018).

Increased Institutional Deliveries

In 2007, an estimated 86 percent of women from slums in Bangladesh gave birth at home, and only one-quarter received antenatal and postnatal care (Marcil, Afsana, and Perry 2016). A survey of women from Manoshi project areas in Dhaka showed that of the 15 percent who chose to deliver at a healthcare facility in 2007, only one percent used a BRAC facility. A repeat survey in 2011 found that 23 percent of women delivered at BRAC facilities, and 59 percent delivered at either a BRAC facility or a hospital. The surveyors concluded that Manoshi was successful at improving practices and reducing inequalities (Alam, Khanam, and Khan 2010). Although not all additional, institutional births occurred at BRAC facilities, BRAC had provided prenatal services, raised public awareness, and referred emergency cases to



hospitals. By 2013, 87 percent of women delivered at either a BRAC or hospital facility (Marcil, Afsana, and Perry 2016).

Improved Health Outcomes

Maternal mortality rates declined by 40 percent nationwide between 2001 and 2010, but Manoshi communities exceeded this trend (Marcil, Afsana, and Perry 2016). At the start of implementation, the project area was experiencing high mortality and limited access to health services. Between 2007 and 2013, the maternal mortality rate in the Manoshi service area fell 56 percent from 294 deaths per 100,000 live births to 130 deaths per 100,000 live births (Marcil, Afsana, and Perry 2016). Over the same period, the neonatal mortality rate in the service area fell 60 percent from 43 deaths per 1,000 live births to 17 per 1,000 live births (Marcil, Afsana, and Perry 2016). In 2010, the national maternal mortality rate was 170 deaths per 100,000 live births, and the national neonatal mortality rate was 36 deaths per live births. The mortality rates in Manoshi service areas were lower than these national figures when next measured in 2011, suggesting that the interventions have helped to reverse historic health inequities. As of 2016, similar progress has not been observed across Bangladesh; national neonatal mortality rates have declined to 28 deaths per 1,000, but national mortality rates have reportedly increased to 196 deaths per 100,000 live births (Afsana, 2016). BRAC has estimated that between 2008 and 2017, the Manoshi program averted 1,087 maternal deaths out of an estimated 2,476 deaths that otherwise would have occurred based on national statistics (Afsana 2018).

An additional proxy for overall quality of care is the fresh stillbirth rate, which divides the number of stillbirths by the combined number of still and live births (WHO 2018). The rate correlates with access to maternal services, and nearly half of stillbirths occur during labor. In 2016, the fresh stillbirth rate for home deliveries was 1.9 percent; in hospitals, 1.8 percent; and in BRAC Maternity Centers, 1.3 percent (Afsana 2018). This is further evidence that BRAC centers support better health outcomes.



The Importance of Community Health Workers

A social network analysis suggests that CHWs were important to realizing these health benefits. Adams et al. surveyed 993 women from Dhaka slums who had recently given birth (Adams, Nababan, and Manzoor Ahmed Hanifi 2015). Women who accepted Manoshi membership by default were compared against those who had opted out of the program. For Manoshi members, CHWs served as the main source of informational, instrumental, and emotional support during pregnancy, while non-members relied more on mothers-in-law and other family. Furthermore, women who included Manoshi CHWs in their social networks were far more likely to use maternal and postnatal services. Women who listed a CHW in their network were twice as likely to deliver with a trained attendant, and Manoshi members in particular were three times as likely to receive postnatal care. Conversely, relying solely on a mother-in-law and family was associated with negative outcomes. These results demonstrate how CHWs have successfully integrated into support networks, and underscore the importance of making women known to the health system.

Mobile Data Sharing

BRAC's seven-month pilot evaluation of the mobile data collection system from Click Diagnostics showed success (Rahman 2018), but issues were later realized (Afsana 2018). Follow up interviews with nine shasthya kormis suggested that the module could shorten patient appointments from 30 minutes to within a range of four to six minutes, and the data could be processed immediately (Alam, Khanam, and Khan 2010). The module reduced the potential for errors in comparison to manual reports, and questions could be updated at no expense. However, a BRAC review in 2018 found that the mobile application had several issues and was no longer fit for purpose (Afsana 2018). Identified problems include missing records, misreporting, and the lack of a dashboard for analyzing data (Rahman 2018). Maternity Centers have been simultaneously maintaining complete records, so potential disruptions were minimized (Afsana 2018). BRAC is now planning an overhaul of its mobile health program (Rahman



2018). The Bangladeshi government has recently adopted the DHIS2 and OpenSRP health reporting platforms to support the national exchange of health data, and BRAC intends for the revised application to be interoperable with the government's system (Rahman 2018). A new application would not only improve the collection of data but would also allow for maternal and neonatal mortalities from slum communities to be officially reported (Rahman 2018).

Challenges

Overall access to maternal health care services has improved in Bangladeshi slums, but health facilities still struggle with limited staff and medical supplies (Hoope-Bender et al. 2014). At the start of Manoshi implementation, CHWs faced difficulties in identifying all households because the operation was logically complex (Afsana 2018). The slum communities are also in constant flux, with 20 to 40 percent of the slum population moving annually (Roy et al. 2014). As a result, BRAC has to perform an update every six months of all the information from the communities where they work (Afsana 2018).

Additionally, Bangladeshi slum communities face the constant risk of being forcibly removed by the government from the land they informally occupy, making way for other forms of development (Islam and Mungai 2016). When a community supported by Manoshi is evicted, BRAC attempts to follow up with displaced mothers and children, but this is unavoidably difficult (Afsana 2018). Slums are also being forced further into flood-prone river banks, compromising the health and safety of residents (Roy et al. 2014).

Replication

In 2013, BRAC received a Healthcare Innovation Award from pharmaceutical company GSK and nonprofit Save the Children in recognition of Manoshi (GSK 2013). The prize money of \$300,000 was invested in replicating the Manoshi program in the slums of Freetown, Sierra Leone (BRAC 2013). These slums experience some of the highest under-five and maternal mortality rates in the world. The investment is part of a larger initiative in the area with funding from UNICEF and the UK's foreign aid efforts, and BRAC has developed a series of interventions that address microfinancing, advocacy, and



health (Sesay 2015). BRAC adapted Manoshi's operations to the local community in Freetown, where the government is more active in the delivery of slum health services (Afsana 2018). The Manoshi expansion has involved creating Maternity Centers, developing CHW capacity, and identifying pregnancies (Sesay 2015). The program started a few health facilities that are continuing under government operation (Afsana 2018).

Conclusion

The complex layout of Bangladeshi slum communities has long made it difficult for residents to access healthcare services. Combining data from social mapping, a local census, and continual e-record sharing provided a detailed understanding of these communities and their individual healthcare needs. Empowered by this data, BRAC has trained a team of community healthcare workers that can use information to monitor pregnant women, mothers, and young children. The ability to identify and support individuals has expanded the availability of health facilities and dramatically improved maternal and neonatal health outcomes. The informed application of data has saved lives and protected the most vulnerable members of Bangladeshi society. Wider applications of social maps and household level demographic and economic data could realize even greater benefits for these historically marginalized communities.

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