Demography India (2017) ISSN: 0970-454X
Vol. 46, Issue: 1, pp: 01-21

Research Article

Progress Towards Child Survival in India: 1971-2015

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Abstract

This paper analyses the progress towards child survival in India during the period 1971 through 2015 in terms of the probability of survival up to the 18th birthday and the probability of survival up to the 5th birthday on the basis of the official life tables prepared by the Government of India. The analysis reveals that child survival progress has not been the same in different mutually independent population sub-groups and the progress has slowed down substantially after 1991-95 as compared to the progress before 1991-95. There has been some acceleration in the progress after 2001-05 but this acceleration is confined to the survival probability in the first year only. This slowing down of the progress appears to be the reason behind India missing the MDG 4. The analysis also reveals that around 85 per cent of the improvement in the survival probability has been confined to children below five years of age while improvement in survival of children aged 5-17 years of age has at best been marginal. In most of states of the country, the progress has not been fast enough to achieve MDG 4. The paper calls for reinvigorating child survival efforts in the country to achieve the goals laid down in the National Health Policy 2017 and the targets set under United Nations 2030 Agenda for Sustainable Development.

Introduction

Concerns about securing the life of the Indian children date back to 1946 when the First Health Survey and Development Committee constituted during the colonial rule recommended that measures directed towards reducing sickness and mortality in children must be given the highest priority in the programme for health development in the country (Government of India, 1946). After independence, improving the survival of children has been one of the priority development agenda in all Five-year Development Plans of the country. In 1974, the Government of India announced the first National Policy on Children which declared children as country's "supremely important asset" and emphasised that the programmes for children should be given prominent place in national plans for the development of human resources, so that children could grow up to become robust citizens, physically fit, mentally alert and morally healthy, endowed with the skills and motivations provided by the society (Government of India, 1974). In 1975, the Integrated Child Development Scheme was launched which is now the world's largest community-based outreach programme for early childhood development and which has implications for securing the life of Indian children (Government of India, 1975).

Concerted efforts towards improving child survival in India, could however be started only in 1978 when the Expanded Programme of Immunisation and the National Programme for the Control of Diarrhoeal Diseases were launched (Sokhey, Kim-Farley and Bhargava, 1989; World Health Organization, 1986; Tyagi, 1983). The Expanded Programme of Immunisation graduated into the Universal Immunisation Programme in 1985 and was given the status of National Technology Mission in 1986 (Government of India, 1988). In 1989, the National Acute Respiratory Infections Control Programme was launched and, in 1992, different vertical programmes and activities directed towards health of mothers and children were subsumed into the Child Survival and Safe Motherhood Programme (Government of India, 1992) which was expanded into the Reproductive and Child

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Health Programme in 1997 (Government of India, 1997). The Reproductive and Child Health Programme has been the lead programme of the National Rural Health Mission (2005-2012) launched in 2005 (Government of India, 2005) which has since been expanded into the National Health Mission.

There have been other initiatives also to address child survival and health related issues in India. These include pulse polio initiative launched in 1995, constitution of a Technical Committee on Child Health and the Immunisation in 2000 and formation of National Technical Advisory Group on Immunisation in 2001 (Government of India, 2003). In 2013, the Government of India announced the new National Policy on Children which affirmed that the right to life, survival, health and nutrition was an inalienable right of every child (Government of India, 2013). The recently announced India's National Health Policy 2017 aims at reducing the under-five mortality rate to 23 under five deaths for every 1000 live births by 2025 through reducing the infant mortality rate to 28 infant deaths for every 1000 live births by 2019 and neonatal mortality rate to 16 neonatal deaths for every 1000 live births by 2025 (Government of India, 2017a). The policy emphasises addressing social determinants of child survival and health through developmental action in all sectors.

How have India's child survival efforts contributed towards improving the survival chances of Indian children? The available evidence suggests that the survival probability during the first five years of life in India has improved substantially during the last 40 years. This improvement is often cited as the evidence of the success of the child survival movement in India. However, the pace of improvement has been slower than expected so that the child survival probability in India remains low by international standards. The estimates prepared by the United Nations Inter-Agency Group for Child Mortality Estimation (UNICEF, 2015) suggest that the under-five mortality rate in India decreased by 62 per cent between 1990 and 2015 so that the Millennium Development Goal 4 could not be achieved. It is estimated that India alone accounted for more than 20 per cent (about 1.2 million) of about 5.9 million deaths of children below five years of age in the world in 2015. It is also argued that about 57 per cent of the deaths in children below five years of age in India can be prevented through achieving high coverage of basic public health and nutrition interventions (Jones, Schultink and Babille, 2006).

It is worth pointing our here that nearly all studies on the progress towards child survival in India have been limited to the survival in either the first year of life or the first five years of life (Puffer, 1985, Visaria, 1985; Jain and Visaria, 1988; Tilak, 1991; Pandey et al, 1998; Measham et al, 1999; Claeson et al, 2000; NIMS and UNICEF, 2012; Kuntla, Goli and Jain, 2014; NIPCCD, 2014). The National Policy on Children 2013 (Government of India, 2013), however, classifies a person as a child if the person is below 18 years of age. The United Nations Convention on the Rights of the Child also recognises a person as a child if the person is below 18 years of age (United Nations, 1989). The Constitution of India (Government of India, 2015) and the Child Labour (Prohibition and Regulation) Amendment Act 2016 (Government of India, 2016), on the other hand, consider people below 15 years of age as children. There is, however, little analysis of the survival prospects of Indian children aged 5-14 years or 5-17 years. In the context of the National Policy on Children 2013, it is imperative that the progress towards child survival should be analysed in terms of the probability of survival during the childhood or up to the 18^{th} birth day in addition to the probability of survival up to the 5^{th} birthday.

Analysing the progress towards child survival in terms of the probability of survival up to 18^{th} birth day is also important in the context of the concept of the continuum of care that has been highlighted as a core principle of programmes for improving maternal, newborn, and child health, and as a means to reduce the burden of unwanted maternal and child deaths (WHO, 2005; Tinker et al, 2005; de Graft-Johnson et al, 2006). The concept of the continuum of care aims at avoiding dichotomies, between either mothers and children, or places of service delivery, or single health issues (Kerber et al, 2007; Lawn et al, 2006; OECD, 2005). In the context of child survival, the concept of the continuum of care ensures that all new born are able to survive the childhood period or the first 18 years of life and thrive (Gill et al, 2007).

In this paper, we analyse the progress towards child survival in India in terms of the improvement in the survival probability during the first 18 years of life as well as during the first five

years of life during the 40 years between 1971-75 through 2011-15. From the perspective of continuum of care, the childhood period can be divided into four distinct phases: 1) infancy (0-1 years); 2) pre-school age (1-4 years); 3) school age (5-10 years); and 4) adolescence (11-17 years). This means that the survival through the period of childhood depends upon the survival during infancy; during pre-school age; during school age; and during adolescence. We use a decomposition approach to estimate the relative contribution of the improvement in the survival probability during different ages of the childhood period to the improvement in the survival probability during childhood.

The paper is organised as follows. The next section describes the methodology adopted for estimating the probability of survival up to the 18th birthday from the official abridged life tables prepared and published by the Government of India and for decomposing the change in the probability of survival up 18th birthday and up to 5th birthday over time. The paper uses a decomposition methodology to analyse the contribution of the change in the probability of survival during infancy, during pre-school age, during school age and during adolescence to the improvement in the survival probability during childhood. Section three describes the data source. We have used the data available through India's official sample registration system. Section four discusses levels, trends and differentials in the probability of survival of a new born up to the 18th birthday. Section four analyses the improvement in survival probability at the national level whereas section five decomposes the change in the survival probability during childhood into the change in the survival probability during infancy, during pre-school age; during school age and during adolescence. Section six analyses inter-state variations in the progress towards child survival while the last section summarises main findings of the analysis and discusses future prospects of improvement in the child survival probability in the country, especially in the context of the National Health Policy 2017 and the 2030 Sustainable Development Agenda of the United Nations.

Methodology

The key variable used in the present analysis is the probability of survival during childhood or, more specifically, the probability of survival from birth to the 18th birthday ($_{18}p_0$). It is well known that the probability of survival up to the 18th birthday ($_{18}p_0$) can be obtained as

$$_{18}p_0 = \prod_{i=1}^{18} {}_i p_{i-1} \quad (1)$$

where p=1-q, and q denotes the probability of death at a particular age. More specifically, if the childhood period (0-17 completed years) is divided into four age segments 0-1 year; 1-4 years; 5-9 years; and 10-17 completed years, then equation (1) can be written as

$$_{18}p_0 = {}_1p_0 * {}_4p_1 * {}_5p_5 * {}_8p_{10} \quad (2)$$

Equation (2) implies that the change in $_{18}p_0$ over two points in time can be written as

$$\begin{aligned} \nabla {}_{18}p_0 &= {}_{18}p_0^2 - {}_{18}p_0^1 \\ &= {}_1p_0^2 * {}_4p_1^2 * {}_5p_5^2 * {}_8p_{10}^2 - {}_1p_0^1 * {}_4p_1^1 * {}_5p_5^1 * {}_8p_{10}^1 \end{aligned} \quad (3)$$

Now, following Kim and Strobino (1984) and Das Gupta (1993), the change in $_{18}p_0$ can be decomposed as

$$
\begin{aligned}
\nabla_{18}p_0 = {} & [({}_1p_0^2 -_1 p_0^1) *_4 p_1^1 *_5 p_5^1 *_8 p_{10}^1] + \\
& [{}_1p_0^1 * ({}_4p_1^2 -_4 p_1^1) *_5 p_5^1 *_8 p_{10}^1] + \\
& [{}_1p_0^1 *_4 p_1^1 * ({}_5p_5^2 -_5 p_5^1) *_8 p_{10}^1] + \\
& [{}_1p_0^1 *_4 p_1^1 *_5 p_5^1 * ({}_8p_{10}^2 -_8 p_{10}^1)] + \\
& [({}_1p_0^2 -_1 p_0^1) * ({}_4p_1^2 -_4 p_1^1) *_5 p_5^1 *_8 p_{10}^1] + \\
& [({}_1p_0^2 -_1 p_0^1) *_4 p_1^1 * ({}_5p_5^2 -_5 p_5^1) *_8 p_{10}^1] + \\
& [({}_1p_0^2 -_1 p_0^1) *_4 p_1^1 *_5 p_5^1 * ({}_8p_{10}^2 -_8 p_{10}^1)] + \\
& [{}_1p_0^1 * ({}_4p_1^2 -_4 p_1^1) * ({}_5p_5^2 -_5 p_5^1) *_8 p_{10}^1] + \\
& [{}_1p_0^1 * ({}_4p_1^2 -_4 p_1^1) *_5 p_5^1 * ({}_8p_{10}^2 -_8 p_{10}^1] + \\
& [{}_1p_0^1 *_4 p_1^1 * ({}_5p_5^2 -_5 p_5^1) * ({}_8p_{10}^2 -_8 p_{10}^1] + \\
& [({}_1p_0^2 -_1 p_0^1) * ({}_4p_1^2 -_4 p_1^1) * ({}_5p_5^2 -_5 p_5^1) *_8 p_{10}^1] + \\
& [({}_1p_0^2 -_1 p_0^1) * ({}_4p_1^2 -_4 p_1^1) *_5 p_5^1 * ({}_8p_{10}^2 -_8 p_{10}^1)] + \\
& [({}_1p_0^2 -_1 p_0^1) *_4 p_1^1 * ({}_5p_5^2 -_5 p_5^1) * ({}_8p_{10}^2 -_8 p_{10}^1)] + \\
& [{}_1p_0^1 * ({}_4p_1^2 -_4 p_1^1) * ({}_5p_5^2 -_5 p_5^1) * ({}_8p_{10}^2 -_8 p_{10}^1)] + \\
& [({}_1p_0^2 -_1 p_0^1) * ({}_4p_1^2 -_4 p_1^1) * ({}_5p_5^2 -_5 p_5^1) * ({}_8p_{10}^2 -_8 p_{10}^1)] \\
\nabla p_n = {} & A + B + C + D + AB + AC + AD + BC + BD + CD + \\
& ABC + ABD + ACD + BCD + ABCD
\end{aligned} \tag{4}
$$

Finally, the contribution of the change in ${}_1p_0$, ${}_4p_1$, ${}_5p_5$ and ${}_8p_{10}$ to the change in ${}_{18}p_0$ can be obtained by applying the Goldfield's rule of "allocating interactions to various individual factors on the principle of equal distribution of all variables involved in each interaction" (Durand, 1948). In other words, change in ${}_{18}p_0$ can be decomposed into the change in ${}_1p_0$, ${}_4p_1$, ${}_5p_5$ and ${}_8p_{10}$ as follows

$$
\begin{aligned}
\nabla_{18}p_0 &= \partial_1 p_0 + \partial_4 p_1 + \partial_5 p_5 + \partial_8 p_{10} \\
\partial_1 p_0 &= A + (AB + AC + AD)/2 + (ABC + ABD + ACD/3 + ABCD/4 \\
\partial_4 p_1 &= B + (AB + BC + BD)/2 + (ABC + ABD + BCD)/3 + ABCD/4 \\
\partial_5 p_5 &= C + (AC + BC + CD)/2 + (ABC + ACD + BCD)/3 + ABCD/4 \\
\partial_8 p_{10} &= D + (AD + BD + CD)/2 + (ABD + ACD + BCD)/3 + ABCD/4
\end{aligned} \tag{5}
$$

Equation (5) permits analysing how the change in the probability of survival during childhood or during the first 17 years of life is influenced by the change in the probability of survival during the first year of life; during the pre-school age; during the school age; and during the adolescence and thus helps in analysing the effectiveness of different child survival interventions. It is well known that main causes responsible for the death of children of different ages are essentially different. According to the survey of causes of death conducted by the Registrar General of India, deaths due to prematurity and low birth weight; pneumonia; and birth asphyxia and birth trauma accounted for almost 63 per cent of all infant deaths in India during 2010-2013 (Government of India, *no date*). On the other hand, deaths due to pneumonia, diarrhoeal diseases, injuries, and other communicable diseases accounted for almost 64 per cent of all deaths of children aged 1-4 years whereas unintentional injuries other than motor vehicle accidents, diarrhoeal diseases and other infectious and parasitic diseases accounted for almost 63 per cent of all deaths of children aged 5-14 years. In children aged 15 years and above, main causes of death have been identified to be intentional (suicides); and unintentional injuries. This means that the change in the survival probability in different age groups may be attributed to different child survival interventions.

Similarly, it is possible to decompose the change in the probability of survival in the first five years of life into the change in the probability of survival in the first year of life and the change in the probability of survival in the 1-4 years of life in the following manner:

$$
\begin{aligned}
\nabla_5 p_0 &= {}_5p_0^2 - {}_5p_0^1 = {}_1p_0^2 * {}_4p_1^2 - {}_1p_0^1 * {}_4p_1^1 \\
\nabla_5 p_0 &= ({}_1p_0^2 - {}_1p_0^1) * {}_4p_1^1 + {}_1p_0^1 * ({}_4p_1^2 - {}_4p_1^1) + \\
&\qquad ({}_1p_0^2 - {}_1p_0^1) * ({}_4p_1^2 - {}_4p_1^1) \\
&= A + B + AB \\
or & \\
\nabla_5 p_0 &= \partial_1 p_0 + \partial_4 p_1 \\
\partial_1 p_0 &= A + AB/2 \\
\partial_4 p_1 &= B + AB/2
\end{aligned}
\qquad (6)
$$

Data Source

The analysis is based on the official abridged life tables prepared by the Registrar General and Census Commissioner of India for five-years period beginning 1971-75 through 2011-15 (Government of India, 1984; 1985; 1989; 1994; 2004; 2008; 2017). These life tables are based on India's sample registration system which is a dual record system that provides annual estimates of birth rate, death rate and other fertility and mortality indicators at national and sub-national levels (Lal and Swamy, 1977). The system is currently operational in 8,775 sample units (4,916 rural and 3,859 urban) throughout the country and covers more than 7.05 million population (Government of India, 2016a).

The abridged life tables provide estimates of the probability of death for the conventional age groups: 0-1 year; 1-4 years; 5-9 years; 10-14 years; 15-19 years, etc. but not for the childhood period or for the age group 0-17 years. We have therefore derived unabridged life tables from the official abridged life tables by applying the UNABR routine of the MORTPAK-Lite software package of mortality analysis (United Nations, 1988). The UNABR routine is based on the Heligman-Pollard model mortality schedule (Heligman and Pollard, 1980) for expanding the abridge life table. Rogers and Gard (1981) have observed that UNABR routine gives 'correct' estimates of the parameters of the Heligman-Pollard mortality model and the aggregation bias that arise from using five-year instead of single-year age groups in fitting the model is probably acceptably small in most instances, with the exception of the parameter E which measures the spread of 'accident' hump. On the basis of the single-year probability of death obtained through the application of the UNABR routine, we have calculated ${}_1p_0$, ${}_5p_0$, ${}_{10}p_0$, and ${}_{18}p_0$ and then ${}_4p_1$, ${}_5p_5$ and ${}_8p_{10}$ have been calculated for the total population as well as separately for males and females for different five-years interval for the period 1971 through 2015. These survival probabilities constitute the database for the present analysis.

Improvement in Child Survival Probability

Estimates of ${}_{18}p_0$ along with the estimates of ${}_1p_0$, ${}_4p_1$, ${}_5p_0$, ${}_5p_5$ and ${}_8p_{10}$ for different population sub-groups are presented in the appendix table while the improvement in the child survival probability during the period 1971-75 through 2011-15 is presented in table 1. During 1971-75, 756 out of every 1000 newborn survived to their 18th birth day in India. This number increased to 940 during 2011-15. The increase in ${}_{18}p_0$ and in ${}_5p_0$ was the most rapid in rural females but the least rapid in urban males. In the rural areas, the increase in ${}_{18}p_0$ and in ${}_5p_0$ was almost two times more rapid than the increase in the urban areas. Similarly, increase in ${}_{18}p_0$ and in ${}_5p_0$ was more rapid in female as compared to male children. As the result, the gender and residence gap in both ${}_{18}p_0$ and ${}_5p_0$ has narrowed substantially over time, although male survival probability remains higher than the female survival probability and survival probability in urban areas remains well above that in rural areas.

We have applied the mean polish technique (Selvin, 2004) to estimate the gender and residence effects of the improvement in child survival probability at different ages and the results are presented in table 2. The table suggests that improvement in rural ${}_{18}p_0$ has been faster by 0.047 absolute points than the average which means that improvement in urban ${}_{18}p_0$ has been slower by 0.047 absolute points than the average. Similarly, improvement in female ${}_{18}p_0$ has been faster by 0.012 absolute points than the average which means that improvement in male ${}_{18}p_0$ has been slower by 0.012 absolute points than the average. On the other hand, improvement in rural ${}_5p_0$ has faster by 0.042 absolute points or improvement in urban ${}_5p_0$ has been slower by 0.042 absolute points than the average. Similarly, improvement in female ${}_5p_0$ has been faster by 0.010 absolute points or improvement in male ${}_5p_0$ has been slower by 0.010 absolute points than the average.

Table 2 also shows that the residence and gender effects of improvement in ${}_1p_0$ are quite small compared to residence and gender effects of improvement in ${}_4p_1$. On the other hand, residence effects of improvement in ${}_5p_5$ are larger than that in ${}_8p_{10}$ but gender effects of improvement in ${}_8p_{10}$ are larger than that in ${}_5p_5$. In any case, it is obvious from table 2 that the difference in the improvement in survival probability across the four mutually exclusive population sub-groups increases with age. They are quite narrow in ${}_1p_0$ but quite substantial in ${}_{18}p_0$. More importantly, improvement in female ${}_1p_0$ has been slower than that in male ${}_1p_0$ but not in ${}_4p_1$, ${}_5p_5$ and ${}_8p_{10}$.

The pace of improvement in child survival probability has however not been the same throughout the 40 years under reference and there has been considerable slowdown in improvement in the post 1991-95 period compared to the period before 1991-95. During 1971-75 through 1991-95, ${}_{18}p_0$ improved by 0.109 absolute points whereas the improvement during 1991-95 through 2011-15 was around 0.075 absolute points only. The slowdown in the improvement is particularly marked in ${}_4p_1$. The improvement in ${}_1p_0$ gained some momentum after 2001-05 but the improvement in survival probability at other ages of childhood continued to slow down after 1991-95.

The slowdown in the improvement in child survival probability during the post 1991-95 period appears to be the reason behind India missing the MDG 4 goal of reducing the under-five mortality rate by two-third between 1990 and 2015 as confirmed by the official report on the progress towards MDGs prepared by the Government of India (Government of India, 2015a). The under-five mortality rate in India in 1990 is estimated to be 126 under-five deaths per 1000 live births which means that ${}_5p_0$ should improve to 0.998 by the year 2015 to achieve MDG 4. The ${}_5p_0$ in India during 1991-95 is estimated to be 0.886. If the improvement in ${}_5p_0$ during 1991-95 through 2011-15 would have been the same as the improvement during 1971-75 through 1991-95, then ${}_5p_0$ would have increased to 0.983 during 2011-15 which suggests that the country would have been able to achieve the MDG 4 by 2015. However, instead of accelerating, the improvement in ${}_5p_0$ decelerated during the post 1991-95 period so that ${}_5p_0$ could increase to only 0.949 by 2011-15. The primary reason behind the slowdown in the increase in ${}_5p_0$ has been the slowdown in the improvement in ${}_4p_1$.

Decomposition of the Improvement in Child Survival Probability

Table 3 presents the relative contribution of the increase in ${}_1p_0$, ${}_4p_1$, ${}_5p_5$ and ${}_8p_{10}$ to the increase in ${}_{18}p_0$ in conjunction with equation (5) and the contribution of the increase in ${}_1p_0$ and ${}_4p_1$, to the increase in ${}_5p_0$ in conjunction with equation (6). Around 45 per cent of the improvement in ${}_{18}p_0$ in India between 1971-75 and 2011-15 may be attributed to the improvement in ${}_1p_0$ while another 40 per cent to the improvement in ${}_4p_1$ so that around 85 per cent of the improvement in ${}_{18}p_0$ may be attributed to the improvement in ${}_5p_0$ during the 40 years under reference. The remaining 15 per cent improvement may be attributed to the improvement in ${}_5p_5$ and ${}_8p_{10}$. On the other hand, 53 per cent of the improvement in ${}_5p_0$ may be attributed to the improvement in ${}_1p_0$ and around 47 per cent to the improvement in ${}_4p_1$.

The relative contribution of the improvement in ${}_1p_0$ and ${}_4p_1$ to the improvement in ${}_{18}p_0$ and ${}_5p_0$ however varies by residence and gender. In rural male children, 47 per cent of the improvement in ${}_{18}p_0$ and 55 per cent of the improvement in ${}_5p_0$ is attributed to the improvement in ${}_1p_0$ whereas these proportions are 42 and 50 per cent respectively in rural female children. In urban male children, 61 per cent of the improvement in ${}_{18}p_0$ and 71 per cent of the improvement in ${}_5p_0$ is the result of the

improvement in ${}_1p_0$ but these proportions are only 46 and 54 per cent respectively in urban female children. On the other hand, the contribution of the improvement in ${}_4p_1$ to the improvement in ${}_{18}p_0$ and ${}_5p_0$ is relatively larger in the rural than in the urban areas of the country.

It is also evident from table 3 that the contribution of the improvement in ${}_4p_1$ to the improvement in ${}_{18}p_0$ and ${}_5p_0$ is substantially smaller during the post 1991-95 period as compared to the pre1991-95 period. This observation again indicates that improvement in ${}_4p_1$ slowed down during the post 1991-95 period as compared to the improvement in the pre1991-95 period. This slowdown appears to be primarily the reason behind the slowdown in the improvement in both ${}_{18}p_0$ and ${}_5p_0$ during the post 1991-95 period as compared to the pre1991-95 period. The slowdown in ${}_4p_1$ also appears to be reason behind India missing the MDG 4.

Inter-state Variations

Any discussion on the progress towards child survival in India is incomplete without an analysis of within country, inter-state, variation in the progress towards child survival. Estimates of childhood survival probabilities during 2011-15 for 17 states of the country derived from the official life tables are presented in table 4. The table shows wide inter-state variation in the child survival probability as ${}_{18}p_0$ ranges from the highest in Kerala to the lowest in Madhya Pradesh. Kerala also has the highest survival probability in all ages of the childhood period whereas ${}_1p_0$ is the lowest in Uttar Pradesh and ${}_5p_{10}$ is the lowest in Odisha. At other ages of the childhood period, the survival probability is the lowest in Madhya Pradesh.

The improvement in ${}_{18}p_0$ and ${}_5p_0$ between 1971-75 and 2011-15 has also been different in different states of the country (Table 5). The improvement in ${}_{18}p_0$ has been the most rapid in Uttar Pradesh (40 per cent) and quite rapid in Madhya Pradesh and Rajasthan but the least rapid in Karnataka (8 per cent) and slow in Haryana, Jammu and Kashmir and Punjab. The improvement in ${}_1p_0$ and ${}_4p_1$ has also been the most rapid in Uttar Pradesh whereas improvement in ${}_5p_5$ and ${}_8p_{10}$ has been the most rapid in Assam. On the other hand, improvement in survival probability at all ages of childhood has been the slowest in Karnataka and slow in Haryana.

The contribution of the improvement in ${}_1p_0$, ${}_4p_1$, ${}_5p_5$ and ${}_8p_{10}$ to the improvement in ${}_{18}p_0$ also varies across the states of the country. In Punjab and Gujarat, for example, around 90 per cent of the improvement in ${}_{18}p_0$ may be attributed to the improvement in ${}_1p_0$ and ${}_4p_1$ only. In Assam, on the other hand, this proportion is estimated to be less than 75 per cent. In Punjab, almost 55 per cent of the improvement in ${}_{18}p_0$ is attributed to the improvement in ${}_1p_0$. On the other hand, in 7 states of the country, this proportion is less than 40 per cent. In Jammu and Kashmir and Karnataka, improvement in ${}_1p_0$ accounts for only one third of the improvement in ${}_{18}p_0$. In Karnataka, improvement in ${}_4p_1$ accounts for more than 53 per cent of the improvement in ${}_{18}p_0$ but only 28 per cent in Assam. In majority of the states, however, 85-87 per cent of the improvement in ${}_{18}p_0$ is accounted by the improvement in ${}_1p_0$ and ${}_4p_1$. Assam is the only state where more than 25 per cent of the improvement in ${}_{18}p_0$ is attributed to the improvement in survival probability in children at least 5 years of age.

As regards the achievement of the MDG 4, there are only three states in the country - Gujarat, Maharashtra and Tamil Nadu - which have been able to reduce the under-five mortality rate by at least two-third between 1990 and 2013 (2011-15). It is also highly likely that Karnataka and West Bengal will be able to achieve MDG 4 within one or two years of 2015 (Table 6). On the other hand, the distance to MDG 4 appears to be the longest in Uttar Pradesh where ${}_5p_0$ is estimated to be 0.924 against the 2015 goal of 0.945. Other states which are the most likely to miss MDG 4 are Haryana, Himachal Pradesh, Madhya Pradesh and Rajasthan. In many of these states, improvement in ${}_5p_0$ has been quite rapid during the 40 years under reference but the pace of improvement appears to be insufficient to achieve the MDG 4. In the context of the National Health Policy 2017 and the United Nations Sustainable Development Goals, it is obvious that these states will have to make significant additional efforts to increase the pace of improvement in ${}_5p_0$ so that the target of a child survival probability of more than 0.975 by the year 2030 set under the National Health Policy 2017 could be achieved.

Discussions and Conclusions

The foregoing analysis reflects a rather unsatisfactory progress towards securing the life of Indian children during the 40 years under reference. A disturbing finding of the present analysis is that the child survival progress slowed down after 1991-95 which appears to have been the reason behind India missing the MDG 4. Had the pace of improvement in the child survival probability during 1971-75 through 1991-95 been maintained during 1991-95 through 2011-15, India would have been able to achieve the MDG 4. Although, there has been some acceleration in the improvement in child survival probability after 2001-05, yet this acceleration is at best marginal and is confined to the first year of life only. The slowdown in the improvement has been particularly marked in the 1-4 years of life. The recent report by UNICEF also confirms that progress towards child survival in India has been slow by international standards (UNICEF, 2016).

The present analysis also suggests that the gender and residence differentials in child survival probability in the country have narrowed down over time. However, this narrowing of the differentials appears to be the result of relatively slow improvement in the survival probability of male as compared to female children in the urban as compared to the rural areas so that the improvement in the survival probability has been the slowest in urban male children but the fastest in the rural female children. In the urban areas of the country, the probability of survival in the first five years of life and in the first 18 years of life is now higher in female than in male children because of the slow improvement in the survival probability of male children. Even in the rural areas, improvement in the survival probability of female children has been faster than that of male children so that the gender difference in child survival probability has narrowed down considerably, although male children survival probability remains higher than female children survival probability.

Reasons for differential improvement in the child survival probability in India are not known at present. It is generally argued that health care services delivery infrastructure is better in urban than in rural areas. Similarly, the general level of social and economic development is argued to be better in urban than in rural areas. The evidence available from the latest round of the National Family Health Survey 2015-16 also indicates that the coverage of key child survival interventions such as immunisation against vaccine preventable diseases, use of oral rehydration therapy during diarrhoea, initiation of breastfeeding within 1 hour of birth, etc. is relatively higher in urban than in rural areas of the country. Similarly, the prevalence of child under nutrition measured in terms of the prevalence of stunting, wasting and under-weight has also been found to be higher in rural than in urban areas currently as well as in the past. It is also argued that females face different forms of discrimination at the level of the family and the society which has implications for the survival of female children. However, despite numerous urban and many male advantages, the slow improvement in child survival probability in male children, particularly in urban male children is a matter of concern that needs comprehensive scrutiny.

The history of child survival efforts in India can be divided into three distinct phases. The first phase started with the independence and lasted up to 1977. The child survival and health related services, during this phase, were delivered through the public health institutions, although, a community-based programme of training of traditional birth attendants was launched way back in 1955 to prevent child deaths from neonatal tetanus. The impact of these services on child survival, however, appears to be limited, at best, as is reflected from the very low child survival probabilities during 1971-75.

The second phase of child survival efforts spanned from 1975 through 1992. This phase focussed on specific child survival interventions such as immunisation and oral rehydration therapy, etc. including community mobilisation for the cause of child survival. The most notable programmatic intervention of this phase was the Universal Immunisation Programme which was launched in 1985 and which received the highest priority of the government by according the status of National Technology Mission in 1987. The Integrated Child Development Scheme was also launched during this period that focussed on early childhood development.

The third phase of child survival efforts had a beginning in 1992. This phase focussed on an integrated approach in which child survival activities were integrated with reproductive health and

other services in line with the concept of continuum of care. However, improvement in child survival probability during this phase has been considerably slower than the improvement in the earlier phase. Integration of child survival activities with reproductive and other health care services appears to have resulted in a residual attention paid to key child survival so that improvement in child survival probabilities have slowed down during this phase.

From the global perspective, an accelerated improvement in child survival probability in India is the need of the time. At the current rate of improvement, total number of under-five deaths in India will be accounting for 17 per cent of the global under-five deaths in 2030. Obviously, the pace of reduction in the under-five mortality rate in India will influence substantially the global progress towards realising the target of reducing the under-five mortality rate at least as low as 25 under-five deaths per 1000 live births by 2030 as articulated in the United Nations 2030 Agenda for Sustainable Development (United Nations, 2015). The under-five mortality rate in India needs to decrease by 3-4 per cent per year in the coming years to achieve the target of reducing under-five mortality rate to 23 under-five deaths per 1000 live births by 2025, infant mortality rate to 28 infant deaths per 1000 live births by 2019 and neonatal mortality rate to 16 neonatal deaths per 1000 live births by 2025 as laid down in the National Health Policy 2017. The task appears to be challenging as it is projected that at the current pace of reduction, the under-five mortality rate in India will reduce to only 31 under-five deaths per 1000 live births while the neonatal mortality rate will decrease to only 20 neonatal deaths per 1000 live births by 2025. On the other hand, it is projected that the infant mortality rate will decrease to only 33 infant deaths per 1000 live births by 2019 (De et al, 2016).

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Table 1: Improvement in child survival probability in India 1971-2015

Population		Survival probability					
		$_1p_0$	$_4p_1$	$_5p_0$	$_5p_5$	$_8p_{10}$	$_{18}p_0$
Total		0.090	0.082	0.160	0.019	0.012	0.183
Total	Male	0.088	0.070	0.149	0.017	0.010	0.170
Total	Female	0.091	0.095	0.172	0.021	0.015	0.198
Rural		0.095	0.090	0.171	0.021	0.014	0.196
Rural	Male	0.093	0.079	0.160	0.019	0.011	0.181
Rural	Female	0.097	0.103	0.184	0.023	0.017	0.211
Urban		0.061	0.036	0.094	0.010	0.007	0.107
Urban	Male	0.059	0.025	0.081	0.009	0.006	0.094
Urban	Female	0.054	0.048	0.097	0.011	0.007	0.112

Table 2: Residence and gender effects of improvement in child survival probability in India

Effects		Survival probability					
		$_1p_0$	$_4p_1$	$_5p_0$	$_5p_5$	$_8p_{10}$	$_{18}p_0$
Average improvement		0.076	0.064	0.131	0.016	0.010	0.150
Residence effects	Rural	0.019	0.027	0.042	0.006	0.004	0.047
	Urban	-0.019	-0.027	-0.042	-0.006	-0.004	-0.047
Gender effects	Male	0.000	-0.012	-0.010	-0.002	-0.002	-0.012
	Female	0.000	0.012	0.010	0.002	0.002	-0.012
Residuals	Rural male	-0.002	0.000	-0.002	-0.001	-0.001	-0.003
	Rural female	0.002	0.000	0.002	0.001	0.001	0.003
	Urban male	0.002	0.000	0.002	0.001	0.001	0.003
	Urban female	-0.002	0.000	-0.002	-0.001	-0.001	-0.003

Table 3: Decomposition of the improvement in $_{18}p_0$ and $_5p_0$ in India, 1971-2015

Period	Improvement in	Proportionate (per cent) improvement attributed to improvement in				Improvement in	Proportionate improvement attributed to improvement in	
	$_{18}p_0$	$_1p_0$	$_4p_1$	$_5p_5$	$_8p_{10}$	$_5p_0$	$_1p_0$	$_4p_1$
				Combined population, both sexes				
1971-75/1976-80	0.0209	34.26	45.27	12.62	7.85	0.0173	43.08	56.92
1976-80/1981-85	0.0336	52.06	38.91	5.61	3.43	0.0322	57.23	42.77
1981-85/1986-90	0.0267	46.59	39.06	9.20	5.16	0.0239	54.40	45.60
1986-90/1991-95	0.0262	35.44	52.11	8.75	3.69	0.0239	40.48	59.52
1991-95/1996-2000	0.0152	50.96	30.00	11.28	7.76	0.0128	62.94	37.06
1996-2000/2001-05	0.0191	30.30	53.58	10.67	5.45	0.0165	36.12	63.88
2001-05/2006-10	0.0193	65.75	19.27	7.77	7.21	0.0168	77.33	22.67
2006-10/2011-15	0.0201	49.30	33.19	8.62	8.89	0.0170	59.76	40.24
1971-75/2011-15	*0.1832*	*45.39*	*39.85*	*8.98*	*5.77*	*0.1603*	*53.25*	*46.75*
				Combined population, male				
1971-75/1976-80	0.0194	37.87	44.39	11.90	5.84	0.0168	46.04	53.96
1976-80/1981-85	0.0298	51.31	37.78	6.64	4.27	0.0279	57.60	42.40
1981-85/1986-90	0.0282	54.61	33.05	8.48	3.87	0.0258	62.29	37.71
1986-90/1991-95	0.0204	29.20	55.39	10.65	4.76	0.0179	34.52	65.48
1991-95/1996-2000	0.0162	54.20	29.02	10.11	6.66	0.0139	65.13	34.87
1996-2000/2001-05	0.0159	42.82	45.44	8.17	3.58	0.0144	48.52	51.48
2001-05/2006-10	0.0185	65.91	19.21	7.74	7.15	0.0162	77.44	22.56
2006-10/2011-15	0.0189	54.03	30.31	8.52	7.14	0.0163	64.06	35.94
1971-75/2011-15	*0.1696*	*48.77*	*37.12*	*8.89*	*5.22*	*0.1492*	*56.78*	*43.22*
				Combined population, female				
1971-75/1976-80	0.0223	28.87	50.16	10.72	10.26	0.0188	36.53	63.47
1976-80/1981-85	0.0371	53.94	37.65	5.75	2.65	0.0359	58.89	41.11
1981-85/1986-90	0.0301	50.17	36.26	8.98	4.59	0.0274	58.05	41.95
1986-90/1991-95	0.0268	24.82	62.59	8.65	3.95	0.0245	28.39	71.61
1991-95/1996-2000	0.0133	50.30	26.43	12.89	10.38	0.0106	65.56	34.44
1996-2000/2001-05	0.0234	19.83	61.42	12.22	6.53	0.0196	24.41	75.59
2001-05/2006-10	0.0202	65.60	18.94	8.18	7.28	0.0175	77.6	22.40
2006-10/2011-15	0.0213	45.13	35.98	8.43	10.46	0.0176	55.65	44.35
1971-75/2011-15	*0.1975*	*42.29*	*42.43*	*9.00*	*6.28*	*0.1721*	*49.92*	*50.08*

Period	Improvement in	Proportionate (per cent) improvement attributed to improvement in				Improvement in	Proportionate improvement attributed to improvement in	
	${}_{18}p_0$	${}_1p_0$	${}_4p_1$	${}_5p_5$	${}_8p_{10}$	${}_5p_0$	${}_1p_0$	${}_4p_1$
				Rural population, both sexes				
1971-75/1976-80	0.0209	27.45	51.43	12.79	8.33	0.0172	34.8	65.2
1976-80/1981-85	0.0348	55.38	36.37	4.88	3.37	0.0338	60.36	39.64
1981-85/1986-90	0.0268	41.69	42.74	10.48	5.09	0.0238	49.38	50.62
1986-90/1991-95	0.032	39.85	48.87	7.93	3.35	0.0297	44.92	55.08
1991-95/1996-2000	0.0179	43.29	38.87	11.42	6.42	0.0153	52.69	47.31
1996-2000/2001-05	0.0177	29.76	51.11	11.80	7.32	0.0148	36.8	63.20
2001-05/2006-10	0.0213	67.05	18.39	7.49	7.07	0.0187	78.48	21.52
2006-10/2011-15	0.0219	46.88	33.90	9.42	9.80	0.0181	58.03	41.97
1971-75/2011-15	*0.1959*	*44.56*	*40.54*	*9.05*	*5.86*	*0.1715*	*52.36*	*47.64*
				Rural population, male				
1971-75/1976-80	0.0212	32.79	50.4	11.09	5.72	0.0187	39.42	60.58
1976-80/1981-85	0.0297	53.27	36.03	6.52	4.17	0.0279	59.65	40.35
1981-85/1986-90	0.0257	43.09	42.31	10.01	4.59	0.0230	50.46	49.54
1986-90/1991-95	0.0286	44.03	44.10	8.78	3.10	0.0263	49.96	50.04
1991-95/1996-2000	0.0181	49.20	34.24	10.28	6.28	0.0156	58.97	41.03
1996-2000/2001-05	0.0145	41.67	44.50	8.98	4.85	0.0129	48.36	51.64
2001-05/2006-10	0.0206	66.82	19.41	7.30	6.47	0.0183	77.49	22.51
2006-10/2011-15	0.0206	50.67	31.78	9.48	8.06	0.0174	61.45	38.55
1971-75/2011-15	*0.1815*	*47.49*	*38.37*	*8.95*	*5.18*	*0.1600*	*55.31*	*44.69*
				Rural population, female				
1971-75/1976-80	0.0224	26.77	50.34	10.57	12.32	0.0185	34.71	65.29
1976-80/1981-85	0.0379	55.68	37.4	5.07	1.86	0.0375	59.82	40.18
1981-85/1986-90	0.0276	40.49	42.17	11.4	5.94	0.0241	48.98	51.02
1986-90/1991-95	0.0354	36.26	54.07	6.82	2.85	0.0336	40.14	59.86
1991-95/1996-2000	0.0173	37.86	40.71	12.98	8.45	0.0142	48.19	51.81
1996-2000/2001-05	0.0216	20.51	57.48	13.36	8.65	0.0175	26.30	73.70
2001-05/2006-10	0.0221	67.19	17.64	8.13	7.04	0.0193	79.20	20.80
2006-10/2011-15	0.0232	43.49	35.77	9.18	11.56	0.0188	54.87	45.13
1971-75/2011-15	*0.2111*	*41.82*	*42.58*	*9.07*	*6.53*	*0.1837*	*49.54*	*50.46*

Period	Improvement in	Proportionate (per cent) improvement attributed to improvement in				Improvement in	Proportionate improvement attributed to improvement in	
	${}_{18}p_0$	${}_1p_0$	${}_4p_1$	${}_5p_5$	${}_8p_{10}$	${}_5p_0$	${}_1p_0$	${}_4p_1$
				Urban population, both sexes				
1971-75/1976-80	0.0147	92.24	-16.75	13.99	10.52	0.0113	122.19	-22.19
1976-80/1981-85	0.0205	48.62	44.06	6.90	0.43	0.0195	52.46	47.54
1981-85/1986-90	0.0135	40.68	44.17	6.17	8.99	0.0118	47.94	52.06
1986-90/1991-95	0.0115	38.02	48.30	9.91	3.78	0.0101	44.04	55.96
1991-95/1996-2000	0.0105	73.64	9.16	6.34	10.86	0.0089	88.94	11.06
1996-2000/2001-05	0.014	30.73	58.05	10.17	1.06	0.0127	34.61	65.39
2001-05/2006-10	0.0098	60.29	20.83	8.14	10.73	0.0081	74.32	25.68
2006-10/2011-15	0.0122	59.68	32.57	3.99	3.75	0.0114	64.69	35.31
1971-75/2011-15	*0.1074*	*55.09*	*30.89*	*8.31*	*5.70*	*0.0939*	*64.07*	*35.93*
				Urban population, male				
1971-75/1976-80	0.007	140.99	-99.32	29.05	29.28	0.0030	338.36	-238.4
1976-80/1981-85	0.0134	72.33	28.71	3.94	-4.98	0.0139	71.59	28.41
1981-85/1986-90	0.0149	13.20	64.47	9.71	12.62	0.0119	16.99	83.01
1986-90/1991-95	0.0122	53.62	38.14	4.98	3.27	0.0114	58.43	41.57
1991-95/1996-2000	0.013	62.92	19.84	9.36	7.88	0.0110	76.02	23.98
1996-2000/2001-05	0.0126	51.54	41.89	6.20	0.37	0.0120	55.16	44.84
2001-05/2006-10	0.0088	63.28	15.96	10.92	9.84	0.0071	79.85	20.15
2006-10/2011-15	0.0113	69.99	25.14	3.11	1.76	0.0109	73.57	26.43
1971-75/2011-15	*0.0941*	*60.51*	*24.56*	*8.6*	*6.32*	*0.0813*	*71.13*	*28.87*
				Urban population, female				
1971-75/1976-80	0.0131	55.60	21.06	15.07	8.27	0.0104	72.53	27.47
1976-80/1981-85	0.023	51.42	38.8	7.60	2.18	0.0214	57.00	43.00
1981-85/1986-90	0.0166	45.21	45	4.71	5.08	0.0154	50.12	49.88
1986-90/1991-95	0.011	20.82	59.68	14.1	5.41	0.0091	25.86	74.14
1991-95/1996-2000	0.0094	76.94	-0.03	9.08	14.01	0.0074	100.03	-0.03
1996-2000/2001-05	0.0139	14.17	74.78	10.12	0.93	0.0126	15.93	84.07
2001-05/2006-10	0.0109	58.18	24.09	7.58	10.16	0.0091	70.72	29.28
2006-10/2011-15	0.0129	49.62	40.35	3.81	6.23	0.0118	55.15	44.85
1971-75/2011-15	*0.1118*	*46.02*	*39.49*	*8.75*	*5.74*	*0.0972*	*53.82*	*46.18*

Source: Author's calculations

Table 4: Child survival probabilities in Indian states, 2011-2015

State	${}_1p_0$	${}_4p_1$	${}_5p_0$	${}_5p_5$	${}_8p_{10}$	${}_{18}p_0$
Andhra Pradesh	0.932	0.998	0.930	0.998	0.995	0.923
Assam	0.950	0.981	0.932	0.995	0.992	0.920
Bihar	0.963	0.988	0.951	0.995	0.994	0.940
Gujarat	0.956	0.991	0.947	0.996	0.994	0.939
Haryana	0.956	0.994	0.950	0.997	0.995	0.943
Himachal Pradesh	0.960	0.995	0.955	0.998	0.996	0.949
Jammu & Kashmir	0.947	0.997	0.944	0.997	0.995	0.936
Karnataka	0.968	0.996	0.964	0.997	0.994	0.956
Kerala	0.988	0.999	0.987	0.999	0.997	0.984
Madhya Pradesh	0.941	0.984	0.926	0.994	0.991	0.912
Maharashtra	0.980	0.997	0.977	0.998	0.995	0.970
Odisha	0.953	0.986	0.940	0.994	0.991	0.925
Punjab	0.974	0.995	0.969	0.998	0.994	0.962
Rajasthan	0.945	0.990	0.936	0.996	0.994	0.926
Tamil Nadu	0.979	0.998	0.977	0.998	0.994	0.969
Uttar Pradesh	0.937	0.987	0.925	0.995	0.993	0.914
West Bengal	0.971	0.996	0.967	0.997	0.994	0.959

Source: Author's calculations

Table 5: Improvement in child survival probability in selected states of India, 1971-2015

State	Improvement in ${}_{18}p_0$	Improvement in ${}_{18}p_0$ attributed to the improvement in				Improvement in ${}_5p_0$	Improvement in ${}_5p_0$ attributed to the improvement in	
		${}_1p_0$	${}_4p_1$	${}_5p_5$	${}_8p_{10}$		${}_1p_0$	${}_4p_1$
Andhra Pradesh	0.156	25.8	53.1	12.6	8.5	0.126	32.7	67.3
Assam	0.180	44.2	28.6	14.1	13.1	0.137	60.7	39.3
Bihar	na	na	na	na	na	na	na	na
Gujarat	0.199	45.1	44.6	6.2	4.1	0.182	50.3	49.7
Haryana	0.125	37.7	47.4	9.0	5.9	0.108	44.3	55.7
Himachal Pradesh	na	na	na	na	na	na	na	na
Jammu & Kashmir	0.120	28.3	51.0	11.8	8.9	0.097	35.7	64.3
Karnataka	0.071	33.0	53.3	10.6	3.1	0.062	38.3	61.7
Kerala	na	na	na	na	na	na	na	na
Madhya Pradesh	0.197	39.7	46.8	7.8	5.7	0.175	45.9	54.1
Maharashtra	0.168	44.3	42.1	8.4	5.2	0.148	51.3	48.7
Odisha	0.192	43.7	38.5	9.9	7.9	0.164	53.1	46.9
Punjab	0.141	54.5	37.1	5.3	3.1	0.131	59.5	40.5
Rajasthan	0.199	38.2	48.3	9.1	4.4	0.177	44.2	55.8
Tamil Nadu	0.197	43.8	41.4	8.6	6.2	0.172	51.4	48.6
Uttar Pradesh	0.259	38.7	48.5	8.7	4.1	0.233	44.4	55.6
West Bengal	na	na	na	na	na	na	na	na

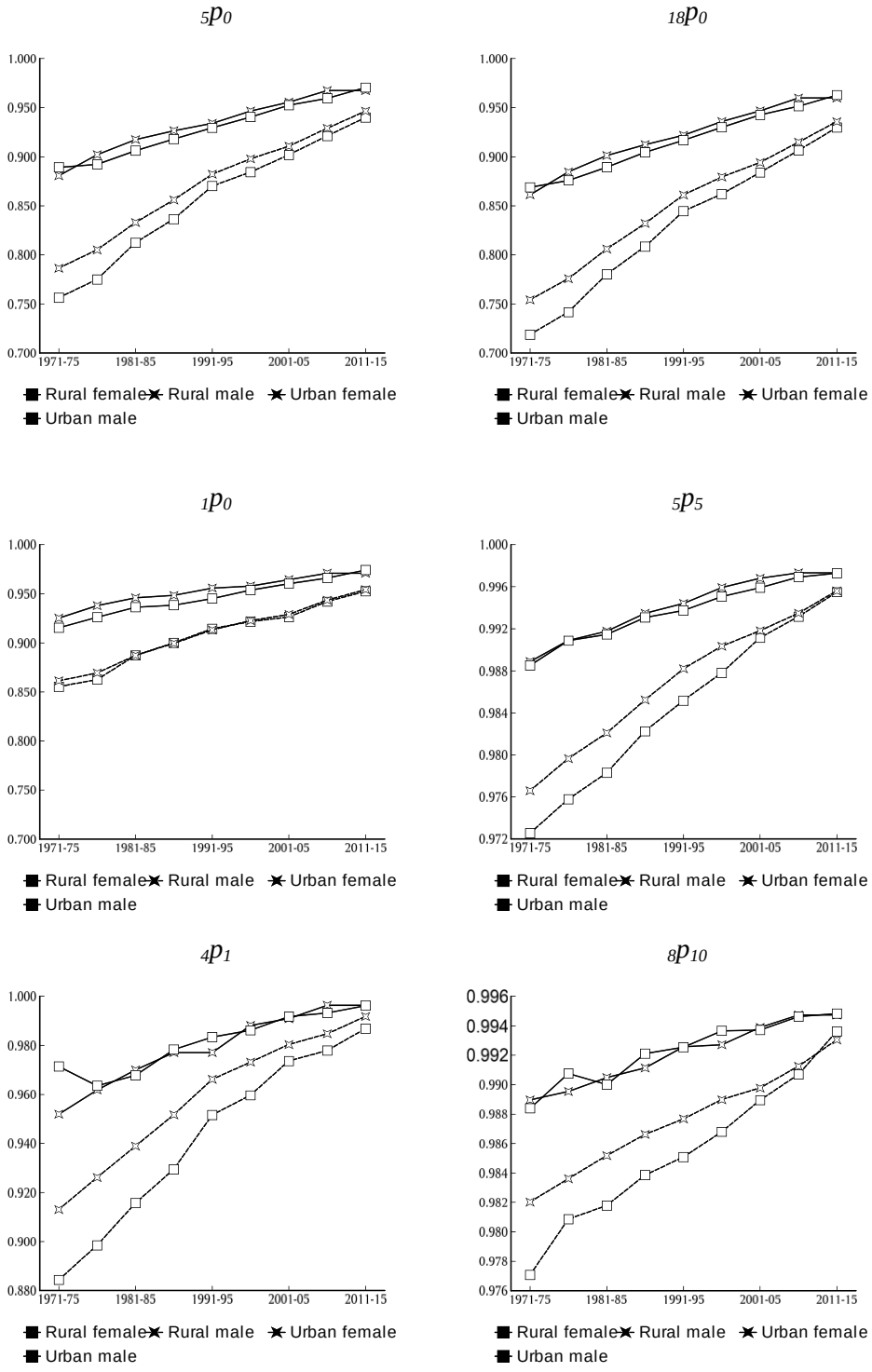
Source: Author's calculations

Table 6: Progress towards MDG4 in India and states

State	${}_5p_0$ in 1990	Under-5 mortality rate in 1990	MDG4 target for 2015	${}_5p_0$ during 2011-15	Under-5 mortality rate during 2011-15
India	0.874	0.126	0.042	0.950	0.050
Andhra Pradesh	0.904	0.096	0.032	0.961	0.039
Assam	0.854	0.146	0.049	0.932	0.068
Bihar	0.660	0.34	0.113	0.951	0.049
Gujarat	0.803	0.197	0.066	0.948	0.052
Haryana	0.895	0.105	0.035	0.951	0.049
Himachal Pradesh	0.910	0.09	0.030	0.955	0.045
Jammu & Kashmir	0.896	0.104	0.035	0.955	0.045
Karnataka	0.896	0.104	0.035	0.964	0.036
Kerala	0.973	0.027	0.009	0.987	0.013
Madhya Pradesh	0.818	0.182	0.061	0.926	0.074
Maharashtra	0.919	0.081	0.027	0.977	0.023
Odisha	0.840	0.16	0.053	0.940	0.060
Punjab	0.916	0.084	0.028	0.969	0.031
Rajasthan	0.849	0.151	0.050	0.936	0.064
Tamil Nadu	0.919	0.081	0.027	0.977	0.023
Uttar Pradesh	0.835	0.165	0.055	0.924	0.076
West Bengal	0.902	0.098	0.033	0.966	0.034

Source: Author's calculations

Figure 1: Trend in child survival probabilities in India, 1971-75 through 2011-15



Appendix Table: Child survival probabilities in India, 1971-2015.

Period	Probability of survival during					
	0-1 year	1-4 years	0-5 years	5-9 years	10-14 years	0-17 years
	${}_1p_0$	${}_4p_1$	${}_5p_0$	${}_5p_5$	${}_8p_{10}$	${}_{18}p_0$
			Combined population both sexes			
1971-75	0.868	0.909	0.789	0.977	0.981	0.756
1976-80	0.876	0.920	0.806	0.980	0.983	0.777
1981-85	0.896	0.936	0.839	0.983	0.985	0.812
1986-90	0.910	0.948	0.863	0.986	0.987	0.839
1991-95	0.920	0.963	0.886	0.988	0.988	0.865
1996-2000	0.928	0.969	0.899	0.990	0.989	0.881
2001-05	0.935	0.980	0.916	0.992	0.990	0.900
2006-10	0.948	0.984	0.933	0.994	0.992	0.919
2011-15	0.958	0.991	0.949	0.996	0.994	0.940
Improvement (%)	*10.369*	*9.021*	*20.32*	*1.945*	*1.325*	*24.339*
			Combined population male			
1971-75	0.871	0.922	0.803	0.979	0.983	0.773
1976-80	0.879	0.933	0.820	0.982	0.985	0.792
1981-85	0.896	0.946	0.848	0.984	0.986	0.823
1986-90	0.913	0.957	0.873	0.987	0.988	0.851
1991-95	0.919	0.970	0.891	0.989	0.989	0.872
1996-2000	0.929	0.975	0.905	0.991	0.990	0.888
2001-05	0.936	0.983	0.920	0.993	0.991	0.904
2006-10	0.948	0.987	0.936	0.994	0.992	0.923
2011-15	0.959	0.993	0.952	0.996	0.994	0.942
Improvement (%)	*10.163*	*7.642*	*18.58*	*1.778*	*1.119*	*21.946*
			Combined population female			
1971-75	0.866	0.895	0.774	0.975	0.979	0.739
1976-80	0.873	0.908	0.793	0.978	0.982	0.762
1981-85	0.896	0.925	0.829	0.981	0.984	0.800
1986-90	0.913	0.938	0.857	0.984	0.985	0.831
1991-95	0.921	0.957	0.881	0.987	0.987	0.858
1996-2000	0.928	0.961	0.892	0.989	0.988	0.871
2001-05	0.933	0.977	0.911	0.992	0.990	0.895
2006-10	0.947	0.981	0.929	0.994	0.991	0.915
2011-15	0.957	0.989	0.946	0.996	0.994	0.937
Improvement (%)	*10.534*	*10.571*	*22.22*	*2.152*	*1.532*	*26.714*
			Rural population both sexes			
1971-75	0.858	0.899	0.772	0.975	0.98	0.737
1976-80	0.865	0.912	0.789	0.978	0.982	0.758
1981-85	0.887	0.928	0.823	0.980	0.984	0.793
1986-90	0.900	0.941	0.847	0.984	0.985	0.821
1991-95	0.914	0.959	0.876	0.987	0.987	0.853
1996-2000	0.922	0.967	0.892	0.989	0.988	0.871
2001-05	0.928	0.977	0.907	0.992	0.989	0.889
2006-10	0.943	0.981	0.925	0.993	0.991	0.911
2011-15	0.953	0.989	0.943	0.996	0.993	0.933
Improvement (%)	*11.077*	*10.029*	*22.22*	*2.152*	*1.327*	*26.581*
			Rural population male			
1971-75	0.861	0.913	0.786	0.977	0.982	0.754
1976-80	0.869	0.926	0.805	0.980	0.984	0.776
1981-85	0.887	0.939	0.833	0.982	0.985	0.806
1986-90	0.899	0.952	0.856	0.985	0.987	0.832
1991-95	0.913	0.966	0.882	0.988	0.988	0.861
1996-2000	0.923	0.973	0.898	0.990	0.989	0.879
2001-05	0.929	0.980	0.911	0.992	0.990	0.894
2006-10	0.943	0.985	0.929	0.993	0.991	0.915

Period	Probability of survival during					
	0-1 year	1-4 years	0-5 years	5-9 years	10-14 years	0-17 years
	$_1p_0$	$_4p_1$	$_5p_0$	$_5p_5$	$_8p_{10}$	$_{18}p_0$
2011-15	0.954	0.992	0.946	0.996	0.993	0.936
Improvement (%)	*10.788*	*8.626*	*20.35*	*1.947*	*1.120*	*24.065*
			Rural population female			
1971-75	0.855	0.884	0.756	0.973	0.977	0.719
1976-80	0.862	0.898	0.775	0.976	0.981	0.742
1981-85	0.887	0.916	0.812	0.978	0.982	0.780
1986-90	0.900	0.929	0.836	0.982	0.984	0.808
1991-95	0.914	0.952	0.870	0.985	0.985	0.844
1996-2000	0.922	0.960	0.884	0.988	0.987	0.862
2001-05	0.926	0.974	0.902	0.991	0.989	0.884
2006-10	0.942	0.978	0.921	0.993	0.991	0.906
2011-15	0.952	0.987	0.940	0.995	0.994	0.930
Improvement (%)	*11.373*	*11.594*	*24.29*	*2.359*	*1.740*	*29.370*
			Urban population both sexes			
1971-75	0.911	0.961	0.875	0.987	0.988	0.854
1976-80	0.926	0.958	0.887	0.990	0.990	0.869
1981-85	0.936	0.968	0.906	0.991	0.990	0.889
1986-90	0.942	0.974	0.918	0.992	0.991	0.903
1991-95	0.947	0.980	0.928	0.994	0.992	0.915
1996-2000	0.955	0.981	0.937	0.994	0.993	0.925
2001-05	0.959	0.990	0.950	0.996	0.993	0.939
2006-10	0.965	0.992	0.958	0.997	0.994	0.949
2011-15	0.973	0.996	0.969	0.997	0.995	0.961
Improvement (%)	*6.747*	*3.727*	*10.73*	*0.989*	*0.709*	*12.580*
			Urban population male			
1971-75	0.915	0.971	0.889	0.989	0.988	0.869
1976-80	0.926	0.964	0.892	0.991	0.991	0.876
1981-85	0.936	0.968	0.906	0.991	0.990	0.889
1986-90	0.938	0.978	0.918	0.993	0.992	0.904
1991-95	0.945	0.983	0.929	0.994	0.993	0.917
1996-2000	0.954	0.986	0.940	0.995	0.994	0.930
2001-05	0.960	0.992	0.952	0.996	0.994	0.943
2006-10	0.966	0.993	0.960	0.997	0.995	0.951
2011-15	0.974	0.996	0.970	0.997	0.995	0.963
Improvement (%)	*6.420*	*2.557*	*9.14*	*0.888*	*0.709*	*10.828*
			Urban population female			
1971-75	0.917	0.949	0.870	0.987	0.988	0.848
1976-80	0.925	0.952	0.881	0.989	0.989	0.861
1981-85	0.938	0.962	0.902	0.991	0.990	0.885
1986-90	0.946	0.970	0.917	0.992	0.990	0.901
1991-95	0.948	0.977	0.927	0.993	0.991	0.912
1996-2000	0.956	0.977	0.934	0.994	0.993	0.922
2001-05	0.958	0.988	0.947	0.996	0.993	0.936
2006-10	0.964	0.991	0.956	0.997	0.994	0.947
2011-15	0.971	0.996	0.967	0.997	0.995	0.960
Improvement (%)	*5.863*	*5.009*	*11.17*	*1.089*	*0.709*	*13.179*

Source: Author's calculations