Summary of a Baseline Study to

Estimate the Number of Child Marriages in South Asia 2014-2017

UNICEF Regional office for South Asia

September 2016

The opinions expressed in this work are those of the author and do not necessarily reflect the views of UNICEF.

The designations employed and the presentation of the material in this report, including tables, do not imply the expression of any opinion whatsoever on the part of UNICEF concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Permission to copy, disseminate or otherwise use information from this report is granted as long as appropriate acknowledgement is given. Suggested citation: UNICEF. *Summary of a Baseline Study to Estimate the Number of Child Marriages in South Asia 2014-2017,* UNICEF, 2016.

To the best of our knowledge, the information contained herein is accurate and reliable; however, UNICEF do not assume any liability whatsoever for its accuracy and completeness.
© 2016 United Nations Children's Fund (UNICEF), Regional Office for South Asia (ROSA)

Acknowledgments

The Baseline Study to Estimate the Number of Child Marriages in South Asia 2014-2017 was undertaken by Deepali Godha (independent consultant) supported by the United Nation's Children Fund (UNICEF), Regional Office for South Asia (ROSA). The following is a summary report of this study prepared by Rhiannon James (independent consultant). Both documents were developed under the direction of Kendra Gregson (Regional Adviser, UNICEF ROSA) and Eri Mathers Suzuki (Child Protection Specialist, UNCIEF ROSA).

Valuable comments and data used in the study including the summary report were provided by[1]:

Zabihullah Kamran, Information Management Officer, UNICEF Afghanistan
Roshni Basu, Gender & Development Specialist, UNICEF Bangladesh
Shantanu Gupta, Monitoring & Evaluation Specialist, UNICEF Bangladesh
Alexandra Illmer, Monitoring & Evaluation Specialist, UNICEF Bangladesh
Rose-Anne Papavero, Chief, Child Protection, UNICEF Bangladesh
Aniruddha Kulkarni, Child Protection Specialist, UNICEF Bhutan
Dechen Zam, Planning, Monitoring & Evaluation Specialist, UNICEF Bhutan
Dechen Zangmo, Monitoring & Evaluation Officer, UNICEF Bhutan
Misaki Akasaka Ueda, Chief Planning and Evaluation, UNICEF India
Dora Giusti, Child Protection Specialist, UNICEF India
Bhaskar Mishra, Monitoring & Evaluation Officer, UNICEF India
Dhuwarakha Sriram, Child Protection Specialist, UNICEF India
Joachim Theis, Chief Child Protection, UNICEF India
Mohamed Naeem, Programme Specialist, UNICEF Maldives
Ibrahim Naseem, Monitoring & Evaluation Officer, UNICEF Maldives
Amadou Seck, Monitoring & Evaluation Specialist, UNICEF Maldives
Nicholas John Mathers, Programme Specialist, UNICEF Nepal
Yendra Rai, Monitoring & Evaluation Officer, UNICEF Nepal
Yukiko Sakurai, Chief, Youth & Adolescent Development, UNICEF Nepal
Pragya Shah Karki, Youth & Adolescent Development Specialist, UNICEF Nepal
Ramiz Behbudov, Child Protection Specialist, UNICEF Sri Lanka
Sajith De Mel, Planning & Monitoring Officer, UNICEF Sri Lanka
Tetyana Nikitina, Monitoring & Evaluation Specialist, UNICEF Sri Lanka
Ingrid FitzGerald, Technical Adviser, Gender and Human Rights, UNFPA Asia and the Pacific Regional Office
Two anonymous reviewers from UNFPA, Bangladesh
Kay Engelhardt, External Consultant

[1] By country offices in alphabetical order. Titles and affiliations reflect the positions of induvial at the time of the review was conducted/data was collected.

Contents

Introduction

Child marriage is a violation of children's rights. Married children face fewer educational opportunities, more health risks, a lack of freedom to interact with peers and a lack of livelihood opportunities.[2] Child marriage affects both boys and girls although girls are disproportionally more affected. The practice of child marriage is declining in South Asia, with the decline being especially marked for girls under 15, however the marriage of girls aged 15-18 is still commonplace. South Asia has the highest rates of child marriage in the world and accounts for over half of global child brides; almost half (45 percent) of the women in South Asia are married before their 18th birthday.[3] More efforts are needed to protect older adolescents from marriage and to accelerate the end of child marriage. Recognizing the magnitude of the problem and the far reaching negative impacts of child marriage, the UNICEF Regional Office of South Asia (ROSA) identified ending child marriage as one of its six headline result programme areas within the 2014-2017 Regional Office Management Plan (ROMP).

ROSA is supporting countries[4] to develop and implement strategies to tackle child marriage through a mix of interventions that appreciate the complex nature of the problem, and the socio-cultural and structural factors underpinning the practice. However in order to track progress towards ending child marriage, it is necessary to measure the actual change in the prevalence and number of child marriages over the programme duration. In the case of the ROSA 2014-2017 ROMP, in order to know whether there has been a decline in child marriage the measurement of child marriage at the beginning of 2014 and at the end of 2017 needs to be possible.

Despite the known broad magnitude of child marriage, obtaining evidence on the phenomena is problematic. Whilst information on marriages within a population should be recorded through civil registration and vital statistics (CRVS) systems, there are still many deficiencies in these records in South Asia and as yet the structures in place are not considered robust enough to provide reliable data on numbers of marriages occurring in a population. In the absence of reliable CRVS data on marriage, censuses and national household surveys have become the default data source for providing a picture of the level of child marriage in a country and the region.

Establishing a baseline for 2014 Regional Headline Result was challenging as censuses only occur once a decade and national household surveys also occur fairly infrequently (every 3-5 years at best). Very few censuses and/or national household surveys such as Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) had been carried out in the 8 countries in 2013 or 2014. Recent and accessible data was only available from Nepal (2014). It was recognized that this same problem would be faced in 2017 at the end of the headline result period as few, if any, countries will be implementing a census or survey in early 2018. Further to this, without an up-to-date baseline it was very challenging to set a target for the regional headline result i.e. to project how many fewer child marriages will occur over the time period.

In the face of data scarcity, estimates and projections of child marriage are usually made using simple linear regression based on child marriage prevalence rates from past household survey data. Projections are conducted to estimate child marriages among women age 20-24 years old because the conventional indicator for child marriage is defined as the "*percentage of women age 20-24 years who were married or*

2 United Nations Children's Fund Regional Office for South Asia Progress Report 2016. Available at http://www.unicefrosa-progressreport.org/childmarriage.html.

3 United Nations Children's Fund, The State of the World's Children 2015 – Reimagine the future: innovation for every child. Available at http://www.unicef.org/wcaro/english/SOWC_2015_Executive_20Summary_20web.pdf.

4 Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

in union before the age of 18 or 15". The reason the indicator focuses on the age group 20-24 is because this is the first cohort of women, at the time of a survey, to have all entered into adulthood as opposed to the 15-19 year old cohort in which many members may still be at risk of child marriage. While this indicator is very useful for understanding overall trends in child marriage, the pitfall of using this indicator is the time-lag factor; the indicator is describing events that happened to women three or more years ago so cannot capture any immediate changes in child marriage patterns which is required for monitoring the Headline Result. Yet another constraint is the missing dimension on child marriage among boys that provides further contextual insights on child marriage.

Until CRVS systems are considerably strengthened the widespread problem of measuring annual rates of marriage, let alone child marriage, in a country and in the region will remain. However as programming to end child marriage continues, it is critical that attention is also directed towards measurement issues. To this end this study explored a possible approach to the measurement of child marriage. The study was an attempt to look at whether immediate (annual) changes in the marriage behaviour of the under 18 population (both females and males) could be measured with data that includes and goes beyond the standard MICS/DHS sources.

The study aimed to answer the following three questions:

(1) What was the number of child marriages in the region at the start of 2014?

(2) If marriage patterns in 2014 remain the same, how many child marriages are likely to occur at the end of 2017?

(3) If interventions to prevent child marriage implemented in the four year ROMP period are successful, what will be the total reduction in child marriages[5] by the end of 2017?

To answer these questions, the study attempted to use a Markov model with Monte Carlo simulations. The report provides a summary of the methodologies used in the study and a discussion of the findings at the regional level.

5 This total reduction refers to the reduction in number irrespective of cause and therefore includes those due to the underlying downward trend observed over time.

Study Methodology

The method proposed for this study is a statistical modelling tool known as Markov model with Monte Carlo simulations. A Markov model is a modelling tool that predicts repetitive movements or actions over time across mutually exclusive states. In turn, Monte Carlo simulations produce distributions of the probabilities of different outcomes (events) occurring in a population. Markov models are used for many purposes, for example they are used by epidemiologists to replicate the patterns of short and long term diseases to enable economic analysis of different interventions. Applying a Markov model to quantify child marriage was a novel approach in an attempt to overcome the data limitations and statistical problems such as censoring[6] and non-parametric data[7] on child marriage rates. Unfortunately the data limitations for some countries proved to be too significant for the model to be successfully applied. In such cases an alternative and less sophisticated methodology was used instead. This section describes the two methodologies applied in the study used to answer the study questions:

(1) What was the number of child marriages in the region at the start of 2014?

(2) If marriage patterns in 2014 remain the same, how many child marriages are likely to occur at the end of 2017?

1. Using the Markov Model to estimate the number of child marriages occurring in a population

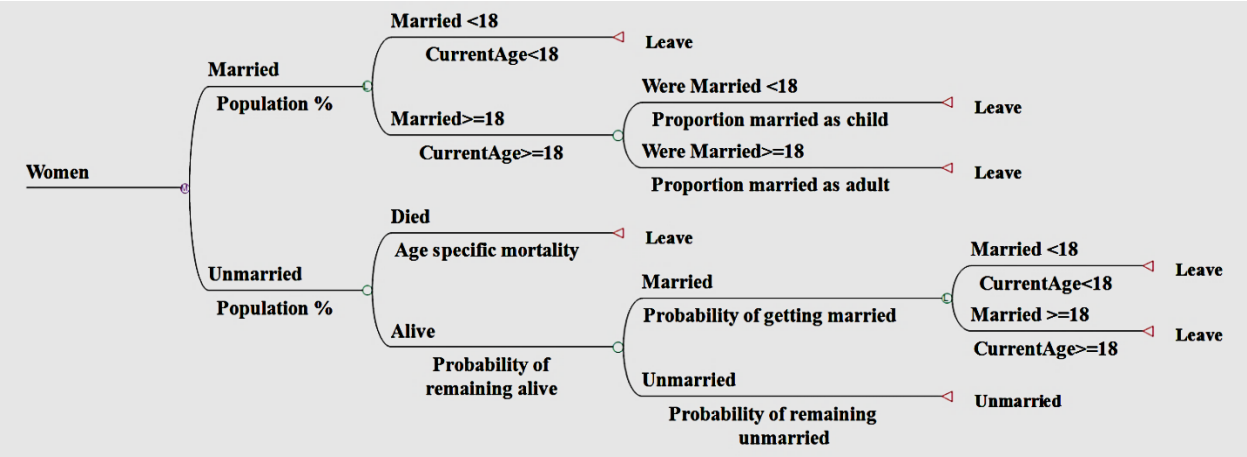
A Markov model is a modelling tool that replicates (predicts) repetitive movements or actions over time based on probabilities of different events happening. To use the model for the study of child marriage a minimum level of data is required from each country and for males and females respectively. This includes data on marriage prevalence, data on the population age-structure as well as survival rates in a country. Although the overall aim of the study was to produce regional results, the model has to be run separately for each country due to the wide variability in marriage patterns and population age structure between countries and between males and females within the same country.

Figure 1 below provides an illustration of how the Markov model has been designed to quantify child marriage in the population. To understand the model it is useful to be familiar with the five basic concepts described in box 1.

6 Censored observations are observations that contain incomplete information relating to 'the time to event'. In case of marriage data, not all respondents are married by the time a survey is conducted (right censored). In child marriage literature, to avoid censoring, traditionally age-group 20-24 years is analyzed.

7 When the variable of interest in the data does not follow a normal distribution, it is called non-parametric data. Most statistical tests are based on the assumption that the data is normally distributed. In case of small sample size, it is difficult to assume a normal distribution because such an assumption may be erroneous.

Figure.1. Illustration of the Markov Model for Estimating Number of Child Marriages in a Population



Box 1: Markov modelling: the basics

Markov states: The model is built on mutually exclusive states. At any point in time, a population or cohort can be present in one or other of the discrete Markov states. In the case of this study the states used were "Married" and "Unmarried".

Branches: Each of the Markov states branches out into a number of arms thereby giving the model the form of a tree. The branches reflect the different likelihoods that can happen to a population when they are in any of the Markov states. For example the population in the "Unmarried" state has the possibility to either remain unmarried, to become married or to die.

Probabilities: The population is distributed between the Markov states based on probabilities of the population proportions being in a particular Markov state. At the start of the model the distribution is governed by *initial population* probabilities. Further movement along the branches of the tree is then based upon *transition probabilities* which reflect what proportion of the population will remain in each of the states by the end of the cycle.

Cycles: A Markov model works along discrete time intervals referred to as cycles and the model ages with each cycle. In the application of the model to this study each cycle is one year in length. With each cycle each member of the population also ages by one year.

Termination condition: A termination condition is built into the model to specify how long the model runs. The specification can be in terms of number of cycles (years) or in relation to a factor (for example age) or a combination of both. While the cycles' condition applies to the whole cohort, the condition in terms of a factor (for example, age) applies to the specific member in the population.

To start the model, the male or female population age less than 24 years old[8] is distributed into the Markov states of "married" and "unmarried". The population age structure of the under 24 year old hypothetical cohort is specified in the model. Information on population age structure is obtained from tables developed by United Nations Population Division (United Nations, 2015). Although national level information on population age structure is available for most of the countries in South Asia along with population projections, for the purpose of this study UN projections are preferred, not only because the methodology is consistent across all countries but these projections have already been adjusted for gaps such as age misreporting, under-enumeration, underreporting of vital events, and international migration. In addition, with each new revision, any new information on past dynamics of a population is reapplied using a technically appropriate methodology.

This distribution of the population into "married" and "unmarried" is done on the basis of initial probabilities which reflect the age-wise prevalence of marriage in the population at time zero (which was either 2006 or 2007 depending on the country). Initial probabilities are based on marriage prevalence rates which come from national household surveys such as Multiple Indicator Cluster Surveys (MICS) and Demographic and Health Surveys (DHS). Other national household surveys were also extensively explored.[9] An exhaustive search and analysis of potential data sources that could be used in the study was undertaken for each of the eight South Asian countries. The sources of data that were eventually used in the model for each country are listed in annex A.

For the female population already in the "married" state at time zero, the model further distinguishes between those that are less than 18 years of age and those that are already adults (18-24). Among the adult married women, the model then branches out between those who were married as a child (i.e. before age 18) versus those married at age 18 or after using age-wise probabilities.

The population in the "unmarried" state at the beginning of the model moves along a branch depicting the likelihood of staying alive or dying within the cycle. These survival probabilities are obtained from abridged life-tables developed by the United Nations Population Divisions (United Nations, 2015). The life tables provide actual survival probabilities for five year periods till 2015 and are thereafter based on projections. However for Nepal, at the time of the study it was assumed that the UN mortality estimates had not yet taken into consideration the mortality caused by the 2015 earthquake, therefore mortality rates were adjusted based on UN Office for the Coordination of Humanitarian Affairs (OCHA) reports.

The surviving unmarried population then moves along the branch portraying the risk of transitioning to married or remaining unmarried. The probability of remaining unmarried within the cycle is based on the reverse of the annual rate of marriage in that cycle. The probabilities are calculated as the proportion of women who were married versus those who remained unmarried in that particular year. For example, referring to table 1, in 2010, 18 percent of 18 years olds were married therefore unmarried 18 year olds have an 82 percent probability of remaining unmarried before turning 19. These probabilities are based on age-at-marriage data collected in national household surveys. However as data is only available for a few survey time-points, to obtain annual estimates for the intervening years, a simplistic assumption of linearity is made between the survey years as shown in table 1.

[8] Although the study was to estimate marriages in the population aged under 18 years old, for validation purposes it was useful to include the population up to 24 years old in order to compare the model results with those of other estimates and projections using the standard indicator "the percentage of women age 20-24 years who were married or in union before the age of 18".

[9] Since it is highly probable that the marriage events in survey data may not give a true picture of nuptial patterns in a population, the upper and lower bounds of child marriage estimates were calculated by applying the 95% confidence intervals in prevalence of annual marriage rates.

Table 1: Annual rate of remaining unmarried (%), by year and age, Nepal

Age	2005	2006	2007	2008	2009	2010	2011	2012	2013
	DHS	Interpolated				DHS	Interpolated		MICS
13	91.82	91.99	92.16	92.33	92.50	92.67	95.11	97.56	100.00
14	91.82	91.99	92.16	92.33	92.50	92.67	93.89	95.10	96.32
15	91.82	91.99	92.16	92.33	92.50	92.67	93.89	95.10	96.32
16	79.12	80.60	82.08	83.56	85.04	86.52	89.79	93.05	96.32
17	80.56	80.78	81.00	81.21	81.43	81.65	84.34	87.03	89.72
18	82.06	82.00	81.94	81.89	81.83	81.77	82.05	82.33	82.61
19	82.06	81.11	80.16	79.21	78.26	77.31	79.80	82.30	84.79
20	82.06	81.11	80.16	79.21	78.26	77.31	79.80	82.30	84.79
21	82.06	81.18	80.31	79.43	78.56	77.68	79.81	81.93	84.06
22	82.06	81.18	80.31	79.43	78.56	77.68	79.81	81.93	84.06
23	82.06	81.18	80.31	79.43	78.56	77.68	79.81	81.93	84.06

For the population who marry within the particular cycle, the model finally distinguishes between whether the marriage happened as a child or adult. Those who are married or turn 24 years of age by the end of the cycle leave the model while those remaining unmarried and less than 24 years start the cycle all over again.

The population is followed from 2006 or 2007 until it reaches the end of 2017. The number of child marriages occurring at the end of the 2013 cycle and the end of 2017 are then extracted from the model to provide the baseline for the headline result and to provide the estimated number of child marriages that will occur at the end of 2017 should marriage patterns in the population remain the same.

It was recognized that the probabilities on which the model is built are subject to uncertainty and that within a real population not everyone follows the course of events with the same interval for each step in life. To address this issue the model was further supported through the use of Monte Carlo simulations; simulations allow to recreate events in a population- with one simulation representing one person's life. For the purpose of this study, a total of 500,000 Monte Carlo simulations were carried out for each model in each country. The simulations work by selecting one person at a time from the hypothetical cohort and taking that person through the model cycles till they meet a termination condition. The branches followed for each person are governed by transition probabilities and simulation trials use computer generated random numbers to select this path, with higher probability events getting more chances. This random pick allows for a variety of combinations across the branches. After 500,000 Monte Carlo simulations, a spreadsheet of information for each member of the population is provided. As opposed to using the basic Markov model, the Monte Carlo simulations also allow the same model to apply differential rates of marriage and death to the actual population structure of a country for the available years. This, in turn, provides the marriage rates by age for each of the upcoming years which are applied to the population structure to get the numbers as well as the prevalence. This is valuable because the marriage rates vary differently for each age and the large effect of population structure on child marriage numbers remains otherwise concealed.

2. Validating the Markov Model results

Following the generation of results a series of validation tests were performed. These tests involved a comparison of the results from the model with those from other available data. For example results were compared with the data sources used for input values in the model (internal validation) as well as being

compared to any another data source of similar scope and time-period for the same population where possible (external validation). Data sources used for the external validation are also included in annex A.

Some discrepancy between model and survey estimates is expected because of data inputs from multiple sources which are not necessarily comparable. Yet another consideration to be kept in mind is a high likelihood that marriage events in the survey population may not be representative of the actual occurrences in the population. This may be due to survey non-response, response bias, misperception of the duration of the reference period, [10] and age-wise distribution of women in the survey.[11] As such, if the discrepancies between survey estimates and model results can be explained during validation and the difference between child marriage prevalence rates is not more than 10 percentage points, the model was deemed validated.

3. Estimating the number of child marriages occurring in a population where the Markov Model could not be applied

It was only possible to apply the Markov model for females in Afghanistan, Bangladesh, India and Nepal. The reasons the Markov model could not be used for females in the remaining 4 countries varied. For the Maldives it was due to the small survey sample sizes whereas for Bhutan and Sri Lanka the only available recent survey data did not collect necessary information on actual age at marriage. In the case of Pakistan, despite sufficient available data in the country, the model was discarded because of a high difference in child marriage prevalence rates and proportion of unmarried population between the model results and survey results.

In the countries where the model could not be used an alternative methodology was developed whereby the most recent age-wise survey prevalence rates of child marriage are directly applied to the population estimates (using UN population estimates) for 2014 and 2017.

In all countries it was extremely challenging to apply the Markov model to estimate the number of child grooms. This was due to the almost complete lack of inclusion of the question on age at marriage of males in the national surveys. Where age-at-marriage data was available (Maldives and Pakistan), the number of grooms younger than 18 years of age in the survey samples was found to be too small to run the model. Therefore for the estimation of child grooms in 2014 and 2017 the alternative methodology is applied in all countries using the most recent estimate of child marriage prevalence for boys and applying to it to the population estimates.

4. Data limitations and assumptions

This study was initiated due to the lack of recent data to provide a baseline for the regional headline result. Due to this data scarcity, along with some known challenges with collecting information on child marriage a certain level of difficulty was expected. However as the study progressed and country data was obtained and meticulously analyzed a series of further problems were encountered the main ones being highlighted below.

10 This is when the reference period is not clearly specified to respondents or when respondents use subjective justification while reporting. For example, if a few respondents are getting married in the coming month, some may report themselves as married while others may not.

11 This mainly refers to the drawing of the survey sample which may not be representative of the number of married and unmarried by age.

An ongoing challenge facing household surveys is referred to as *misreporting of age*. Age misreporting refers to when respondents do not provide their real ages either on purpose or because they do not accurately know their age. Two types of age misreporting that may affect the results of this study include 1) misreporting of respondents age at the time of survey, and 2) misreporting of age at the time of marriage possibly due to a general awareness of legal age at marriage and the associated legal consequences for non-adherence. [1213] Over-reporting of age at marriage can lead to potential under-estimation of the number of child marriages. As a solution a sensitivity analysis was proposed by incorporating a branch into the model to reflect the probabilities of the likelihood of the population over-reporting age-at-marriage. However as a direct measure of misreporting of age at marriage is not available in any country, the sensitivity analysis was run separately for each country as an example only. The sensitivity analysis reflected a range of between 5-20% of misreporting of age at marriage. As expected when age misreporting was factored into the model the number of child marriages increased.

In a few countries there was such a limited amount of data to use, prevalence estimations had to be used irrespective of the quality of the data. In essence this meant ignoring the finer but important details on differences in survey design, target population, survey goals, and survey questions. The study had to assume that data quality of all sources used is good. Given the mathematical nature of the model, any small departure from true estimates may compound over time. Given that this possibility is very high, 95% confidence intervals of incidence rates were used in order to provide an estimates range.

Discrepancies were observed between different data sources within a country which provided information on marriage over comparable time periods. In such situations it was not possible to determine which data source represented the true estimates. In cases when a choice needed to be made over which data source to use for the model the choice would mainly come down to the source which best fit the data requirements and data availability.

Child marriage prevalence rates in the model were obtained for whole age groups and applied to population estimates for these age groups. In some countries, prevalence rate of marriage was only available from reports for five year age groups.[14] Since the rate of marriage was not available by single years, the marriage rate for age group 15-17 years has been calculated assuming uniform distribution of marriages across ages in the age group of 15-19 years. This inevitably hides the variation between ages in the age group. For example, the probability of getting married may be different in 18 year olds as compared to the 16 year olds.

Unfortunately it is not possible to know the extent to which the limitations and assumptions identified above introduce bias and error into the study results.

[12] Gage, A. (1995). An assessment of the quality of data on age at first union, first birth, and first sexual intercourse for phase II of the demographic and health surveys program. Occasional Papers No.4. Calverton, Maryland, USA: Macro International.

[13] Mensch, B. S., Singh, S., & Casterline, J. B. (2006). Trends in the timing of first marriage among men and women in the developing world. In C. B. Lloyd, J. R. Behrman, N. P. Stromquist & B. Cohen (Eds.), The changing transitions to adulthood in developing countries: Selected studies (pp. 118-171). Washington DC: The National Academies Press.

[14] Raw data was not always accessible for all surveys, in such cases the consultant had to rely on survey reports where marriage rates are provided for five year age groups only.

Methodology to establish a target for the Headline Results

After establishing the child marriage baseline for 2014 and the projection for 2017 (assuming the 2014 marriage patterns remain the same), the final question the study aimed to answer was:

(3) If interventions to prevent child marriage implemented in the four year ROMP period are successful, what will be the total reduction in child marriages by the end of 2017?

The answer to this question was required in order to review the target set for the ROSA Headline Result. In 2014, when ROSA renewed its focus on ending child marriage, the Headline Result aimed to avert 750,000 child marriages by the end of 2017. In order to calculate this target it was necessary to project two scenarios of child marriage at 2017; the first scenario whereby the observed decline in the annual rates of marriage had remained constant since 2014 and the second scenario to reflect an accelerated decline as a consequence of ongoing and new programmes to prevent child marriage in the region. The target for the Headline Result was determined by adding the annual reduction in child marriages based on the first scenario for the years 2014 and 2015 and the second scenario for the years 2016 and 2017 where it was assumed interventions would be picking up pace.

The target to avert 750,000 marriages was calculated using existing UNICEF child marriage projections.[15] The projections applied the regional average annual rate of reduction in child marriages observed over the past 25 years to women in the age group 20-24. In order to estimate a potential further decline as a result of accelerated efforts to end child marriage another projection was made using two times the annual rate of reduction. The projections were confined to DHS and MICS data and based on some quite old sources of data (for example the projections did not take into account new data that had become available for India and Nepal).

To review this target, the study applied the Markov model to estimate the possible accelerated decline in child marriage as a result of ongoing programmes until the end of 2017. Adjustments were made to the Markov model described in the previous section to reflect the possible impacts of interventions. To make the adjustment, data on the impact of the different programmes in each country was required along with the proportion of the population targeted in the countries.[16] Such data was not easy to obtain and several estimates and assumptions had to be applied which are discussed further below. For countries where it was not possible to use the Markov model, projection was made with only simple calculations applying the latest prevalence estimates to population estimates for the year.

1. Impact of child marriage programmes in each country

A wide range of child marriage programmes have been implemented in the region. All of these have used different strategies to prevent child marriage in a variety of combinations. Ideally, the estimate of the impact of these programmes should come from a meta-analysis of the programme evaluations conducted for all programmes being implemented in the country. However, this type of meta-analysis was not available. Moreover, not all programmes being implemented in a country have been evaluated and the ones that have are not representative of the on-going programmes. In addition, most of the programme evaluations do not provide a quantitative estimate on reduction in child marriage. Despite these issues and acknowledging the inherent pitfalls, after a review of the available evaluations the following were selected with an assumption

15 United National Children Fund, *Ending Child Marriage: Progress and Prospects*, UNICEF, New York, 2014

16 It is believed that no child marriage prevention programmes are being implemented in Bhutan and Maldives, while those in Sri Lanka are too small scale to be quantified. As such, the child marriage estimates for these countries from the original methodology.

that they were representative for all child marriage programmes and strategies in that country as show in the table 2 below.

Table 2: Available evaluations of child marriage programmes by country used to project future estimates of child marriages

Country	Programme evaluated	Target group	Period of intervention	Estimate of impact on child marriage
Bangladesh	Female Secondary School Stipend Programme (Two phases)	13-18 years	1993/4–2006	15% reduction of child marriage
India	Security for Girls Through Land 2013, Landesa	10-19 years	2012-2013	Delay in marriage by 1.5 years **
Nepal	Youth Reproductive Health in Nepal	14-21 years	1998–2003	9% reduction of child marriage in urban areas

Source: Solotaroff & Pande, 2014. Violence against women and girls. Washington, DC: South Asia Development Forum, World Bank

*** A more recent evaluation by ICRW of the ABAD programme (Apni Beti Apna Dhan) has shown no change in child marriage (Nanda et al., 2015). As such, the estimate of 1.5 years has been rounded down to 1 year.*

No impact evaluations were identified for Afghanistan and Pakistan. The impact estimates from Bangladesh shown above were therefore used with the reasoning that both are also Muslim countries and thus assumed to have a similar cultural context and impact on child marriages. The evaluation estimated a 15 percent reduction in child marriage in the target population.

For Nepal the evaluation estimated that child marriage is reduced by 9 percent in the urban target population. In the case of India, the evaluations identified a one year delay in child marriage which implies that 10 year old girls that have been targeted through various child marriage prevention strategies will now marry at 11 years of age and so on. The impact estimates are applied from the year subsequent to the latest survey in the country till end of year 2017. In case of Nepal, even though the observed decline in child marriage was found only in urban areas, the reduction in marriage rates has been applied to the whole population in the Nepal model.

2. Proportion of population targeted in each country

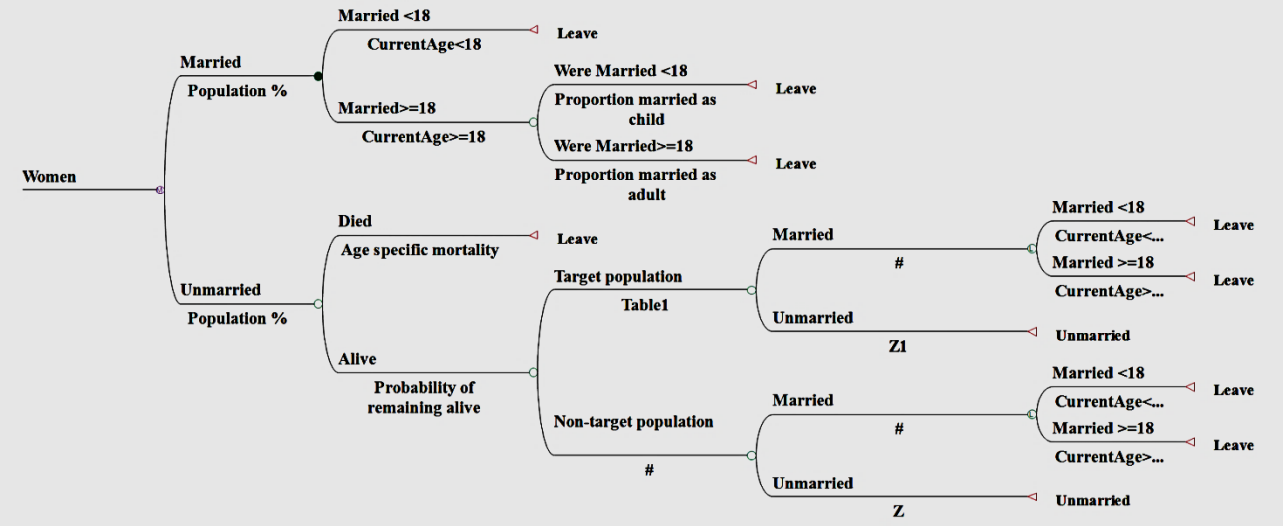
There are numerous programmes being implemented by governments, civil society and international organisations to prevent child marriage in South Asia however there is no available estimate on the population proportion being targeted collectively by these programmes at the country level. Due to the large uncertainty, three annual target scenarios were proposed - 3%, 5%, and 8% of adolescent girls to be reached by direct interventions in the period 2014-2017.

For the four countries where it was possible to run the Markov model, the model was re-run to reflect the impact of child marriage programmes. As illustrated in Figure 2 an additional branch was incorporated into the model to depict the impact of interventions (shown as target population and different probabilities of child marriage in the two arms (Z and Z1). Modelling was conducted to reflect the three target scenarios of 3%, 5%, and 8% in each of the four countries and the following probabilities were used:

Z: Probability of remaining unmarried in non-target population

Z1: Probability of remaining unmarried in target population

Figure 2: Illustration of the Markov Model for estimating number of child marriages after allowing for possible impact of child marriage interventions



Study Findings

The regional estimates of child marriage were obtained by aggregating the number of child marriages for each of the eight countries for women and men separately. The study set out to estimate the number of child marriages at the start of 2014 and to make two projections: one projection based on the previous trend of child marriage not changing over the four year period whilst the other based on an assumed impact of interventions to reduce child marriage.

(1) What was the number of child marriages in the region at the start of 2014?

As shown in table 3, the number of child brides among girls younger than age 18 years in South Asia region by end of 2013 is estimated to be 4,733,070 at a prevalence rate of 6.2%. The number of child grooms among boys younger than age 18 years in South Asia region is estimated to be 653,375 at a prevalence rate of 0.7%.

Table 3: Number of child brides and child grooms among females and males younger than age 18 years in South Asia Region at the end of 2013

South Asia	Total population	Prevalence rate	Point estimate	95% Confidence Intervals	
Females	**76,688,489**	**6.2**	**4,733,070**	**[4,308,363**	**5,485,671]**
Males	**90,675,064**	**0.7**	**653,375**	[17]na	na

[17] These estimates are based on very small numbers within the sample survey data and confidence intervals could not be obtained for most of the study countries.

2) If marriage trends in 2014 remained the same how many child marriages would occur at the end of 2017?

Whilst the study was intended to provide estimates for projecting the number of child marriages among girls and boys, the small numbers of child grooms in the survey data did not allow for further projections beyond the baseline estimates. For the countries where Markov modelling was conducted, female child marriage prevalence rates were projected till the end of year 2017. For countries where the model could not be used estimates for the end of year 2017 have been obtained by applying the latest available prevalence rates to the population estimates for end of year 2017. As shown in table 4 and illustrated by the blue line in figure 3, the number of marriages among girls younger than 18 years in South Asia region by end of 2017 will be 4,362,656 at a prevalence rate of 5.6%. The projected number of child marriages include those that had already occurred to children in 2014 who are still under 18 at the end of 2017 as well as new child marriages that will occur in the coming few years.

Table 4: Child (female) marriage estimates at the end of year 2017

	Women 20-24 years		Girls younger than 18 years	
South Asia	**Prevalence rate**	**# of child marriages**	**Prevalence rate**	**# of child marriages**
	20.9	16,240,281	5.6	4,362,656

Table 4 also shows the projected number of child marriages and the child marriage prevalence rate among women age 20-24 years old. As explained earlier in this report, focusing on the 20-24 year old age group would not reflect the immediate change in child marriage rates required for monitoring the headline result; however the results for this age group in the study have been included in the table in order to compare the results of the study with the previous 2014 UNICEF projections.[18] In the UNICEF 2014 report, the prevalence of child marriage among women 20-24 years has been estimated to decline to around 41%[19] by 2017 if the marriage trends remain the same as in 2014.

The study estimates differ quite significantly from the previous 2014 UNICEF projections (21% versus approximately 41% respectively). There can be a number of reasons for this discrepancy: 1) The UN population estimates used in the UNICEF projections are from the 2012 revisions while the UN population estimates used in this study come from the 2015 revisions; 2) Previous UNICEF projections are based only on MICS and DHS data whilst other national data sources were also used in this study; 3) New data sources in Nepal and India were not released at the time of the UNICEF 2014 projections which are the major corrections. For example, as opposed to the child marriage prevalence of 47.4% in NFHS-III (DHS 2005-06), the RSOC 2014 reports a prevalence rate of 30.3% among Indian women 20-24 years of age. India accounts for more than two-thirds of the region's population and even a difference of one percentage point in prevalence rates will have a serious impact on regional estimates; and 4) UNICEF 2014 projections are based on an average annual rate of reduction over the past 25 years, yet it is commonly observed that at the global level and in many countries, there has already been an acceleration in progress within the past ten years, so the projection may follow a steeper rate of progress in recent years which may be reflected in the results of the model used in this study.

[18] United National Children Fund, *Ending Child Marriage: Progress and Prospects*, UNICEF, New York, 2014

[19] Ibid.

(3) If interventions to prevent child marriage implemented in the four year ROMP period are successful, what will be the total reduction in child marriages by the end of 2017?

Table 5 compares the number of child brides along with the prevalence of marriage among girls in the South Asia region at the end of 2017 for the scenario where 2014 marriage trends remain the same and for three scenarios which assume a greater impact of interventions. The impact estimates assume that a total of 3%, 5%, and 8% of the girls have been targeted by the country-wide programmes and that the programmes have had a uniform impact on those targeted and have been ongoing since the latest survey.[20] As mentioned in the above, the small numbers of child grooms in the survey data did not allow for further projections beyond the baseline estimates. Therefore the reduction is only for child marriage among females.

Table 5: Estimates of number of child marriages comparing programme impact for three scenarios

End of year	Total female population age under 18 years	Number of child marriages assuming 2014 marriage trends remain the same		Number of child marriages if 3% of the population is targeted by interventions		Number of child marriages if 5% of the population is targeted by interventions		Number of child marriages 8% of the population is targeted by interventions	
		#	%	#	%	#	%	#	%
2013	76,688,489	4,733,070	6.17	4,692,220	6.12	4,679,158	6.10	4,662,163	6.08
2014	77,150,920	4,434,708	5.75	4,392,184	5.69	4,379,707	5.67	4,358,504	5.65
2015	77,462,491	4,385,382	5.66	4,340,590	5.60	4,325,382	5.58	4,292,829	5.54
2016	77,621,392	4,374,917	5.64	4,331,178	5.58	4,310,175	5.55	4,277,829	5.51
2017	**77,782,548**	**4,362,656**	**5.61**	**4,323,272**	**5.56**	**4,301,749**	**5.53**	**4,269,729**	**5.49**

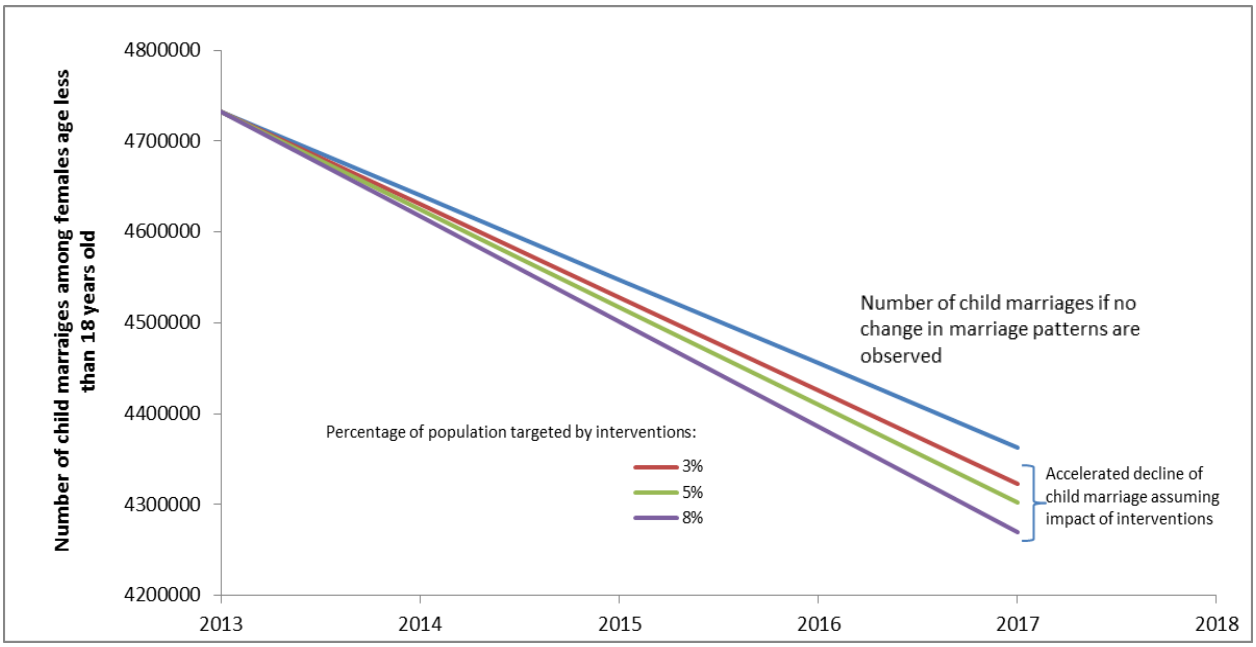
Even if the ongoing child marriage programmes are able to target 3% of the girls below age 18 years, prevalence of marriage in South Asia region will decline to 5.56% by the end of year 2017 and the number of child brides in the region will be 4,323,272. This will mean that approximately 410 thousand child marriages will be averted between end of 2013 and 2017 among girls in South Asia region. Similarly, if the collective effort against child marriage is able to target 5% of girls in select countries, approximately 431 thousand girls in the region will be prevented from becoming child brides in the period 2014- 2017. On the other hand, if the same effort targets 8% of girls in specified countries of South Asia region, the number of

[20] Though the programmes may have been continuing before the latest survey in any particular country, the impact of these programmes has been included for the years only after the latest survey because the survey findings already reflect the impact of the ongoing programmes till the time of enumeration.

child marriages averted between end of 2013 and 2017 will be approximately 463 thousand while the prevalence of marriage among girls will decline from 6.2% at end of 2013 to 5.5% by end of 2017.

The three projected scenarios are illustrated in figure 3 and compared against the initial projection for child marriage over the 3 year period assuming no change at all child marriage patterns in the region (represented by the blue line). In all scenarios incidence of child marriage is projected to decline. Based on the population targeted collectively by the child marriage programmes in study countries in range of 3-8%, the reduction in the total number of child marriages among girls between end of 2013 and 2017 will be in the range of 410-463 thousand. Following consultation with UNICEF country offices it was agreed that the 8% scenario was the most appropriate to use to reflect the collective efforts (not only UNICEF) being made to end child marriage.

Figure 3: Projections for numbers of child marriages among females under 18 years in the South Asia region



The results indicate that the headline result target should be reduced from its current value (of averting 750,000 marriages). However, it goes without saying that the above projections should be viewed with caution because of the assumptions made in the calculations. The impact of programmes has been assumed to be uniform across a country's targeted population, irrespective of the strategies being used or geographical area of implementation. The impact estimate for a country is based on a single evaluation which is not representative of all the child marriage strategies being implemented in the country. For some countries like Pakistan and Afghanistan, the impact estimates have been applied from a programme evaluation implemented in Bangladesh which may not have a similar impact in the said countries.

Conclusion

In the face of urgent demand for an up-to-date baseline for child marriage programming and in the absence of reliable annual data on child marriage, this study attempted to develop a methodology that can provide an interim solution to the problem of child marriage measurement. The study was able to reconstruct a baseline for the ROSA ROMP period and was able to suggest a more suitable target for the headline result.

The approach was novel and drew extensively on all country level national data sources including those which had not currently been exploited for the purposes of looking at child marriage by UNICEF in the past. In the process the study uncovered the true extent of data gaps and data discrepancies. Unlike previous approaches to developing regional estimates and projections based on regional averages, the study was based on individual country estimates recognizing the variability and heterogeneity in child marriage across the region.

The study concluded that in 2014, 5,386,445 children (4,733,070 girls and 653,375 boys) were in marriage. It also concluded that if the pattern continues and programmes are active over 2014 - 2017 period, 416,300 child marriage among girls will be averted.

However a number of limitations of the study pertaining to data restrictions prevailed. This attempt at measurement had to be undertaken in an environment that was more data scarce than anticipated, where timely data was absent, not enough data points were available, the available data came from different sources with differing levels of information and discrepancy between the sources, small sample sizes, and other data limitations. Larger issues such as misreporting of age at marriage and assessing impact of child marriage programmes also require specifically designed surveys and evaluations that currently are unavailable. This has led to a multitude of assumptions which along with model limitations have a negative effect on the validity of study estimates. Even so, the study manages an unusual feat of providing insight into the most current situation on child marriage in the face of data restrictions.

An implicit goal of the study was to develop a consistent methodology for the eight countries of South Asia and a modelling pattern that could be replicated at the end of the programme period which would allow for comparison between baseline and end-line and as a consequence, also be able to give insight into the impact of child marriage programmes in a country. Unfortunately applying the Markov model to quantify child marriage proved to be a very cumbersome approach and despite the best efforts to manipulate the data, the model was unusable for half of the countries in the region and unusable to estimate numbers of child marriages among boys. It is unlikely that the situation of country data will sufficiently improve by 2018 to allow this to be a consistent methodology to be used across the region to report on the regional headline result.

Annex A: Sources of Information used to estimate numbers of child marriage by country

Country	Data Sources used for inputs to estimate numbers of child marriages	Data Sources for external validation of **results** of the Markov Model
Afghanistan	National Risk and Vulnerability Assessment 2007 – 2008 & 2011-12	Demographic and Health Survey 2010, Multiple Indicator Cluster Survey 2010-11
Bangladesh	Demographic and Health Survey 2007 Demographic and Health Survey 2011 Census 2011	Multiple Indicator Cluster Survey 2006 Multiple Indicator Cluster Survey 2012-2013
Bhutan	Bhutan Living Standard Survey 2012 Bhutan Living Standard Survey 2007 Multiple Indicator Cluster Survey 2010	
India	National Family Health Survey 2005-06 District Level Household Survey 2007-08 Census 2011 Rapid Survey on Children 2013-14 (for estimation of grooms only)	Rapid Survey on Children 2013-14
Maldives	Demographic and Health Survey 2009	
Nepal	Demographic and Health Survey 2006 Demographic and Health Survey 2011	Multiple Indicator Cluster Survey 2010 Multiple Indicator Cluster Survey 2014
Pakistan	Demographic and Health Survey 2006-07 Demographic and Health Survey 2012-13 Pakistan Living Standard Survey 2013-14	
Sri Lanka	Household Income and Expenditure Survey 2012-13	