

# Understanding Progress and Determinants of Newborn Mortality in Kyrgyzstan

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## Trends and determinants of newborn mortality in Kyrgyzstan: a Countdown country case study

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### Summary

**Background** Kyrgyzstan has made considerable progress in reducing child mortality compared with other countries in the region, despite a comparatively low economic standing. However, maternal mortality is still high. Given the availability of an established birth registration system, we aimed to comprehensively assess the trends and determinants of reproductive, maternal, newborn, and child health in Kyrgyzstan.

**Methods** For this Countdown to 2030 country case study, we used publicly available data repositories and the national birth registry of Kyrgyzstan to examine trends and inequalities of reproductive, maternal, and newborn health and

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See Editorial Comment

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- Background and Rationale
- Methods
- Results
- Policy Implications & Recommendations

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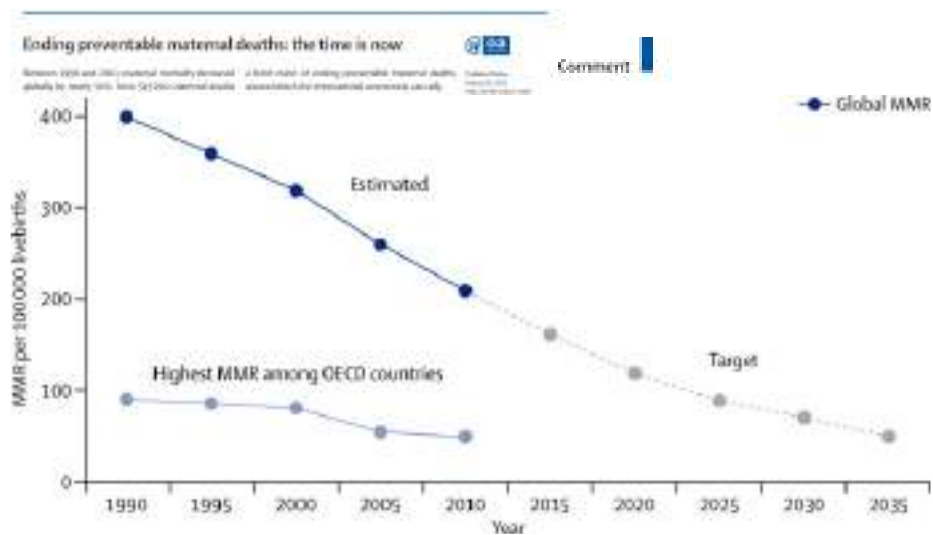
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## Background

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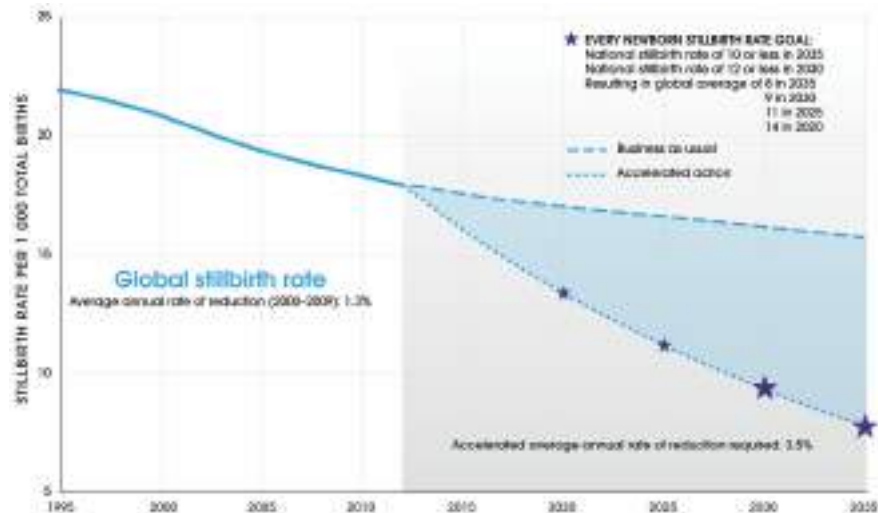
## Maternal mortality goal within SDGs



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## Global goal for stillbirths

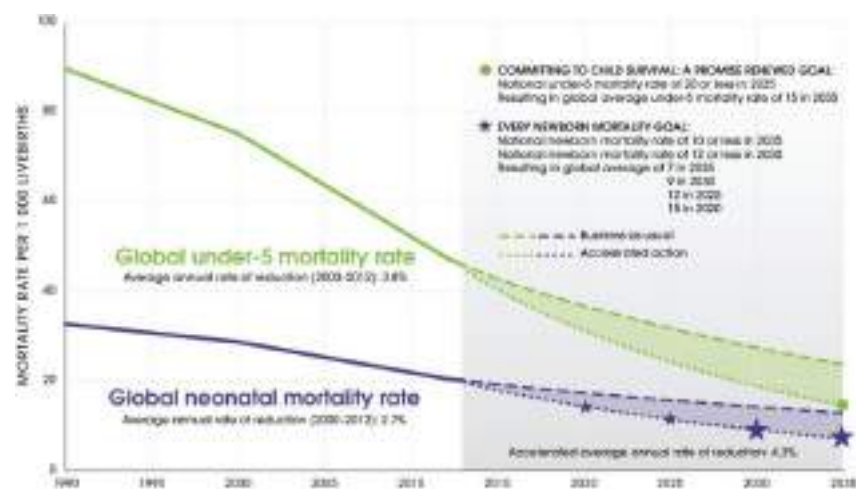


Source: Special analysis detailed in The Lancet Every Newborn Series based on country and official online consultations and using stillbirth rate data from *The Lancet Stillbirth Series* (Cousens S et al Lancet 2011)

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## Global Neonatal Mortality Goal



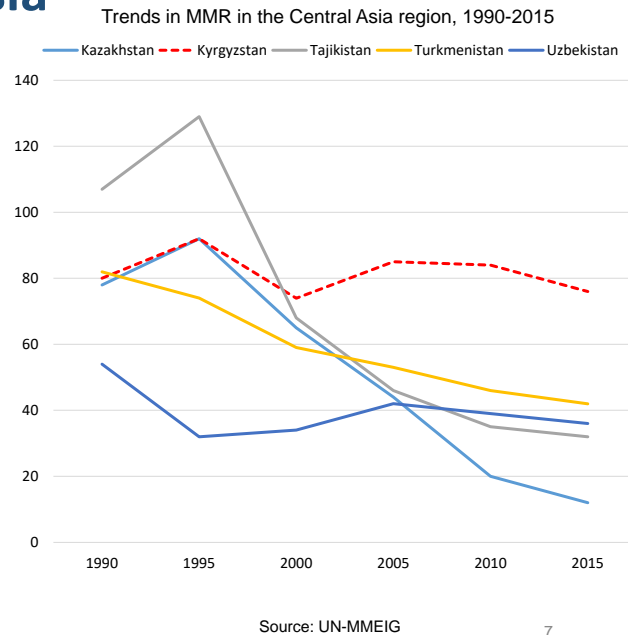
Source: Special analysis detailed in The Lancet Every Newborn Series based on country and official online consultations and using neonatal mortality rate data from the UN Inter-agency Group for Child Mortality Estimation 2013.

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## MMR Trends in Central Asia

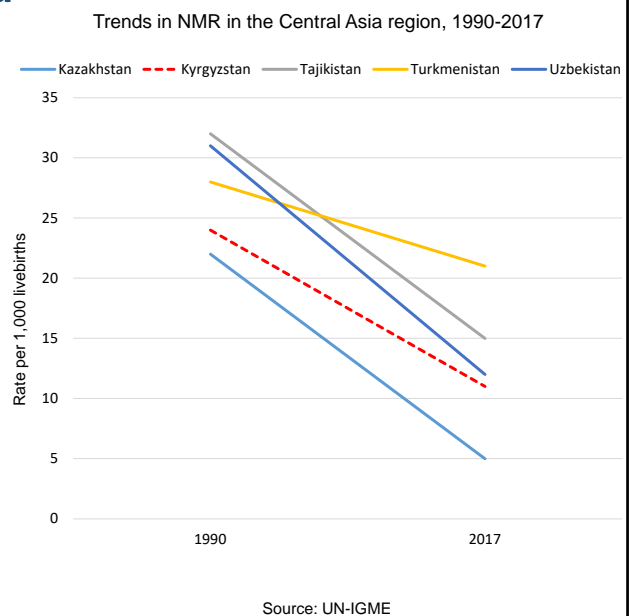
- CAR experienced a 52% decline in maternal mortality ratio (MMR) between 1990-2015
- Kyrgyzstan lags behind the rest the countries in the region, as its MMR declined by only 5% over the 25-year period



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## NMR Trends in Central Asia

- Global neonatal mortality (NMR) ↓ from 37 → 18 between 1990-2017, 51% decline
- Central Asia ↓ 59% decline in NMR between 1990-2017
- Kyrgyzstan's NMR ↓ from 24 → 11, 54% decline



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## Study Rationale

- Limited **systematic evidence** on newborn & perinatal health in Kyrgyzstan
- Progress in Sustainable Development Goals (**SDGs**) unknown
- Identifying **priorities and recommendations** for improving **quality** and **scaling-up** newborn health services sub-nationally are key to SDGs



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## Research Aim

**A comprehensive & systematic** assessment of **trends & determinants of newborn health** and survival in Kyrgyzstan to develop **recommendations** for scaling up health gains in the SDG era

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## Objectives

1. Descriptive trend analyses of mortality and health service coverage (national, geospatial, equity dimension)
2. Policy/program review of newborn-relevant initiatives
3. Decomposition of NMR into relative contributing determinants (1997-2018)
4. Prospective and retrospective Lives Saved Tool (LiST) analyses to assess impact of interventions and packages
5. Develop recommendations for scaling SDGs in Kyrgyzstan

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## Methods

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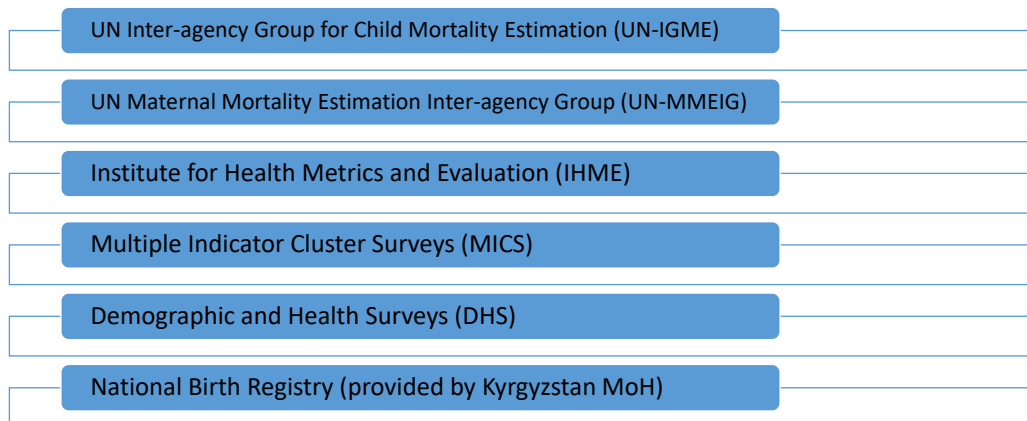
## Systematic Review & Policy Analysis

- Search for maternal and newborn health interventions and mortality outcomes and determinants (Jan-April 2019)
- Databases: Medline, Embase, Scopus, Web of Science and PubMed; & grey literature
- Search period: all years
- Additional hand-search of references and bibliographies
- Policy analysis: identify timeline of key newborn interventions, policies, programs etc from literature & corroborated by country stakeholders

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## Data Sources



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## Quantitative Methods- Data Cleaning

- Data obtained from UN-IGME and IHME, as well as those extracted from publications, were generally of high quality, requiring little cleaning beyond re-categorizing of causes of death.
- DHS and MICS survey data cleaning and variable definitions followed standard protocols
- Data from **National Birth Registry for 2012-2017** were checked for extreme values and completeness
- The main analyses used 2013-2017 given that the registry was nationally representative in those years (i.e. given staggered roll out from 2010-2012)

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## Quantitative Methods- Descriptive Analyses

- Age-specific mortality counts and total birth counts from National birth registry were used to calculate neonatal mortality rates per 1,000 livebirths and stillbirth rates per 1,000 births
- Leading causes of death for newborns and stillbirths were estimated from the birth registry and compared for 2013 and 2017.
- Underlying maternal conditions amongst women whose infant died in the neonatal period were assessed to gain a clearer understanding of the causes of neonatal death

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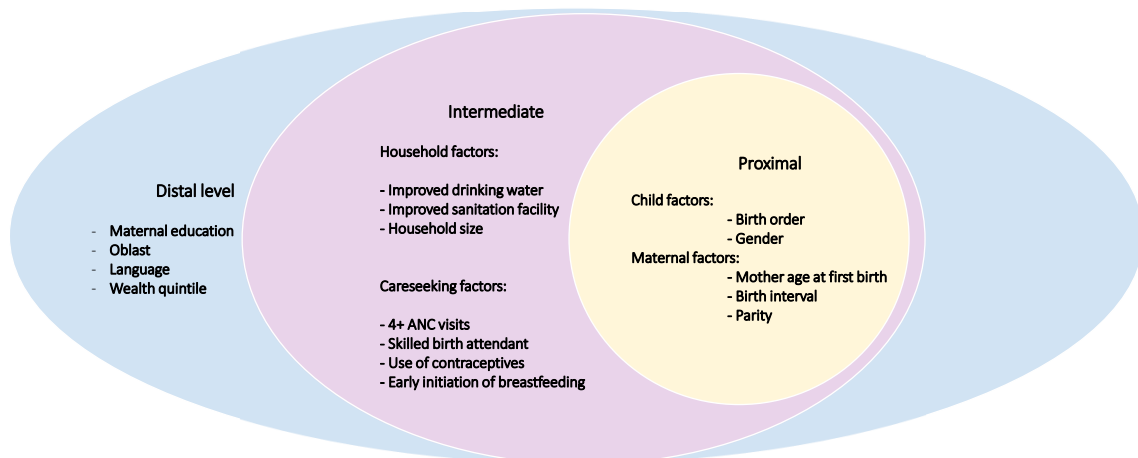
## Quantitative Methods- Multivariable Analyses

- Oaxaca-Blinder decomposition analysis was conducted to determine the socio-demographic factors associated with the observed decline in neonatal mortality rate in Kyrgyzstan over the past 20 years
- Birth history data were analyzed from DHS 1997 and MICS 2018, with a focus on births and newborn deaths over the five years proceeding each survey
- A conceptual framework regarding newborn survival was created to separate variables into one of three levels corresponding to distal, intermediate, and proximal determinants of newborn mortality

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## Conceptual framework for hierarchical MV analyses



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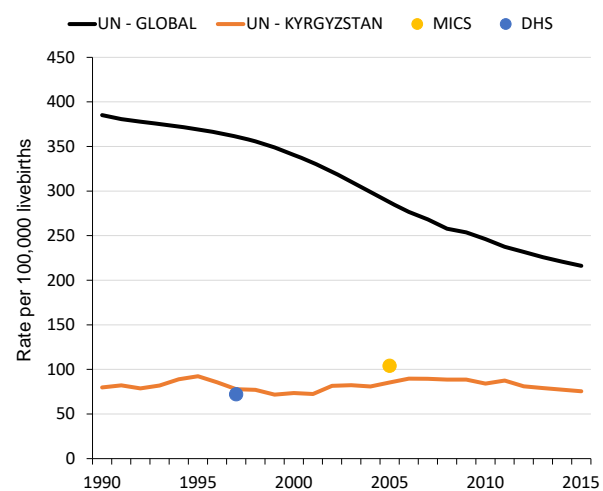
## Key Findings Mortality Trends

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### Trends in MMR

- Maternal mortality ratio (MMR) has been declining steadily from 385 in 1990 to 126 in 2015. This represents a global reduction on MMR by 44%
- Maternal mortality has fluctuated throughout the years between 72-92 deaths per 100,000 livebirths.
- Overall reduction in MMR in Kyrgyzstan is approximately 5%

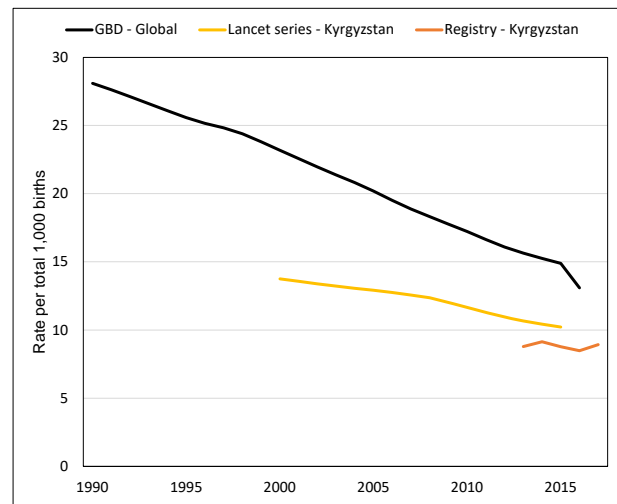


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## Trends in Stillbirths

- Globally, the rate of stillbirths has decreased from 28 in 1990 to 13 per 1000 total births in 2016.
- The rate of stillbirths in Kyrgyzstan (according to global estimates) began at a lower rate at 14 per total 1000 births in 2000 and reduced by only 4 over the next 6 years.
- Birth registry data also showed that the stillbirth rate has remained stagnant at 9 per 1000 births from 2013 to 2017.

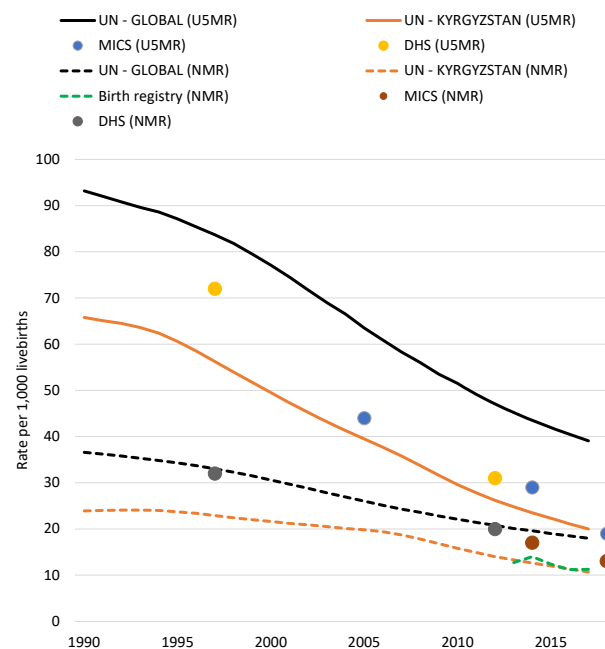


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## Trends in U5MR and NMR

- In Kyrgyzstan, under-5 mortality rate (U5MR) has made the fastest progress over that period decreasing from 68 to 20 per 1,000 livebirths
- NMR has decreased from 22 to 10 per 1,000 livebirths
- In 2017, 54% of under-5 deaths are newborns



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## Birth Registry Numbers versus UN Estimates

Year	Number of births according to official estimates	Number of births registered in the birth registry	% of births captured in registry
2013	153637	128859	83.87
2014	154483	156001	100.98
2015	153977	157721	102.43
2016	145600*	150997	103.71
2017	145600*	154742	106.28

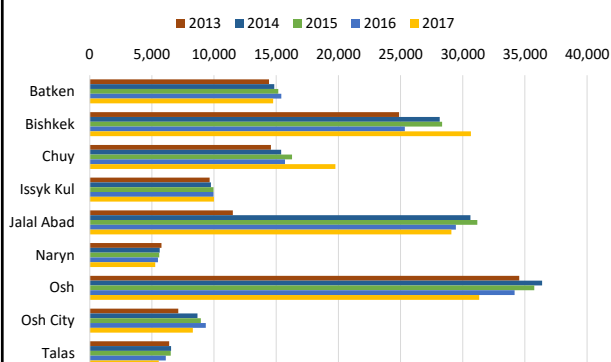
\*Average taken from <https://population.un.org/wpp/DataQuery/>

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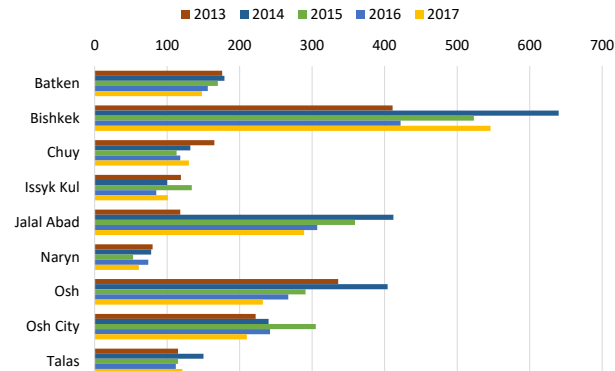
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## Birth Registry Numbers

Number of registered births by oblast



Number of registered deaths by oblast

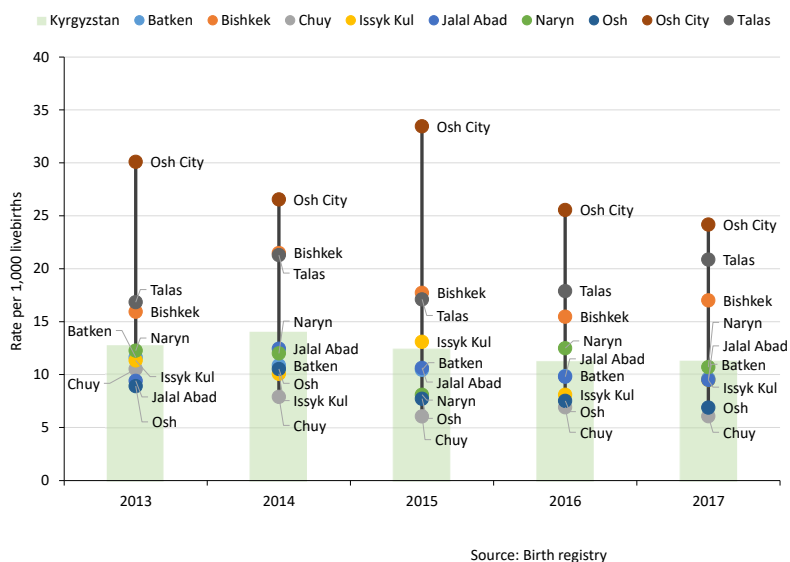


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## NMR Trends at Oblast-level

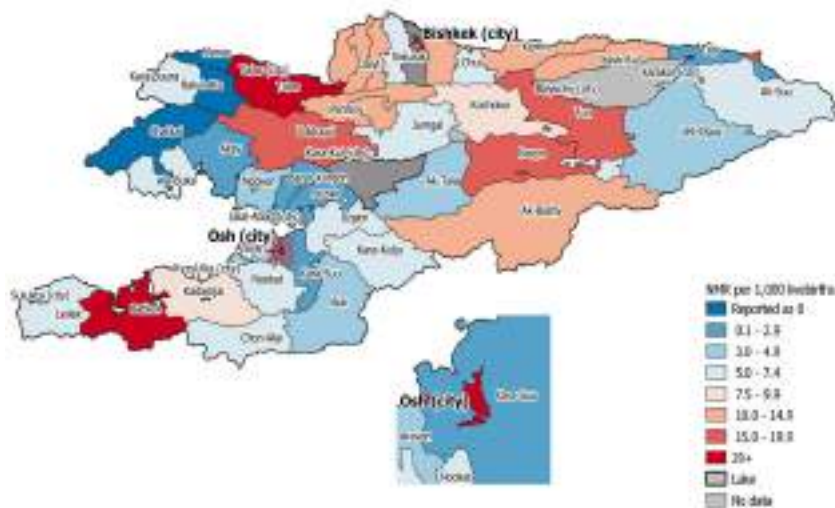
- Osh City and Bishkek consistently had higher levels of NMR across nearly all years.
- Inequalities in neonatal mortality were largest in 2015.
- The largest overall reductions in NMR from 2013 to 2017 were seen in Osh City while the smallest improvements occurred in Bishkek.



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## NMR Trends at Rayon-level

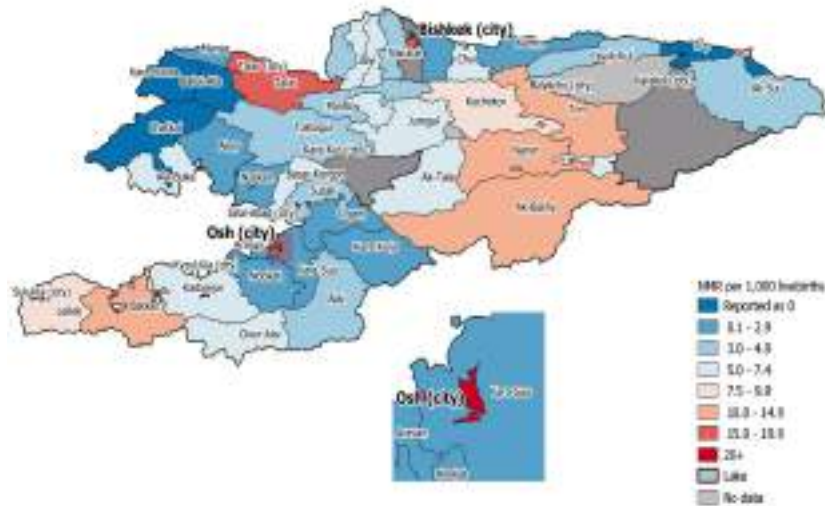
2013



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## NMR Trends at Rayon-level

2017



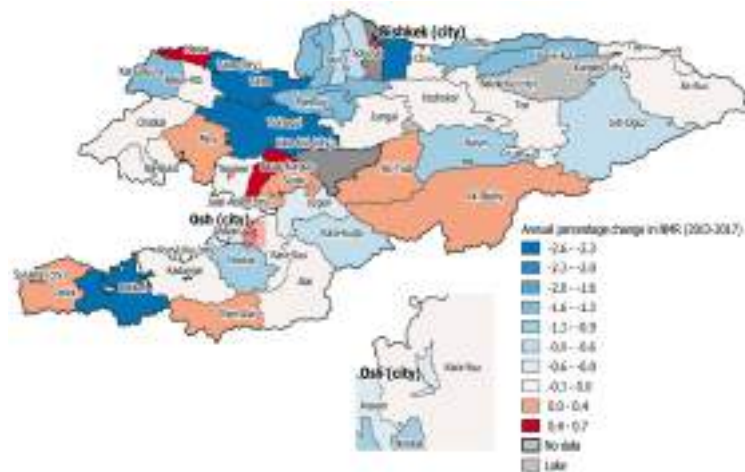
Source: Birth registry

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## NMR Trends at Rayon-level

Change (2013-2017)



Source: Birth registry

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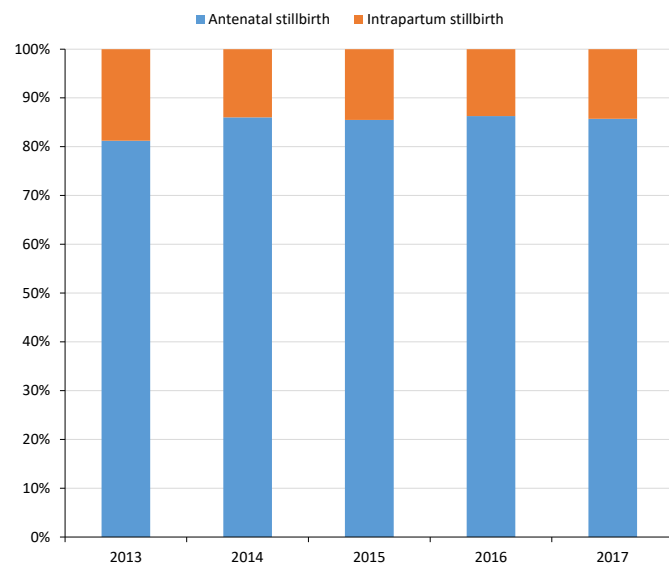
## When do newborns die?

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### Stillbirth Timing of Death

The classification of stillbirths remained fairly consistent between 2013 and 2017, with over 80% of stillbirths occurring during the antenatal period

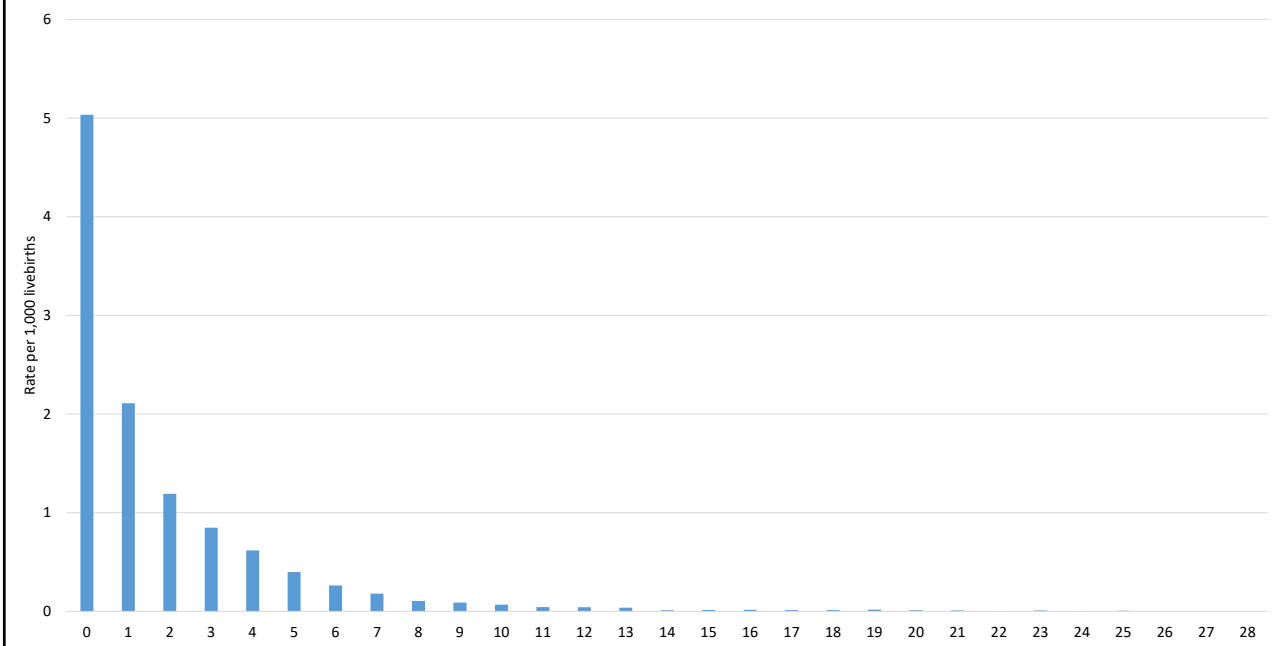


Source: Birth registry

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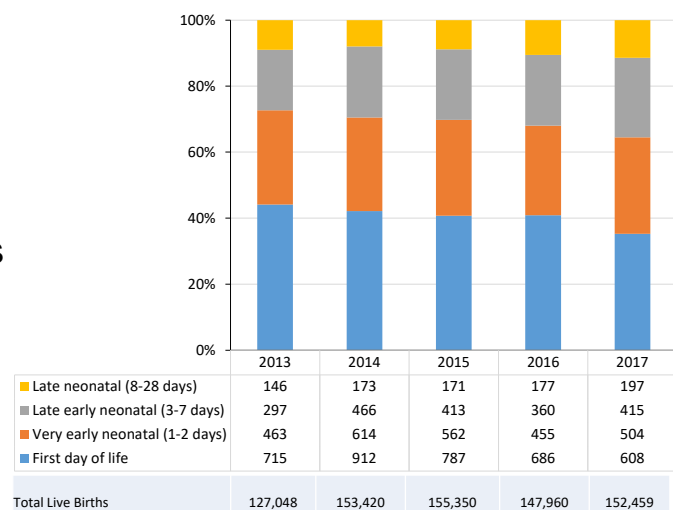
## Timing of Newborn Death by Day (overall)



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## Timing of Newborn Death (overall)

- The majority of neonatal deaths occurred during the first day of life in 2013
- By 2017, the largest proportion was on the days 1-2
- There have been small increases in the proportion of neonatal deaths that occurred during the late early neonatal period (3-7 days) or the late neonatal period (8-28 days)



First day of life = up to 24 hours, 1-2 days= 24-71 hours, 3-7 days=72-167 hours, 8-28 days=168-671 hours

Source: Birth registry 32

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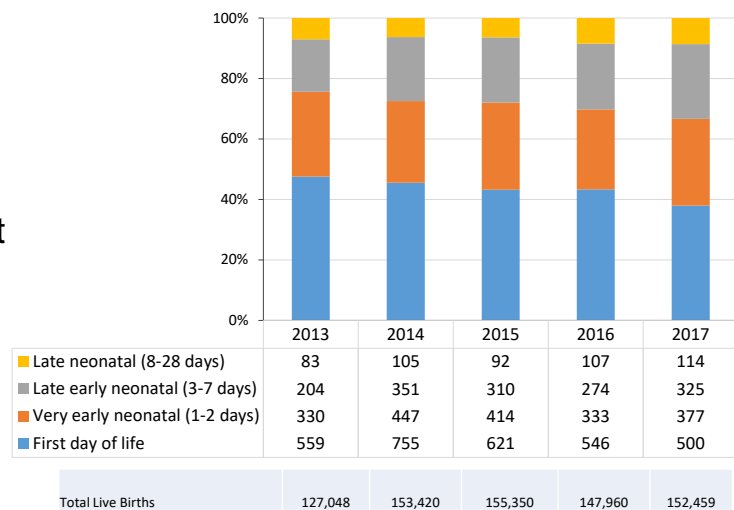
## Which newborns die?

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### Timing of Newborn Death (babies <2500g)

The proportion of late early neonatal deaths have slightly increased while very late neonatal deaths, which account for the smallest proportion of deaths among infants, have remained similar.



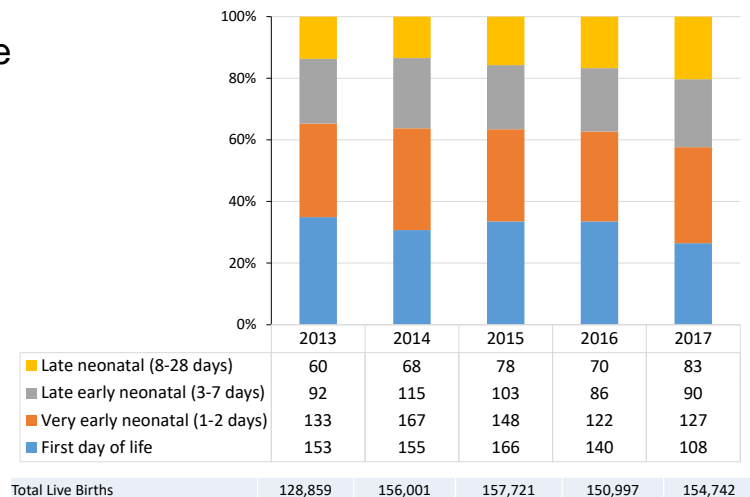
First day of life = up to 24 hours, 1-2 days= 24-71 hours, 3-7 days=72-167 hours, 8-28 days=168-671 hours

Source: Birth registry 34

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## Timing of Newborn Death (babies > 2500g)

Deaths on days 1 and 2 of life account for the largest proportion of deaths among normal birthweight infants, while the proportion of late early neonatal deaths have remained similar, and the proportion of very early neonatal and late neonatal deaths have declined from 2013 to 2017



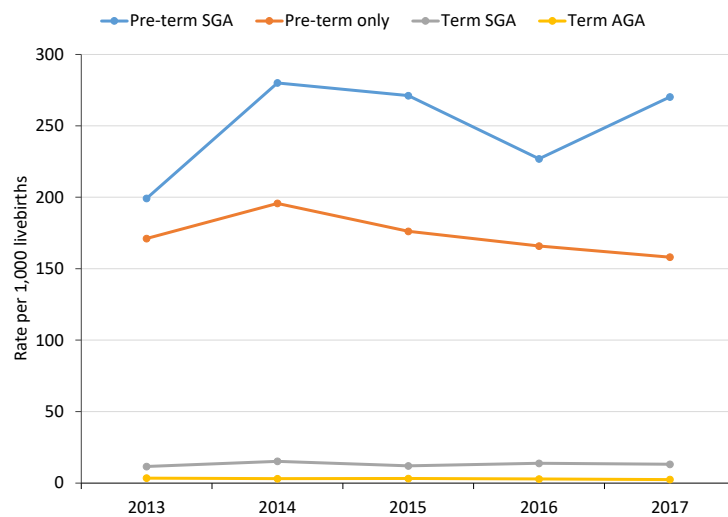
First day of life = up to 24 hours, 1-2 days= 24-71 hours, 3-7 days=72-167 hours, 8-28 days=168-671 hours

Source: Birth registry 35

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## NMR by Gestational Age

- Infants born at less than 37 weeks' gestation had considerably higher neonatal mortality rates than those born at full-term
- Infants who were pre-term and small-for-gestational-age (SGA) had the overall highest rates of neonatal mortality at 270 per 1,000 livebirths in 2017

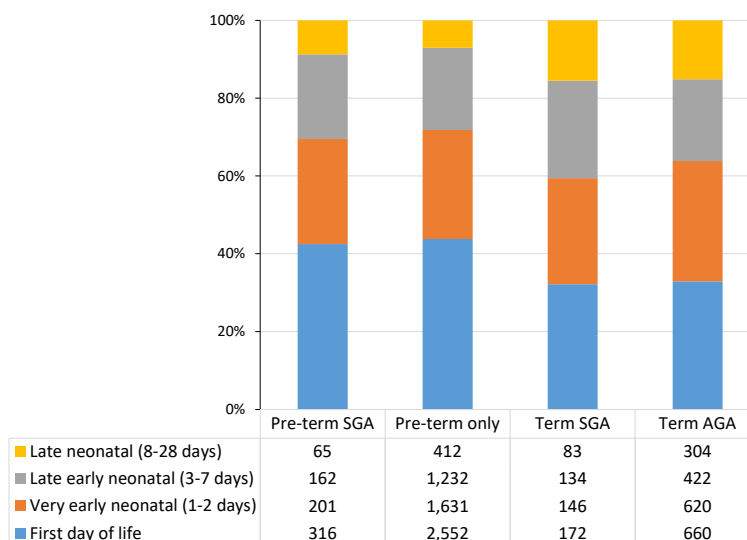


Source: Birth registry 36

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## Timing of Newborn Death by Gestational Age & Size (overall)

- Most common time of death for pre-term small-for-gestational age infants was the first day of life
- The proportion of infants dying on the first day of life decreased as gestation-age-to-weight group improved
- 75% of deaths are amongst preterm babies



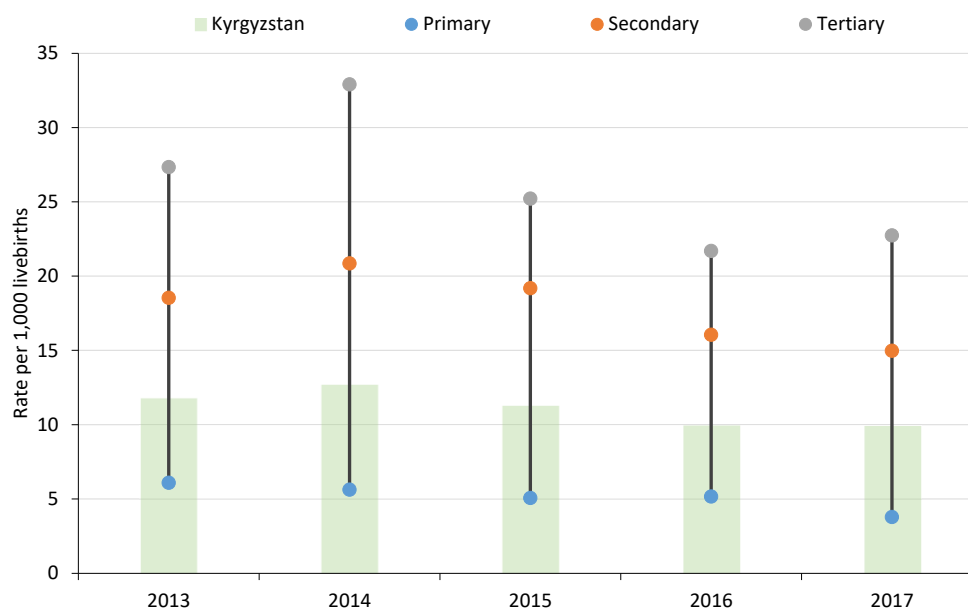
First day of life = up to 24 hours, 1-2 days= 24-71 hours, 3-7 days=72-167 hours, 8-28 days=168-671 hours

Source: Birth registry

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## Newborn Deaths by Level of Care



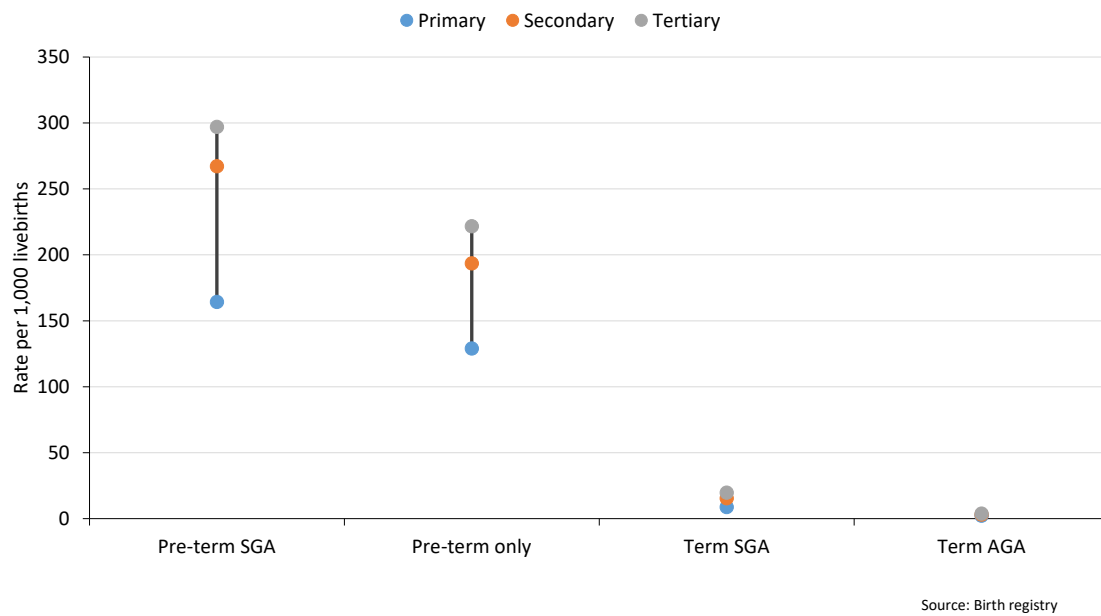
Note: Tertiary care facilities exist in only 2 oblasts across the country; 2 in Bishkek and 1 in Osh

Source: Birth registry

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## Newborn Deaths by Level of Care/ Birth Outcome



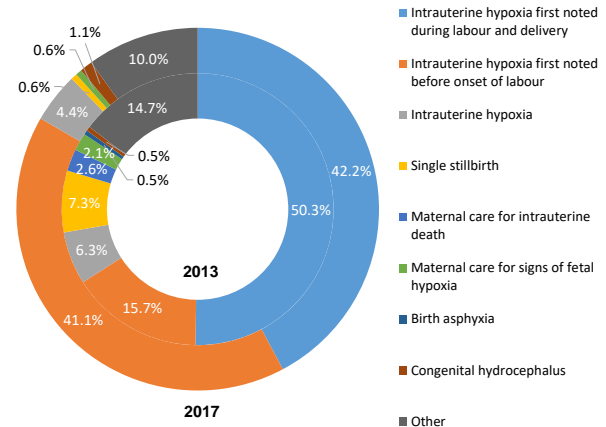
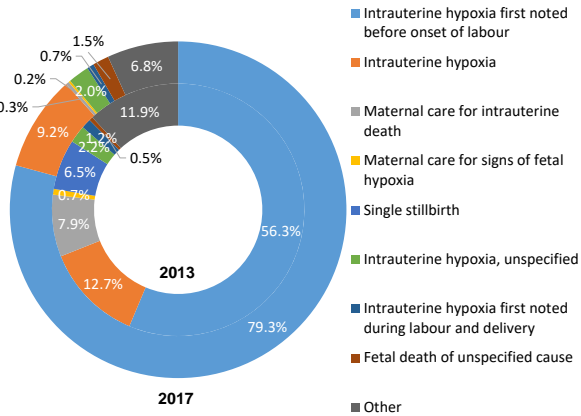
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## What kills fetuses and newborns?

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## Stillbirth Cause of Death: Antenatal vs Intrapartum

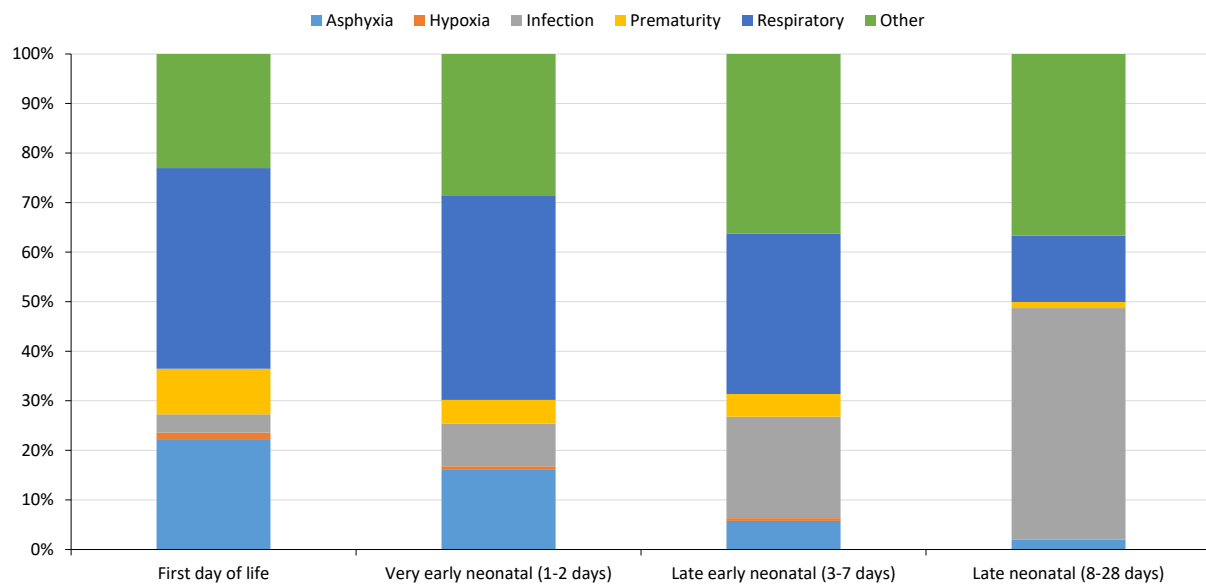


Source: Birth registry

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## Newborn Cause of Death: Overall

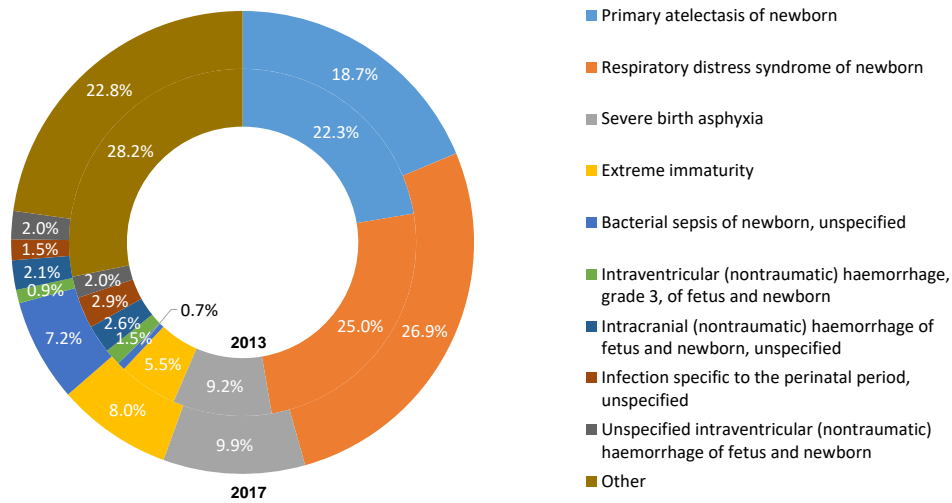


Source: Birth registry

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## Newborn Cause of Death: <2500g babies

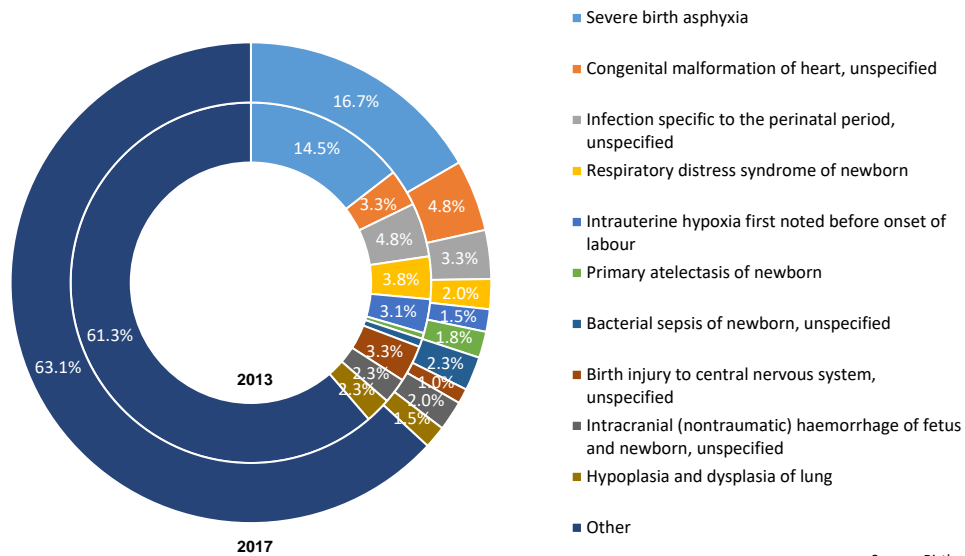


Source: Birth registry

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## Newborn Cause of Death: ≥ 2500g babies

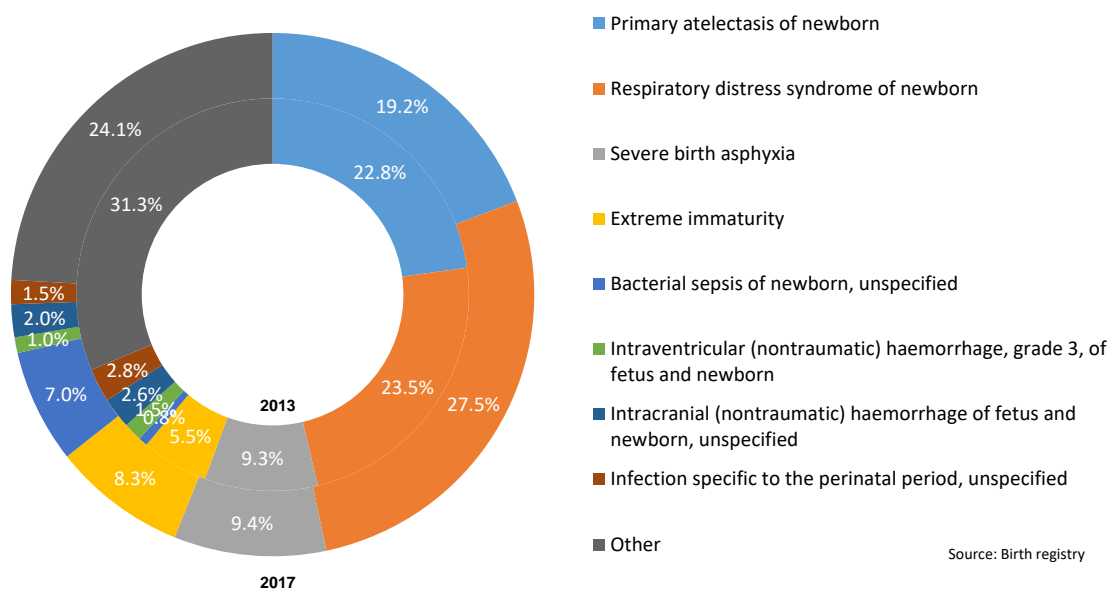


Source: Birth registry

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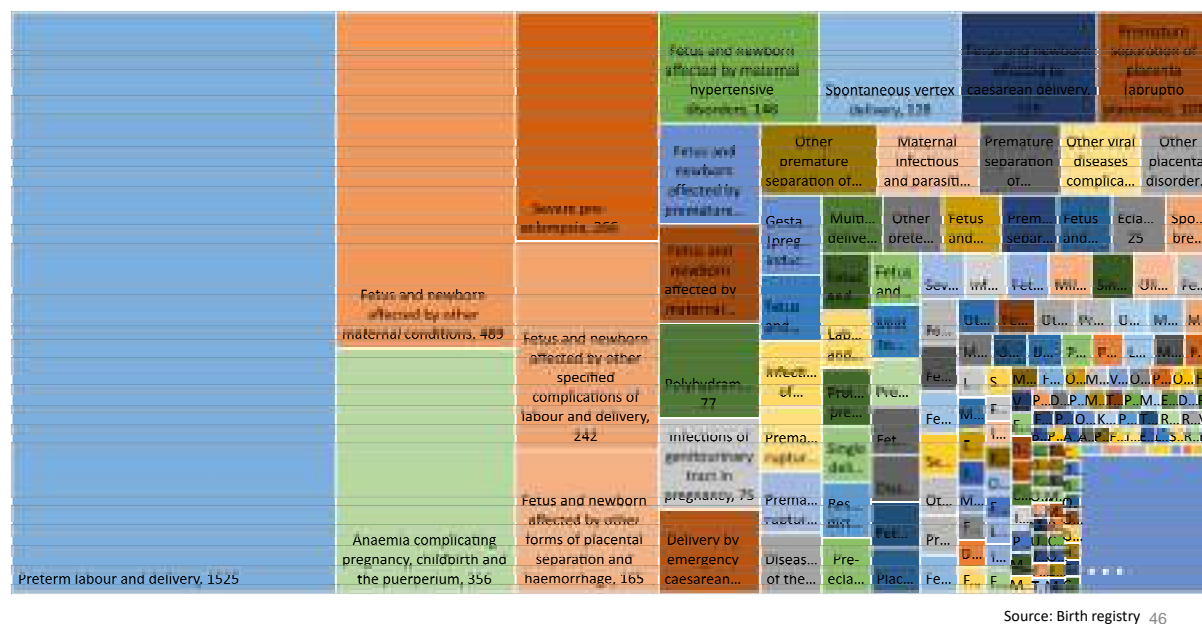
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## Newborn Cause of Death: Preterm babies



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## Underlying Maternal Conditions among Newborn Deaths: Overall



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## Status of care and interventions

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### Effective interventions for Newborn Care Lancet Series on Newborn Survival Paper 2 (2005)

- 16 interventions identified with adequate evidence of effect on neonatal deaths  
(e.g., tetanus toxoid immunization, clean delivery, obstetric care, breastfeeding, antibiotics for infections)
- All were highly cost-effective especially if packaged and delivered within other programmes (e.g., maternal and child health)



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Series

## Every Newborn 3

### Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost?

Zulfiqar A. Bhutta, John Day, Roger Field, Jay F. Costello, Brianne A. Sutter, Shweta Patel, Jennifer S. Haines, Hannah Blencowe, Agnieszka Rys, Patricia R. How, Huijia Poon, for The Lancet Research Group on Women, Babies, and Child Health and Every Newborn Study Group

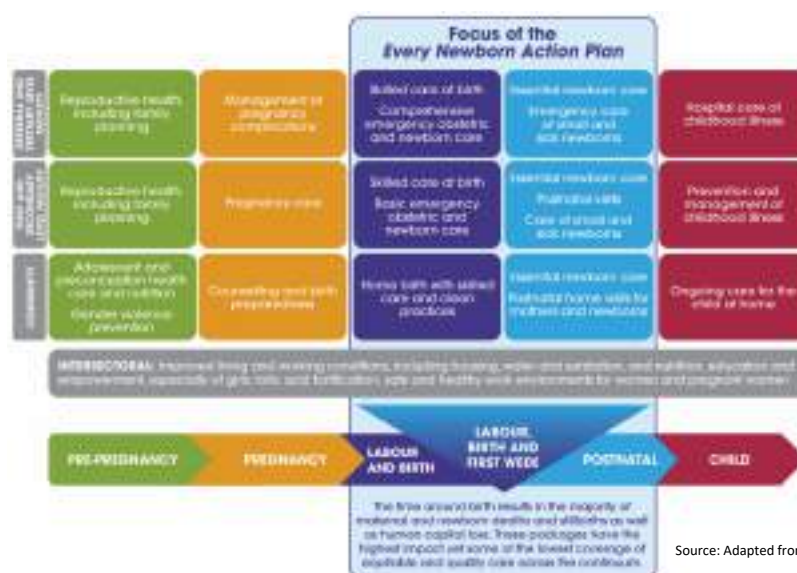
Progress in newborn survival has been slow, and even more so for reductions in stillbirths. To meet Every Newborn targets of fewer than 12 neonatal deaths and fewer than 12 stillbirths per 1000 births in every country by 2030 will necessitate accelerated scaling-up of the most effective care targeting major causes of newborn deaths. We have systematically reviewed interventions across the continuum of care and women delivery platforms, and then modelled the effect and cost of scaling up to the 75 high-burden Countdown countries. Closure of the quality gap through the provision of effective care for all women and newborn babies delivering in facilities could prevent an estimated 113 000 maternal deaths, 510 000 stillbirths, and 1·115 million neonatal deaths annually by 2030 at an estimated running cost of US\$4·5 billion per year (US\$0·9 per person). Increased coverage and quality of preconception, antenatal, intrapartum, and postnatal interventions by 2025 could avert 77% of neonatal deaths (1·9 million [range 1·4–2·1 million], 31% of stillbirths (9·42 million [3·64–13·70 million], and 54% of maternal deaths (8·16 million [3·14–11·7 million] per year. These reductions can be achieved at an annual incremental running cost of US\$1·45 billion (US\$1·15 per person), which amounts to US\$1903 for each life saved, including stillbirths, neonatal, and maternal deaths. Most (82%) of this effect is attributable to facility-based care which, although more expensive than community-based strategies, increases the likelihood of survival. Most of the

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www.thelancet.com/everynewborn  
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## Proven interventions within RMNCH continuum of care



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## We have the knowledge and tools to reduce the main causes of death

- 1 Preterm birth
  - Preterm labor management including antenatal corticosteroids\*
  - Care including Kangaroo mother care, **essential newborn care**
- 2 Birth complications (and intrapartum stillbirths)
  - Prevention with obstetric care \*
  - **Essential newborn care**, and resuscitation\*
- 3 Neonatal infections
  - Prevention, **essential newborn care** especially breastfeeding, Chlorhexidine where appropriate\*
  - Case management of neonatal sepsis \*

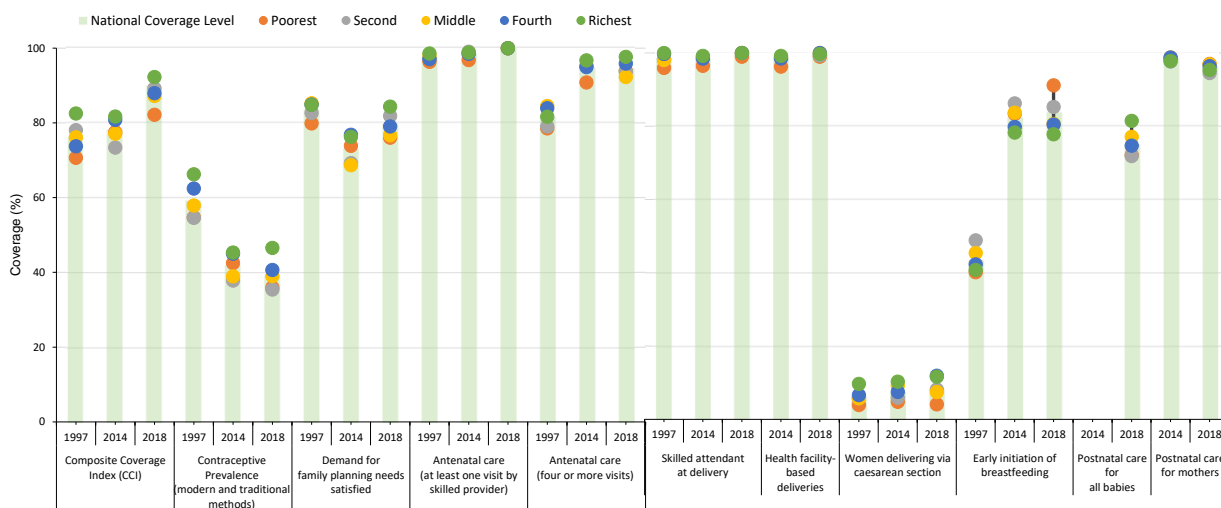
\* Prioritized by the UN Commission on Life Saving Commodities for Women and Children

**Care of small and sick babies can make a huge difference**

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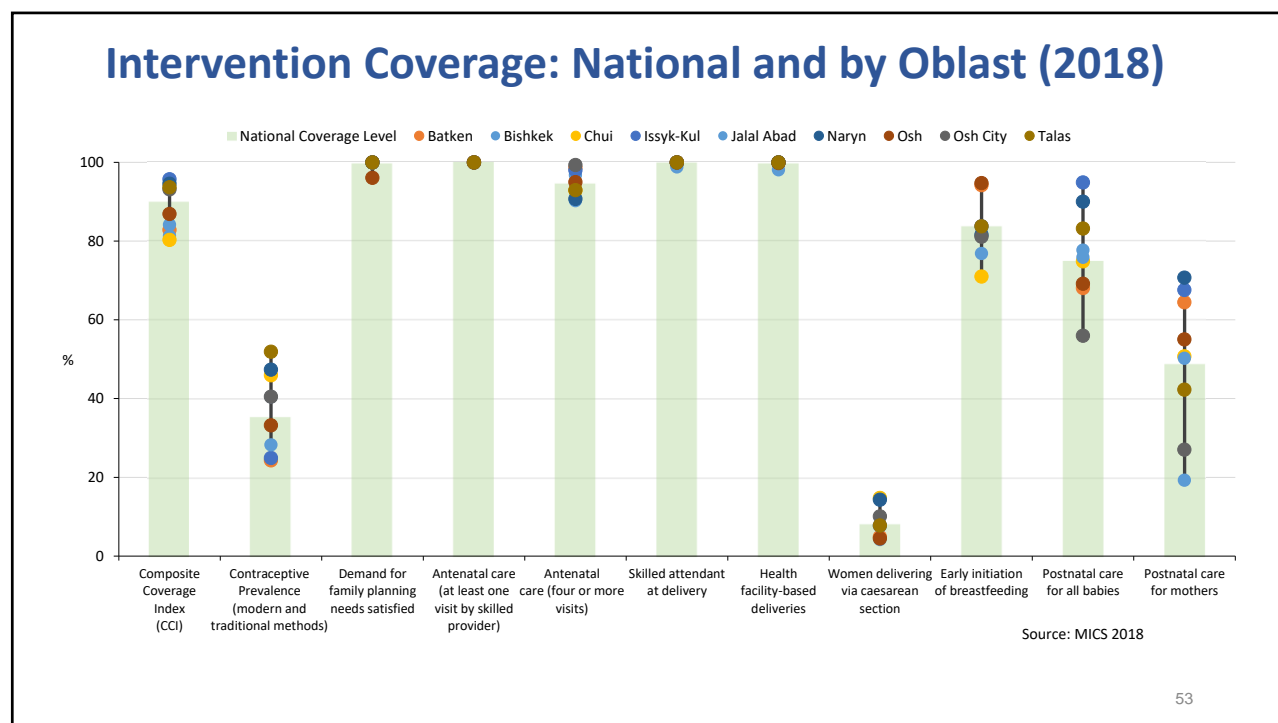
## Intervention Coverage Change: National and by Wealth



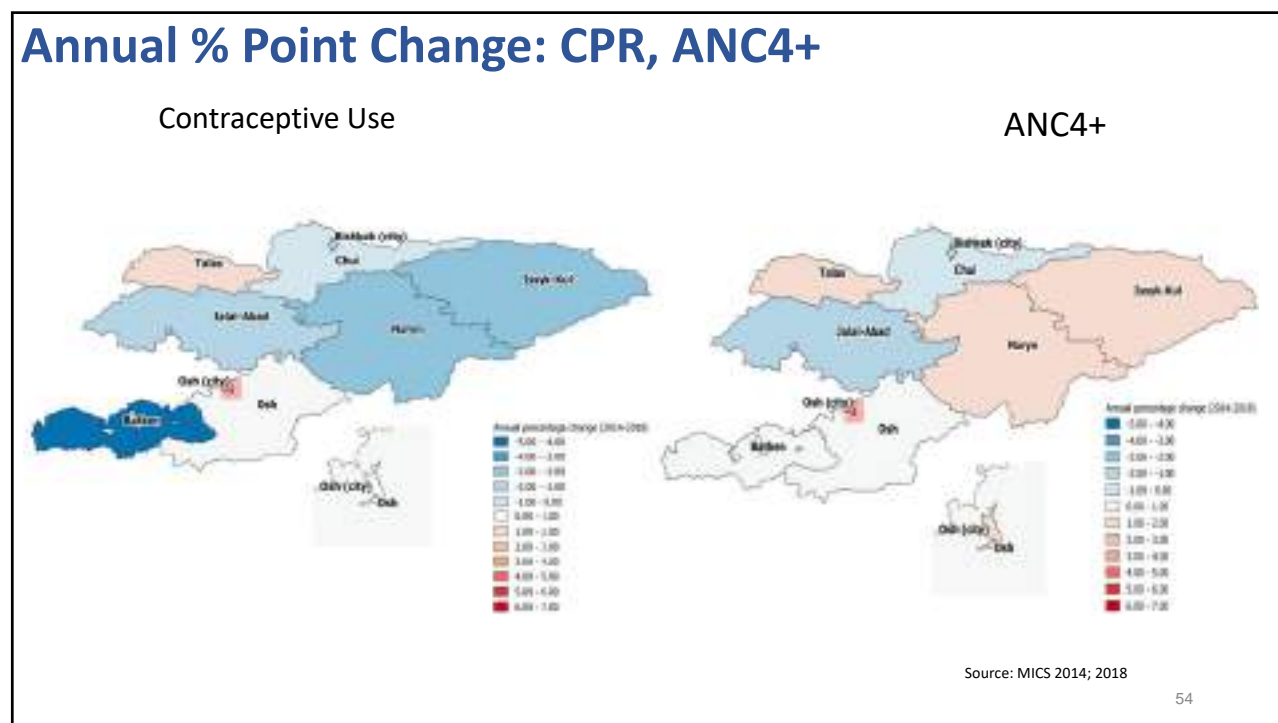
Source: MICS 1997; 2014; 2018

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## Annual % Point Change: Facility births, PNC (mothers)

Facility births



Postnatal care (mothers)

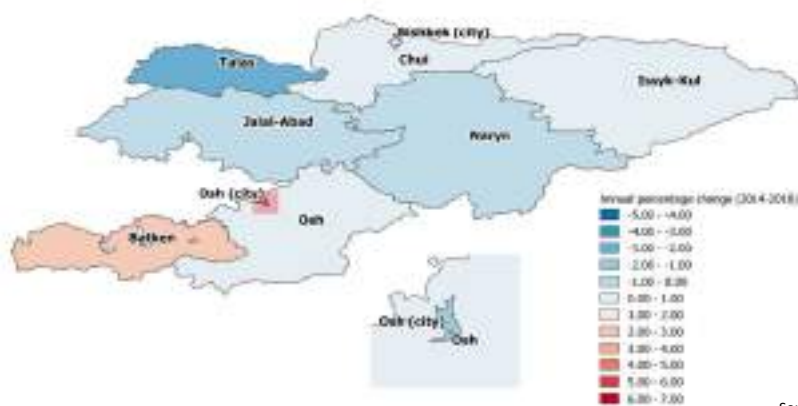


Source: MICS 2014; 2018

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## Annual % Point Change: Early Initiation of Breastfeeding



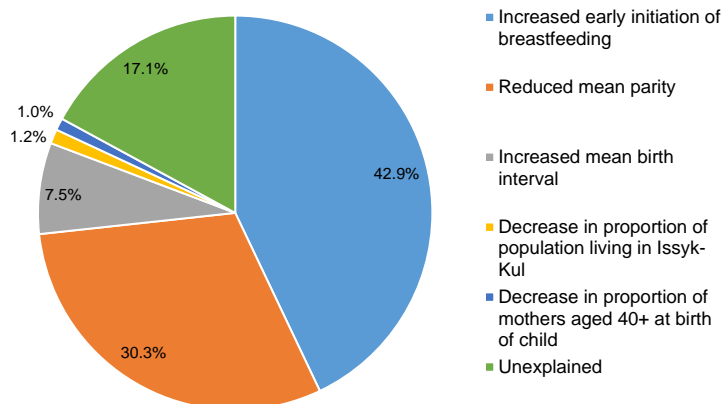
Source: MICS 2014; 2018

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## Oaxaca-Blinder NMR Decomposition (1997-2018)

- 83% of NMR change explained by these factors
- EIBF increase (43%)
- Reduced parity (30%)
- Increased birth interval (8%)

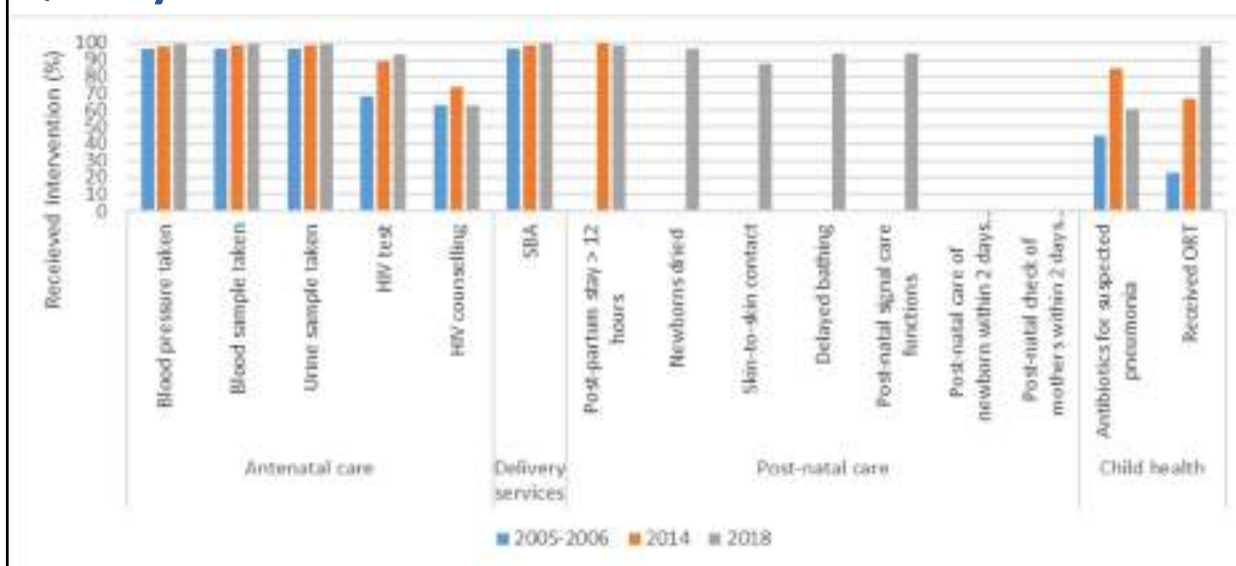


Source: DHS1997; MICS2018

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## Quality of Newborn Health Interventions



Source: MICS 2005/6; 2014; 2018

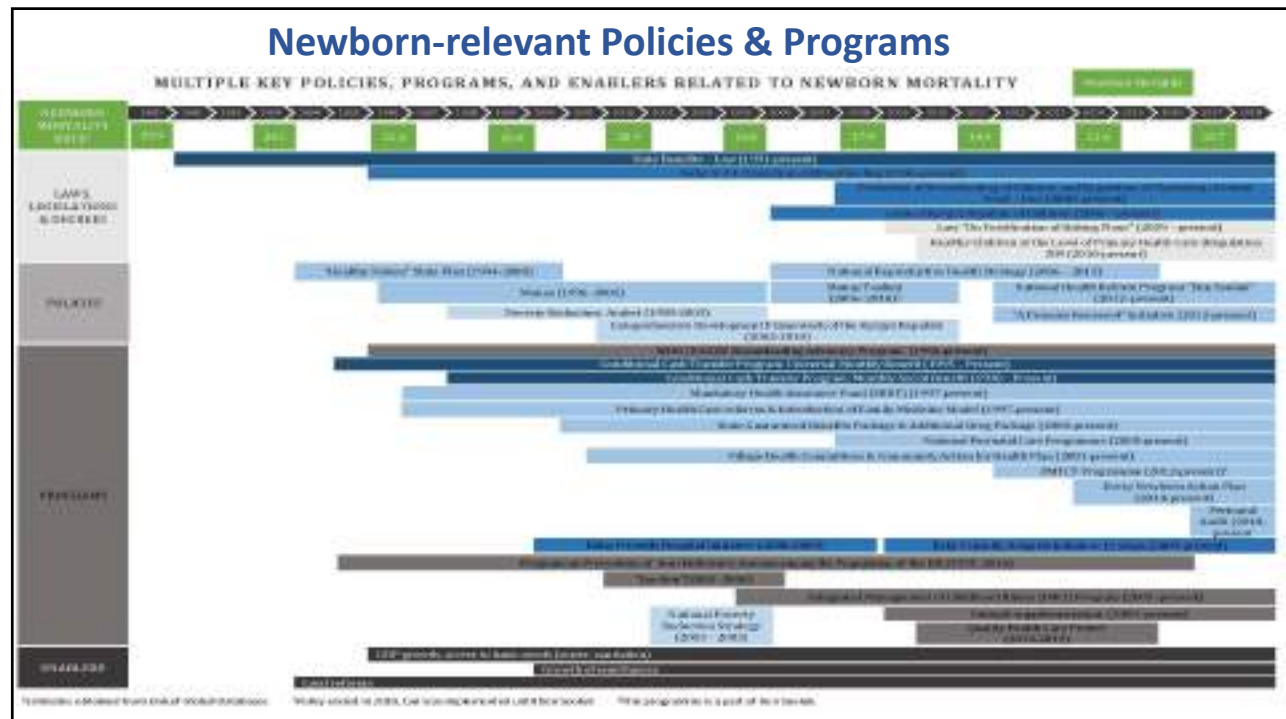
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# What more could Kyrgyzstan do?

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## Key Newborn Regionalization Policies & Programs

- **Manaas (1996-2006)** and **Manaas Taalimi (2006-2010)**, broad primary care reform with elements focused on maternal and child health. Manaas Taalimi had a specific objective emphasizing improvements in rural health centres
- **Village Health Committees & Community Action for Health Model/Program (2001 – present)**, community mobilization and health promotion strategy with a particular focus on breastfeeding
- **National Reproductive Health Strategy (2006-2015)** ensures reproductive rights for all women in the country, and Oblast Coordinating Councils were created in order to address issues related to health organization
- **Den Sooluk (2012-present)**, health reform program to reduce maternal mortality and improving social determinants. Specifically prioritizes antenatal care, family planning services, active management of the third stage of labor to reduce postpartum haemorrhage, and high-quality emergency obstetric care while also improving interactions between different levels of care
- A linked specific program that focused on perinatal care in the community -> **National Perinatal Care Programme (2008-present)**, focused on improving obstetric care through provision of individual services and access to quality health services at all levels of an integrated perinatal care system. This strengthened the referral mechanism from communities to central regions

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## National Perinatal Care Programme (2008-present)

### Objectives

1. **Regionalization** of perinatal and newborn health services; development and introduction of criteria for pregnancy and/or delivery risk assessment for referral; development of standard packages of obstetric and neonatal services; improvement of equipment/supplies provision
2. Establishment of **transport/counseling system**
3. Perinatal **quality improvement** through enhanced knowledge and practical skills of healthcare workers with new guidelines and training programmes
4. Establishment of **monitoring and evaluation** (audit) system to assess quality of perinatal/neonatal care
5. Establishment of **differentiated financing system** for perinatal care based on the provision of service packages at various levels, and depending on risk and severity of care

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## Continued Challenges in National Perinatal Care Programme

### WHO assessment (2012 & 2014) & UNICEF M&E (2014) found:

- Infection control is sub-standard at all levels of care
- Poor diagnostics and laboratory capabilities in facilities, infrastructure and medical furniture and equipment are outdated
- National clinical guidelines/protocols are not up to date and not known to many health providers
- Pre-service and in-service training programmes are not aligned with national perinatal care guidelines and protocols
- Criteria for the referral and transportation system are lacking
- Inadequate use of emergency transportation system for high risk women and newborns
- MoH fails to regularly assess the progress in achieving the set objectives

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**What difference would scaling up  
key interventions make?**

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## Modelling impact of scaling up key packages of care

### Lives Saved Tool (LiST)

- The impact of systematically increasing coverage of various evidence based interventions on reducing the burden of maternal, fetal, newborn and child deaths was assessed using the LiST tool.
- Two scenarios were modeled to determine the impact of these interventions in Kyrgyzstan.
  1. First scenario assumed scale-up of coverage from most recent coverage to 90% from 2019-2025.
  2. Second scenario further scaled up coverage to 99% during 2026-2030.
- Baseline coverage of intervention were taken from MICS 2018. LiST default coverage estimates were used where coverage of interventions was not available from MICS.

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## Lives Saved Tool Analysis

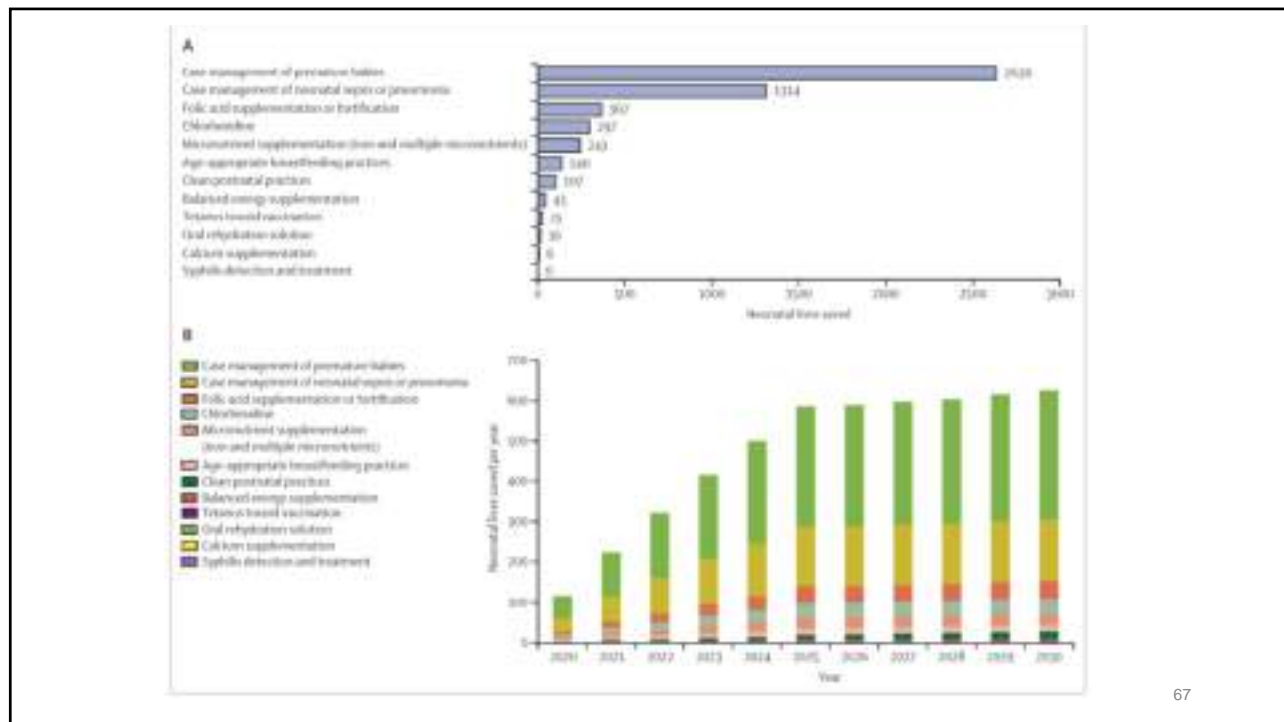
Scale-up of ENAP interventions (by 2030) could result in:

1. **38.9%** of neonatal deaths prevented
2. 11.2% of stillbirths prevented
3. 18.6% of maternal deaths prevented

	2018-2025		2018-2030	
	Lives Saved	%	Lives Saved	%
Neonatal	584	36.4	624	38.9
Stillbirth	151	9.8	172	11.2
Maternal	19	16.8	21	18.6

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## Conclusions

1. Kyrgyzstan has made tremendous progress in reducing under 5 child and neonatal mortality, and now stands at the cusp of achieving further gains consonant with SDG 3 targets
2. Much of these gains have been achieved with equitable distribution of services though many regional disparities remain and there are quality of care gaps by level of care
3. Underreporting in the hierarchy of causes of death especially among preterm infants is possible. Reflects relatively low capacities for microbiology and laboratory diagnostics in most hospitals

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## Recommendations (1) Maternal Health & Care

1. We need better quality data for maternal health, nutrition and quality of care linked to the birth registry. This will allow the establishment of linked data relating maternal and newborn care as well as risks
2. Creating a better linked data set for mothers and newborns would allow identification of pockets for targeting, and regionalization of maternal and newborn care, as well as addressing still births
3. The high burden of preterm SGA births and adverse outcomes suggest the continued need to assess and address maternal nutrition & micronutrient deficiencies in Kyrgyzstan
4. The creation of a fully linked maternal, newborn and possibly child health registry would be an excellent source of information linking the first thousand days to health and developmental outcomes, using the principles of the nurturing care framework

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## Recommendations (2) Care of Small & Sick Babies

1. With existing high coverage rates for key interventions, the biggest gains in neonatal mortality can be from scaling up packages of care for small and sick newborns. Including:
  - Creation of regional neonatal care units, availability and use of antenatal steroids and possibly surfactant in referral centres alongside respiratory care (low cost CPAP and Ventilation systems)
  - Investments in a sound transport system at Oblast level with triage and transport of high-risk pregnancies and newborns to regional centers of excellence
2. An up-to-date training program for health professionals nurses, midwives, obstetricians and paediatricians in newborn care, starting with basic courses (HBB, HBS) and rapidly leading to accredited fellowship training programs
3. Improved and quality laboratory support services especially microbiology services for assessing and addressing diagnosis and management of neonatal infections

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## Recommendations (3) Information systems

1. A vital registration system linking maternal, newborn and child health in Kyrgyzstan is possible and achievable in the medium term
2. Kyrgyzstan has a fantastic reporting base for births and birth outcomes reporting improvements can be made by expanding to a range of coverage indicators for women (antenatal and postnatal), as well as outcomes based on validated diagnostic categories (ICD11)
3. The data system must be linked to regular (if not real time) feedback and perinatal audit systems for maternal and newborn outcomes, including stillbirths by timing, and autopsies
4. The information on infection control, prevention and surveillance for mothers and newborns can be improved through sentinel laboratories

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