Tanzania's Countdown to 2015: an analysis of two decades of progress and gaps for reproductive, maternal, newborn, and child health, to inform priorities for post-2015

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Summary

Background Tanzania is on track to meet Millennium Development Goal (MDG) 4 for child survival, but is making insufficient progress for newborn survival and maternal health (MDG 5) and family planning. To understand this mixed progress and to identify priorities for the post-2015 era, Tanzania was selected as a Countdown to 2015 case study.

Methods We analysed progress made in Tanzania between 1990 and 2014 in maternal, newborn, and child mortality, and unmet need for family planning, in which we used a health systems evaluation framework to assess coverage and equity of interventions along the continuum of care, health systems, policies and investments, while also considering contextual change (eg, economic and educational). We had five objectives, which assessed each level of the health systems evaluation framework. We used the Lives Saved Tool (LiST) and did multiple linear regression analyses to explain the reduction in child mortality in Tanzania. We analysed the reasons for the slower changes in maternal and newborn survival and family planning, to inform priorities to end preventable maternal, newborn, and child deaths by 2030.

Findings In the past two decades, Tanzania's population has doubled in size, necessitating a doubling of health and social services to maintain coverage. Total health-care financing also doubled, with donor funding for child health and HIV/AIDS more than tripling. Trends along the continuum of care varied, with preventive child health services reaching high coverage (≥85%) and equity (socioeconomic status difference 13–14%), but lower coverage and wider inequities for child curative services (71% coverage, socioeconomic status difference 36%), facility delivery (52% coverage, socioeconomic status difference 56%), and family planning (46% coverage, socioeconomic status difference 22%). The LiST analysis suggested that around 39% of child mortality reduction was linked to increases in coverage of interventions, especially of immunisation and insecticide-treated bednets. Economic growth was also associated with reductions in child mortality. Child health programmes focused on selected high-impact interventions at lower levels of the health system (eg, the community and dispensary levels). Despite its high priority, implementation of maternal health care has been intermittent. Newborn survival has gained attention only since 2005, but high-impact interventions are already being implemented. Family planning had consistent policies but only recent reinvestment in implementation.

Interpretation Mixed progress in reproductive, maternal, newborn, and child health in Tanzania indicates a complex interplay of political prioritisation, health financing, and consistent implementation. Post-2015 priorities for Tanzania should focus on the unmet need for family planning, especially in the Western and Lake regions; addressing gaps for coverage and quality of care at birth, especially in rural areas; and continuation of progress for child health.

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Introduction

As the Millennium Development Goals (MDGs) come to a close in 2015, the global community is asking which countries are on track to meet these goals and why, who has been left behind and why, and what the post-2015 priorities are for global development. Of the 75 Countdown to 2015 priority countries, 20 (including Tanzania) are on track to meet MDG 4—to reduce the under-5 mortality rate by two-thirds from 1990 levels[1]—and six are on track for MDG 5, which is to reduce the maternal mortality ratio by three-quarters.[2] However, neighbouring countries vary in the progress they have made. To better understand the drivers for progress in reproductive, maternal, newborn, and child health (RMNCH), Countdown to 2015 commissioned country case studies, including one for Tanzania.[3]

Tanzania has experienced several decades of political stability, with recent high-level attention to RMNCH, as signified by President Jakaya Kikwete co-chairing with Canadian Prime Minister Stephen Harper the UN

Research in context

Evidence before this study

This evaluation of Tanzania's mixed progress in child, newborn, and maternal survival and family planning builds on an earlier analysis that explored determinants of initial successes observed in child survival between 1990 and 2004.

Added value of this study

This large-scale multi-analysis case study documents and critically assesses the extent of progress between 1990 and 2014 in maternal, newborn, and child health, and family planning in Tanzania, and investigates why the positive effects recorded in child survival have not been represented in progress for Tanzania's mothers and neonates. The case study uses a detailed analytical approach, examining coverage, equity, and financing, plus health system and policy changes for maternal, newborn, and child health, and family planning, while considering contextual change.

Implications of the available evidence

Evidence from this case study will inform accelerated action towards the end of the Millennium Development Goals and contribute to ending preventable maternal, newborn, and child deaths by the end of the Sustainable Development Goals in 2030.

Commission on Information and Accountability[4] for the UN Secretary-General's Global Strategy for Women's and Children's Health. However, Tanzania's progress in RMNCH is mixed, with substantial advances in child survival but slower progress in maternal and newborn survival, and family planning. Tanzania has achieved the fifth fastest reduction in under-5 mortality rate of the Countdown to 2015 countries, attaining the MDG 4 target with an under-5 mortality rate of 54 deaths per 1000 livebirths in 2013.[5] However, the reduction in neonatal mortality (deaths occurring within the first 28 days of life) has been much slower, and now accounts for 40% of deaths in Tanzanian children younger than 5 years.[6] The maternal mortality ratio is 410 deaths per 100 000 livebirths, which indicates that the country has made insufficient progress towards MDG 5.[2]

See Online for appendix

This case study explores the reasons for the achievements made in child survival in Tanzania, yet slower changes for maternal and newborn survival and family planning, to inform priorities to end preventable maternal, newborn, and child deaths by 2030.[7] The analysis updates to 2013 and expands a previous analysis[8] that investigated improvements in child survival between 1990 and 2004. That study suggested that progress in the under-5 mortality rate was related to increased health resources combined with a decentralised health system.[8]

Methods

Study design and objectives

We used a health systems evaluation framework (figure 1)[9] to assess changes in impact (mortality and fertility) through analysis of coverage, equity, health system, and financial inputs, while also considering contextual change (eg, economic and educational factors). This framework represents the full RMNCH continuum and includes Countdown to 2015's four technical working areas (coverage, equity, financing, and health systems and policies). This study linked to Tanzania's national process for Health Sector Strategic Plan[10] and One Plan midterm reviews.[11] Five objectives (panel 1) assessed each level of the framework, and included a multiple linear regression and Lives Saved Tool (LiST) analysis.

Data and statistical analyses

To assess trends since 1990 (the MDG baseline) in maternal, newborn, and child mortality, we abstracted mortality estimates for the maternal mortality ratio, neonatal mortality rate, under-5 mortality rate, and stillbirth rate from estimates by the UN,[1,2,6] the Institute for Health Metrics and Evaluation,[12,13] and nationally representative Demographic and Health Surveys.[14–18] We used UN estimates to calculate the average annual rate of reduction. We did forward projections for a business-as-usual scenario, and for the accelerated trends needed to achieve the goals in the Every Newborn Action Plan[19] and A Promised Renewed[20] (appendix p 5). Maternal,[21] neonatal,[6] and child[22] cause-of-death analyses used UN estimates, as detailed elsewhere,[23] with Tanzania-specific inputs (appendix p 7).

To assess policy change from 1990 to the present, we used two standard methods developed by Countdown's Health Systems and Policies Technical Working Group. The Countdown Policy and Programme Timeline Tool describes national macropolicies and strategies, and the translation of specific RMNCH policies into programme implementation through the use of the policy heuristic of formulation, implementation, and evaluation (appendix p 8). The Countdown health systems and policies dashboard for tracer indicators assesses change for the 11 RMNCH policies on Countdown country profiles (appendix p 13).[24] We used data from the Human Resources for Health Country Profile (2012–13) and the 2012 Census[25] to calculate national and subnational health workforce density for midwifery care (appendix p 15).

Qualitative research explored the reasons for district variation in implementation, quality, and performance of RMNCH services. Based on an assessment of RMNCH indicators, we graded the performance of zones as best (Northern zone), intermediate (Central zone), and worst (Lake zone), and selected one region from each zone (ie, Kilimanjaro, Dodoma, and Mara).[26]

Our study focused on two districts from each region (one urban and one rural). The selection of regions and districts were based on an assessment of RMNCH indicators in the 2010 Tanzanian Demographic and Health Survey and logistic imperatives. The regional or district hospital, one health centre, and a dispensary were assessed in each district. Key informant interviews and focus group discussions were done with administrative officials, governing committees, health-care providers, and service users (appendix p 16).

We extracted RMNCH expenditure data from national health accounts and subaccounts (2002–10).[27,28] We obtained data about external financing from the Countdown database constructed by extracting and reclassifying official development assistance projects from the Organisation for Economic Co-operation and Development's Creditor Reporting System, as detailed elsewhere.[29–31] No direct comparisons of national health account and Countdown data were done because the reproductive health remit differed between the two sources (appendix p 20).

We assessed coverage and trend for selected indicators along the continuum of care informed by those tracked by Countdown, showing equity analysis by socioeconomic status in 2010.[5] For impact indicators making insufficient progress, we undertook an in-depth trends and equity analysis of pertinent coverage indicators, which were selected on the basis of their priority as indicators in the Commission on Information and Accountability for Women's and Children's Health, low coverage, wide inequities, and expected high impact (appendix pp 22–40).

We explored contextual factors potentially contributing to changes in child mortality in a descriptive analysis and multiple linear regression of variables with time trend data since 1990, including gross national income (GNI) per person, female education, HIV prevalence, and the under-5 mortality rate between 1990 and 2008 (appendix pp 41–43). We did not do multiple linear regression for the neonatal mortality rate because it is a subset of under-5 mortality rate, or for maternal mortality ratio and stunting because the trend data are less robust and GNI is an input for the maternal mortality ratio estimation model, so a multivariate including GNI would be circular. The coverage, equity, and multiple linear regression analyses were done with Stata version 13.1.

We used LiST version 5.03 to estimate the effect of coverage change on cause-specific mortality for women, neonates, and children younger than 5 years of age (LiST inputs and methods have been published extensively elsewhere).[32] Our retrospective LiST analysis investigated which interventions contributed to mortality change between 2000 and 2012 (appendix pp 44–56). We added an additional variable to the modelling software to account for observed mortality change not estimated through coverage change, such as economic and social status, or interventions without coverage data.

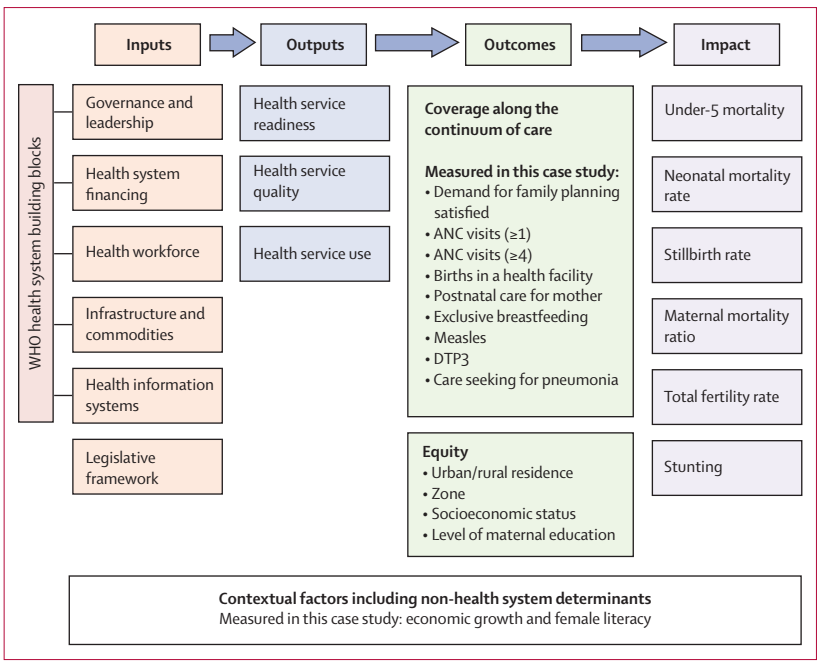


Figure 1: **Health systems evaluation framework for the Tanzania Countdown to 2015 case study**
ANC=antenatal care. DTP3=three doses of diphtheria–tetanus–pertussis immunisation.

Panel 1: Objectives for the Tanzania Countdown to 2015 case study

1) Impact: systematically evaluate trends in maternal, newborn, and child mortality in Tanzania since 1990 and assess the main causes of death
2) Inputs: study health system inputs through a standardised analysis of reproductive, maternal, newborn, and child health systems, policies, workforce, and finances
3) Outcomes (coverage and equity): analyse coverage of indicators across the continuum of care, with equity disaggregation by socioeconomic status, maternal education, and residence
4) Assessment of contributors to mortality change: link across the different levels of the evaluation framework to explore reasons for mortality change, including contextual factors (descriptive and multiple linear regression) and health-care coverage (retrospective LiST analysis)
5) Implications for post-2015: identify drivers of change for mortality reduction and implications for the post-2015 agenda in Tanzania and other similar countries (discussion)

Finally, we did a prospective LiST analysis projecting lives saved by the end of 2015 if coverage of interventions in the government's Sharpened One Plan[33] were accelerated, and then if universal coverage was achieved for maternal, newborn, and child health care and family planning demand satisfied by 2030 (appendix p 57).

	Average annual rate of reduction	
	1990–2012/13	2000–2012/13
Under-5 mortality rate (2012)	5·0%	7·1%
Mortality rate in children aged 1–59 months (2012)	5·9%	8·5%
Neonatal mortality rate (2012)	3·1%	4·3%
Maternal mortality ratio (2013)	3·4%	4·7%

Table 1: **Average annual rate of reduction for impact indicators**

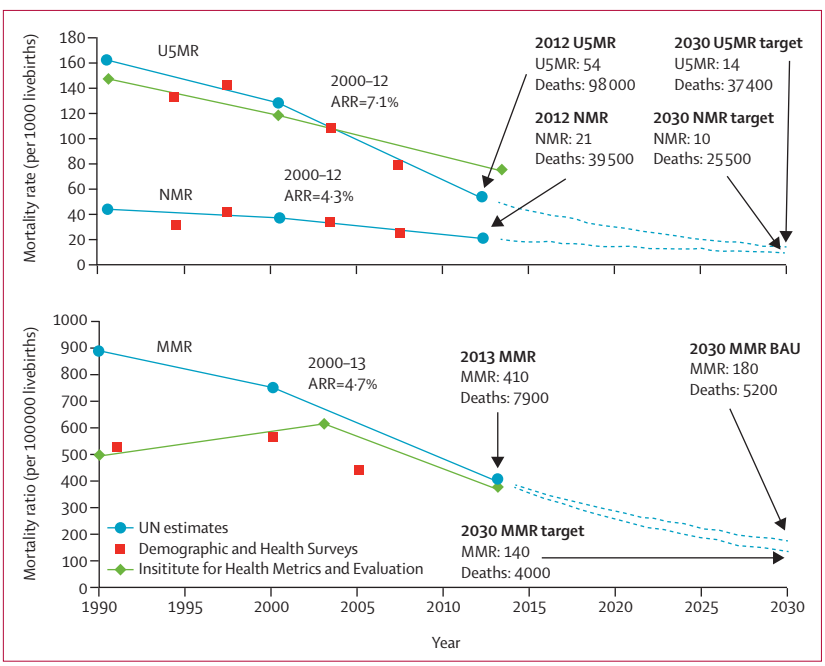


Figure 2: **Tanzania's progress in maternal and child survival from 1990 to 2013, with projections to 2030**
U5MR=under-5 mortality rate. NMR=neonatal mortality rate. ARR=average annual rate of reduction. MMR=maternal mortality ratio. BAU=business as usual (trends to 2030, under the assumption of the 2000–12 ARR for U5MR and NMR, and the 2000–13 ARR for MMR). Full details are available in appendix p 5.

Role of the funding source

The funders of the study had no role in the design, execution, analysis, or interpretation of the study, or in the writing of the report.

Results

Our first objective was to systematically evaluate trends in maternal, newborn, and child mortality in Tanzania since 1990 and to assess the main causes of death. Reductions in maternal, newborn, and child mortality accelerated during the MDG era, especially since 2000, most notably for under-5 mortality. Tanzania met MDG 4 through a substantial reduction in mortality for children aged 1–59 months between 2000 and 2012 (average annual rate of reduction [ARR] 8·5%). However, neonatal mortality decreased at half this rate (ARR 4·3%; table 1, figure 2). Projections to 2030 indicate that, if present trends continue (based on ARR for 2000–12), Tanzania could achieve child and possibly also neonatal targets in A Promised Renewed[20] and the Every Newborn Action Plan[19] (figure 2).

Tanzania has not made sufficient progress towards MDG 5 for maternal health, and is unlikely to reach the 2030 target of 140 maternal deaths per 100 000 livebirths. Between 1990 and 2013, the ARR was only 3·4% (table 1), and although it did increase post-2000 to 4·7%, this rate was still below the 5·5% required for MDG 5 (figure 2). Tanzania has also made poor progress in reducing stillbirths, with around 47 550 stillbirths per year, of which 47% are intrapartum, which is a sensitive indicator of poor-quality care at birth (appendix p 6).[19,34] Tanzania must make substantial changes to achieve the 2030 target of 12 stillbirths per 1000 total births.[6]

Cause-of-death estimates for children aged 1–59 months emphasise an unfinished agenda for childhood infections (pneumonia, malaria, and diarrhoea), which together account for 55% of deaths in those beyond the neonatal age (figure 3). The rate of stunting remains high and has hardly changed in Tanzania during the MDG era (48% in 1999; 43% in 2010).[5] Three conditions account for three-quarters of newborn deaths: intrapartum-related events (birth asphyxia; 31%), preterm complications (25%), and sepsis (20%; figure 3). More than 80% of neonatal deaths occur in low birthweight, mainly preterm, babies. No population-based maternal cause-of-death estimates exist for Tanzania; however, WHO regional estimates calculate that most maternal deaths are caused by direct obstetric conditions, with haemorrhage and hypertensive disorders accounting for more than a third of these deaths (figure 3).

Our second objective was to study health system inputs through a standardised analysis of RMNCH systems, policies, workforce, and finances. In terms of the health policy environment, the national RMNCH policy and strategy environment between 1990 and 2014 was complex (figure 4), with many different policies at national levels, health system levels, and RMNCH-specific levels. Around 2005, when attention to RMNCH increased worldwide, national RMNCH policies and strategies proliferated, with varying timespans and, at times, inconsistent targets. The 2008 Partnership for Maternal, Newborn and Child Health Partners' Forum in Dar es Salaam called for countries to have a single RMNCH plan. Therefore, Tanzania developed the One Plan,[11] to consolidate the RMNCH policy environment. However, the One Plan did not have a fully costed implementation plan.

Important differences exist in policy and programme change across the RMNCH continuum (figure 4). Before the year 2000, child health achieved more programmatic progress than did maternal and newborn health, especially primary care interventions (eg, the Expanded Program on Immunization [EPI] and the Integrated Management of Childhood Illness [IMCI]). Since 2005, immunisation, malaria, and prevention of mother-to-child-transmission of HIV have received major attention.

Maternal health visibility began before 2000, with major political attention at the presidential level and from civil society (figure 4). However, policy implementation has been variable and inconsistent. Few interventions have evidence of national scale-up, including those deliverable through primary care services, such as antenatal care or clean birth practices. Several initiatives have recently focused on the quality of maternal care in facilities, including a national maternal death audit programme and several pilot studies of respectful care. Despite the fact that half of births occur at home, and mothers who deliver in facilities are rapidly discharged, few policies address this situation, with no national programme for home visits for women and neonates.[37]

Neonates were almost unmentioned in the policy timeline pre-2005 (figure 4). The national situation analysis (2009)[38] was followed rapidly by implementation. Strategies such as neonatal resuscitation, kangaroo mother care, and adaptation of the IMCI strategy to include the first week of life were introduced, supported by district-level funding.

Family planning programmes began in the late 1980s. However, implementation efforts were inadequate in the 2000s. In 2010, focus was revitalised with the national family planning costed implementation plan.[39]

The Countdown RMNCH 11 tracer policy indicators (figure 5) represent this mixed picture. Since 2010, seven of the 11 policies have been achieved, such as task shifting for midwives and maternal death notification, but gaps remain in protection of maternity in national law and practice (Maternity Protection Convention, 2000 [no. 183][40]), abortion, and antenatal corticosteroids. Postnatal home visits in the first week of life is described in a policy but implementation awaits the results of a large-scale assessment.[37]

In terms of the health workforce, an analysis of Human Resources for Health Country Profile data (2012–13) showed a health workforce density of 5·5 doctors, nurses, and midwives per 10 000 population in Tanzania, which is far below the WHO minimum density threshold of 23 per 10 000 population,[5] and includes a shortage of specialist cadres.[25] Stark urban–rural and regional inequities in coverage are a major challenge. Only 55% (n=32 036) of the total health workforce work in rural areas in which 70% of the total population of Tanzania live, and trained health workers are clustered in regions with zonal specialist hospitals.[25]

In terms of health finance, total expenditure on health increased in absolute terms from US$734 million in 2002–03 to $1751 million in 2009–10 (2010 prices).[27] Despite this increase, government expenditure on health as a proportion of total government expenditure was 11·9% in 2010–11,[41] which is below the 15% Abuja target.[42] Dependency on foreign assistance remained high, at 40% of total health expenditure in 2009–10.[27] Spending on HIV/AIDS increased substantially in 2005 and receives more external financing than RMNCH, which relies more heavily on government funding and out-of-pocket payments (figure 6A).

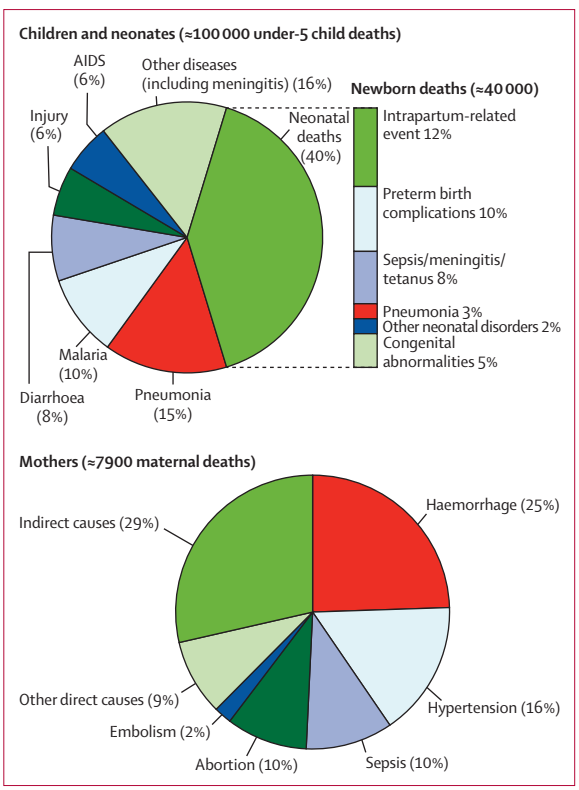
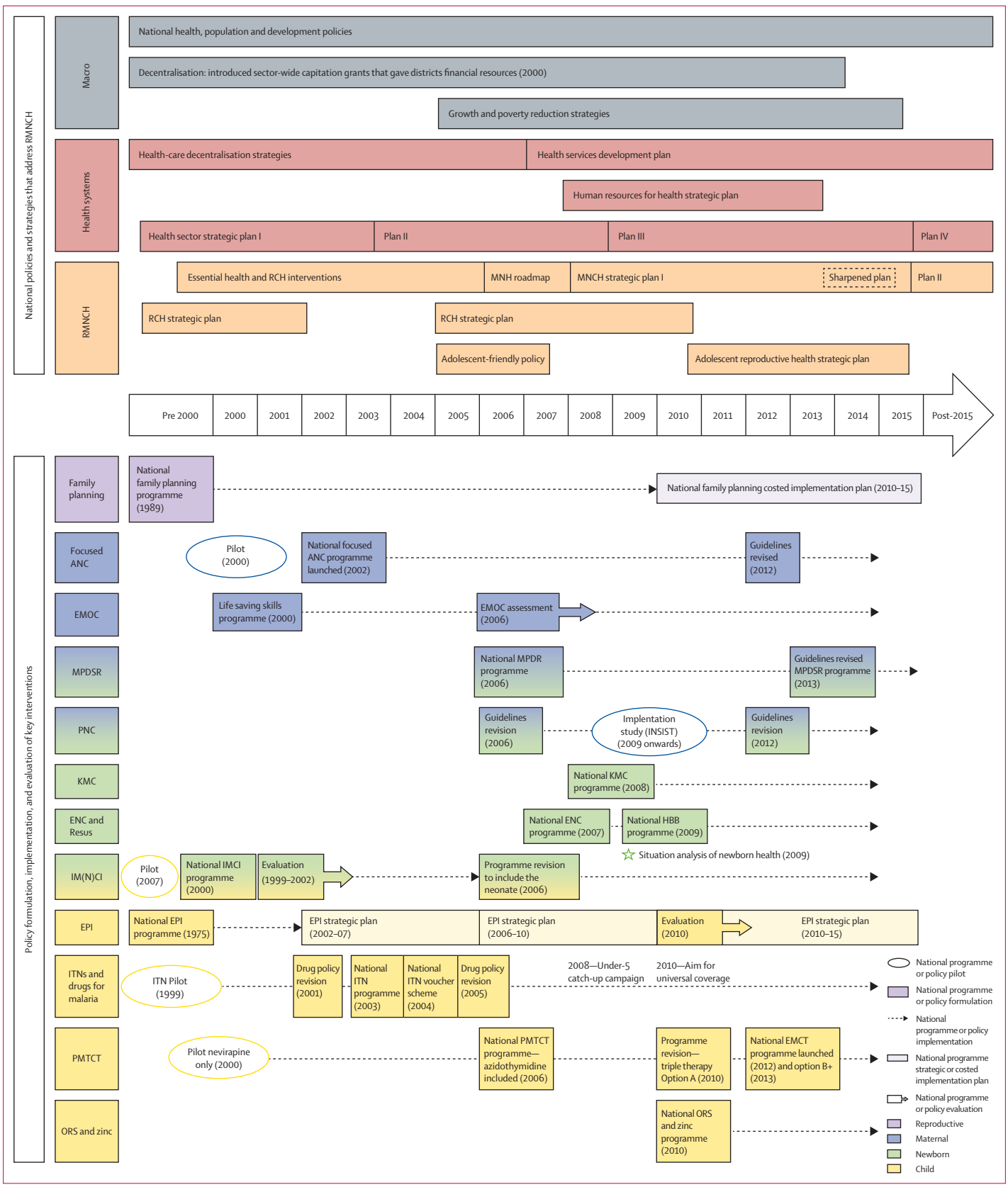


Figure 3: **Estimated causes of death in Tanzania**
Data for children and neonates are from 2012. Tetanus is not listed because Tanzania eliminated tetanus in October, 2012. Data are from WHO and Child Health Epidemiology Research Group 2013.[35] Data for mothers (African region estimation) are for 2013.[36] Full details are available in appendix p 7.

External financing for child health ($160 million in 2010) has consistently been higher than that for maternal health ($48 million in 2010) and newborn health ($11 million in 2010; figure 6B). Furthermore, of $11 million spent on projects mentioning the word "newborn" in 2010, only $1·5 million were for projects specifically benefiting neonates.[30] External financing for reproductive health (including HIV, sexually transmitted infections, and family planning) was $208 million in 2010, which is substantially more than that for maternal and newborn health.

Maternal and child health care is provided free of charge in Tanzania, but studies still report substantial out-of-pocket payments.[44,45] Health insurance coverage has been increasing since 2000 when the National Health Insurance Fund (compulsory for public servants) and Community Health Fund (voluntary for the informal sector) were introduced. However, only 15% of Tanzanians use these schemes, potentially due to poor understanding of risk pooling, low quality of public health services, a lack of provider choice, and limited benefit packages.[44,46]

Our third objective was to analyse coverage of indicators across the continuum of care, with equity disaggregation


National policies and strategies that address RMNCH
Macro
National health, population and development policies
Decentralisation: introduced sector-wide capitation grants that gave districts financial resources (2000)
Growth and poverty reduction strategies
Health systems
Health-care decentralisation strategies
Health services development plan
Human resources for health strategic plan
Health sector strategic plan I
Plan II
Plan III
Plan IV
RMNCH
Essential health and RCH interventions
MNH roadmap
MNCH strategic plan I
Sharpened plan
Plan II
RCH strategic plan
RCH strategic plan
Adolescent-friendly policy
Adolescent reproductive health strategic plan
Pre 2000
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Post-2015
Policy formulation, implementation, and evaluation of key interventions
Family planning
National family planning programme (1989)
National family planning costed implementation plan (2010–15)
Focused ANC
Pilot (2000)
National focused ANC programme launched (2002)
Guidelines revised (2012)
EMOC
Life saving skills programme (2000)
EMOC assessment (2006)
MPDSR
National MPDR programme (2006)
Guidelines revised MPDSR programme (2013)
PNC
Guidelines revision (2006)
Implentation study (INSIST) (2009 onwards)
Guidelines revision (2012)
KMC
National KMC programme (2008)
ENC and Resus
National ENC programme (2007)
National HBB programme (2009)
IM(N)CI
Pilot (2007)
National IMCI programme (2000)
Evaluation (1999–2002)
Programme revision to include the neonate (2006)
Situation analysis of newborn health (2009)
EPI
National EPI programme (1975)
EPI strategic plan (2002–07)
EPI strategic plan (2006–10)
Evaluation (2010)
EPI strategic plan (2010–15)
ITNs and drugs for malaria
ITN Pilot (1999)
Drug policy revision (2001)
National ITN programme (2003)
National ITN voucher scheme (2004)
Drug policy revision (2005)
2008—Under-5 catch-up campaign
2010—Aim for universal coverage
PMTCT
Pilot nevirapine only (2000)
National PMTCT programme—azidothymidine included (2006)
Programme revision—triple therapy Option A (2010)
National EMCT programme launched (2012) and option B+ (2013)
ORS and zinc
National ORS and zinc programme (2010)
National programme or policy pilot
National programme or policy formulation
National programme or policy implementation
National programme strategic or costed implementation plan
National programme or policy evaluation
Reproductive
Maternal
Newborn
Child

by socioeconomic status, maternal education, and area of residence (zonal and urban or rural). Coverage and equity levels vary along the continuum of care (figure 7A). Levels of coverage for child health services are mostly higher than those for reproductive, maternal, and newborn services. Some preventive childcare services (especially immunisation) reach more than 90% of Tanzanian children. Coverage for curative child health services (eg, care-seeking for pneumonia) is lower than for preventative child health services, with larger inequities (36% difference) between the poorest and wealthiest quintiles. Coverage remains low for the proportion of demand for family planning satisfied by modern contraceptive methods (46% in 2010), with large inequities by socioeconomic status (socioeconomic status quintile difference 22%). For care around birth, less than half of pregnant women attend the recommended four or more antenatal visits, and coverage seems to have decreased in 2010. People in Tanzania have almost universal access to at least one antenatal care visit, which indicates a missed opportunity for continuity and quality of antenatal care. In 2010, about half of women gave birth in a health facility, which has the greatest inequity by socioeconomic status (56% difference). In the same year, 31% of women received postnatal care within 2 days of birth.

We note that insufficient progress has been made in Tanzania for maternal mortality ratio, neonatal mortality rate (table 1, figure 2), stillbirth rate (appendix p 6), and total fertility rate (6·2 in 1990; 5·3 in 2012).[47] Therefore, we did in-depth equity analyses for demand for family planning (defined as contraceptive prevalence rate, both modern and other, plus unmet need for family planning) and care at birth (defined as the proportion of births in a health facility, and by caesarean section—a proxy for emergency obstetric care). Despite an increase in the national prevalence rate of modern contraceptive methods among married women (from 7% in 1991 to 27% in 2010), with a large increase in women living in rural areas between 2004 and 2010 (from 16% to 25%; appendix p 28), women in the Western and Lake zones report exceptionally low use of modern contraceptive methods (both 15%) and high unmet need for family planning (26% in the Western zone and 33% in the Lake zone; figure 7B). Our qualitative assessment identified that the Lake zone reports more frequent stock-outs of modern methods of family planning than do the Central and Northern zones, and sociocultural factors impeding modern methods of family planning were more prevalent in the Lake and Central zones than in the Northern zone (figure 7B). For care provided at birth, women living in rural areas are disadvantaged. Women in urban areas are twice as likely to deliver in a health facility and three times more likely to deliver by caesarean section than are those living in rural regions (figure 7C).

The fourth objective of this study was to link across the different levels of the evaluation framework to analyse reasons for mortality change, including contextual factors (descriptive and multiple linear regression) and health-care coverage (retrospective LiST analysis). Changes in contextual factors, demography, economy, and education have occurred in Tanzania between 1990 and 2012 (appendix p 41). The rapidly expanding population (from 25 million in 1990[48] to 45 million in 2012[49]) remains mostly (70%) rural.[49] In 2010, 45% of Tanzanians were younger than 15 years of age.[48] Tanzania's economy has grown from a GNI per person of $590 in 1990 to $1590 in 2012, with most of this increase occurring since the year 2000. Despite a rise in the proportion of women aged 15–49 years who have received primary school education (from 46% in 1992[18] to 66% in 2010[15]), a large proportion of women still do not receive basic education. Just 57%[49] of the population has access to safe drinking water and 16% have access to improved sanitation facilities.[49] Between 1990 and 1995, the HIV prevalence in adults aged 15–49 years increased from 5% to 8%; as of 2012, the prevalence of HIV has fallen back to 5%.[50]

	Policy tracer indicators	Pre-2000	2001–05	2006–10	Post-2010
R	Laws or regulations that allow adolescents to access contraceptives without parental or spousal consent				
R	Legal status of abortion (X of 7 circumstances)	1/7	1/7	1/7	1/7
M	Midwives authorised for specific tasks (X of 7 tasks)	0/7	0/7	7/7	7/7
M	Maternity protection (Convention 183)				
M	Maternal deaths notifications				
M N	Postnatal home visits in the first week after birth				
N	Kangaroo mother care in facilities for low birthweight/preterm neonates				
N	Antenatal corticosteroids as part of management of preterm labour				
N	International Code of Marketing of Breastmilk Substitutes				
C	Low osmolality oral rehydration solution and zinc for management of diarrhoea				
C	Community treatment of pneumonia with antibiotics*	NA	NA	NA	NA

Policy not available
Policy partially available
Policy available

Figure 5: **Countdown tracer indicators for reproductive, maternal, newborn, and child health policy in Tanzania**
Full details are available in appendix p 13. R=reproductive. M=maternal. N=neonatal. C=child. NA=not applicable. *Case management of pneumonia in Tanzania is provided at peripheral health facilities, not in the community.

Figure 4: **Countdown to 2015 health system and policy timeline for Tanzania, 1990–2015**
Full details are available in appendix p 8. RMNCH=reproductive, maternal, newborn, and child health. RCH=reproductive and child health. MNH=maternal and newborn health. ANC=antenatal care. EMOC=emergency obstetric and neonatal care. MPDSR=maternal and perinatal death surveillance and review. MPDR=maternal and perinatal death review. PNC=postnatal care. KMC=kangaroo mother care. ENC=essential newborn care. Resus=Newborn Resuscitation Programme. HBB=Helping Babies Breathe. IM(N)CI=Integrated Management of (Neonatal) and Childhood Illness. EPI=Expanded Program on Immunization. ITN=insecticide-treated bednets. PMTCT=prevention of mother-to-child transmission of HIV. ORS=oral rehydration solution. EMTCT=elimination of mother-to-child transmission of HIV. N/A=not applicable.

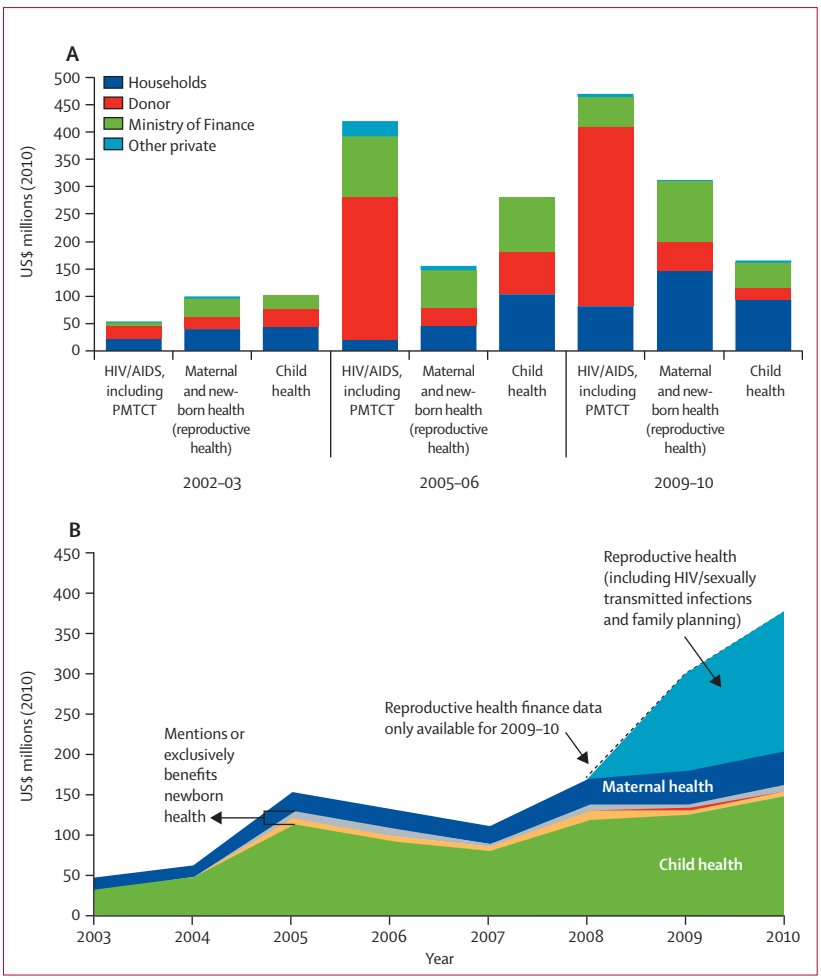


Figure 6: **Assessment of change in Tanzania's health finance**
(A) Trends in National Health Account data to HIV/AIDS, maternal and newborn health (reproductive health), and child health (2002–10). Data are from National Health Accounts 2002–03, 2005–06, and 2009–10.[27,28] (B) Trends in official development assistance to reproductive health (2009–10) and maternal, newborn, and child health (2003–10). Data are from the Countdown to 2015 official development assistance database.[43] PMTCT=prevention of mother-to-child transmission of HIV. Full details are available in appendix p 20.

In view of the fact that this was a single country analysis for 23 years, and had a finite number of datapoints, the multiple linear regression was unable to robustly quantify the contribution of contextual factors to change in under-5 mortality rate. Since female education was strongly correlated with GNI, the final model was based only on GNI and showed weak evidence (p=0·08) for an association between the log-under-5 mortality rate and GNI (appendix p 43). Other multicountry analyses have estimated that female literacy improves child survival.[51]

The retrospective LiST analysis estimated that 140 300 under-5 deaths were averted in 2012 relative to 2000 (figure 8). Around 39% of the additional deaths averted in 2012 are attributable to changes in coverage of interventions in LiST, with under-5 mortality rate falling from 132 per 1000 livebirths in 2000 to 100 in 2012 in the LiST model, by contrast with the UN-estimated under-5 mortality rate of 54 per 1000 livebirths in 2012.

The interventions with the greatest effects on deaths averted in Tanzanian children aged 1–59 months include immunisations (*Haemophilus influenzae* type b vaccine [27%; n=9100]), insecticide-treated bednets (24%; n=8000), and HIV interventions (prevention of mother-to-child transmission, antiretroviral treatment, and cotrimoxazole [17%; n=5900]). For neonates, the five most effective interventions contributed to 76% of total annual lives saved in 2012, notably skilled attendance at birth and emergency obstetric care (29%; n=6200), essential newborn care and neonatal resuscitation (19%; n=4100), case management of severe neonatal infections (11%; n=2300), antenatal corticosteroids for preterm birth (n=11%; 2200), and kangaroo mother care (n=6%; 1300). Improvements in breastfeeding and complementary feeding led to 2400 additional lives saved in neonates and children. Almost three-quarters of the effect so far for maternal mortality was estimated to be attributable to skilled attendance at birth and emergency obstetric care (73%; n=2400), with additional effects from interventions such as active management of the third stage of labour (9%) and clean birth practices (8%). Increasing contraceptive use reduces mortality rates through fewer pregnancies and births, which provides substantial cost savings.

Discussion

Tanzania's progress in child survival is remarkable, has mostly been achieved since the start of the new millennium, and still seems to be accelerating. Understanding why gains in maternal survival, newborn survival, and family planning have been slower than those for child survival generates priorities for Tanzania's post-2015 development agenda, and for the many other nations with similar patterns of progress in RMNCH.

Our findings show important differences in funding and especially in implementation strategies. Child survival has received consistent attention since the mid-1980s, large funding increases since 2000, and has focused on the implementation of high-impact interventions at lower levels of the health system. By contrast, maternal health has had high political priority only since the mid-1990s, has received less funding, and programmatic implementation has been variable and targeted at higher levels of the health system, and at a smaller scale. For newborn survival, attention is recent and funding still inadequate, but strategies are progressing rapidly to wide-scale implementation. Family planning, although feasible at the lower levels of the health system, lost traction during the mid-1990–2000s; however, it has recently begun to receive fresh attention.

Assessment of progress in Tanzania must acknowledge the near-doubling of the population during the past two decades, which necessitates a doubling of services to maintain equivalent coverage levels and emphasises the importance of investment in family planning. Although Tanzania has experienced recent increases in GNI

purchasing power parity per person, the country remains one of the world's poorest, with two-thirds (68%) of the population living on less than $1·25 per day.[52] Addressing persistent poverty remains a major development challenge.

Substantial improvements in child survival have occurred in Tanzania. Global health agendas have had a clear influence on Tanzania's policies. Child survival, a priority since the early 1980s, has consistently focused on the primary care level, such as the EPI and IMCI strategies. Programmes implemented consistently since the 1990s now have high national coverage, low urban–rural inequity, and more data available to drive quality improvement (figure 7). Tanzania was one of the first countries to start implementing IMCI, showing cost savings and a 13% reduction in child mortality between 1999 and 2002,[53] which prompted national scale-up and district budget funding. Between 2003 and 2010, external financing for child health increased more than three-fold. However, global funding for the IMCI strategy stalled, with major donor investments targeting specific programmes and commodities for HIV, malaria, pneumonia, and immunisations. Tanzania's National Health Accounts indicate large budgetary allocation to HIV/AIDS. Proactive leadership in Tanzania has sustained the IMCI programme, partly by drawing on these more vertical funds.

Most of the reduction in child mortality in Tanzania has occurred post-2000, which is also when GNI increased. Several multicountry analyses associate increased GNI and decreased under-5 mortality rate[54] and neonatal mortality rate.[55] Our multiple linear regression was limited because of the paucity of available time series data and because such analyses only give us information about associations and not causality. However, the findings are consistent with an effect of GNI, feasibly mediated through improved health sector coverage and through social changes such as female education[51] and other difficult-to-measure factors influencing child survival. A recent multicountry modelling exercise attributed more than two-thirds of child mortality change since 1990 to a "secular trend,"[56] although this trend might have included health-care coverage change.[13] Challenges remain in disentangling the pathways whereby socioeconomic change and health-care improvements interact, generating these changes.

The LiST analysis aligns with the timing and direction of the change in under-5 mortality rate, but estimates that changes in measured coverage of health services and health behaviours account for only around 39% of deaths averted in 2012 compared with 2000. For children aged 1–59 months, the biggest estimated effect on mortality was through immunisations, the use of bednets to prevent malaria, and interventions to prevent and treat HIV. These interventions are delivered mainly through primary care and donor-driven campaigns.

The LiST analysis that measures the effect of coverage change alone on impact indicators does not explain 61% of the recorded mortality reduction. Three reasons exist for this situation. First, some of the interventions have insufficient coverage data (particularly newborn

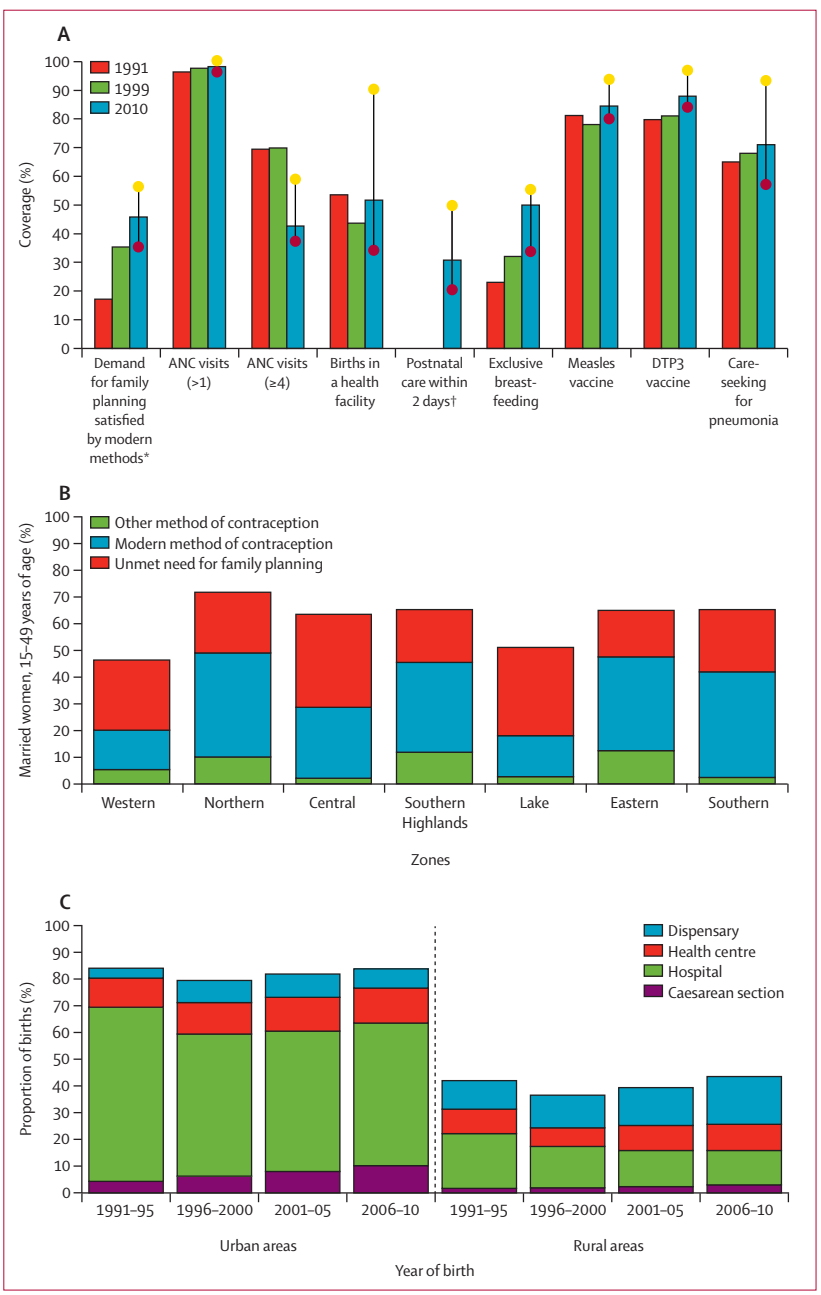
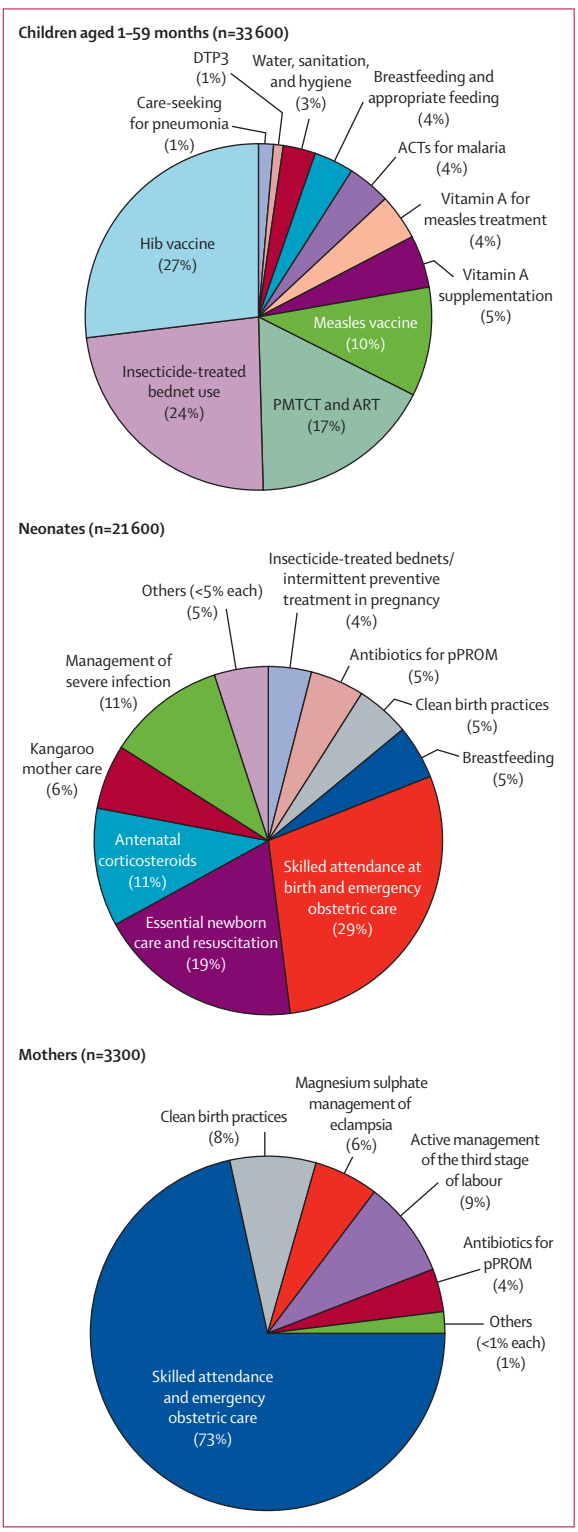


Figure 7: **Coverage time trends and equity analyses for selected reproductive, maternal, newborn, and child health indicators**

(A) Coverage time trends for selected indicators across the continuum of care, showing socioeconomic equity gaps in 2010. Coverage levels are shown for the poorest 20% of the population (red circles) and the wealthiest 20% (yellow circles). The longer the line is between the two groups, the greater the inequity. (B) Zonal equity gaps in Tanzania (2010) for demand for family planning (contraceptive prevalence plus unmet need for family planning). (C) Time trends (1991–2010) for Tanzania in place and mode of birth by residence (urban/rural). ANC=antenatal care. DTP3=three doses of diphtheria–tetanus–pertussis immunisation. *The Pill, intrauterine device, injections, diaphragm, female or male condoms, female or male sterilisation, implants, foam or jelly, or lactational amenorrhoea. †Maternal postnatal visit. Full details are available in appendix pp 22–40. Data are from an analysis of Tanzanian Demographic and Health Surveys for Countdown Country Case Study.

interventions such as newborn resuscitation) or time-lagged data because of rapid scale-up (eg, pneumococcal vaccination). Second, LiST does not include all interventions, notably hospital-based interventions for child health care after the neonatal period. Third, LiST does not include distal factors outside the health sector, such as GNI and female literacy, which have been shown to contribute to mortality change (appendix p 44).



Why has Tanzania not shown substantial change in maternal survival despite continued high-level attention to this issue? In 1987, Tanzania was one of the first sub-Saharan African countries to adopt the Safe Motherhood Initiative,[57] which led to two decades of high-level attention. However, implementation has been patchy, especially at a large scale. From the outset, the global policy community was divided over maternal health strategies that have changed several times in the past few decades,[58] from traditional birth attendants to skilled attendance at birth versus emergency obstetric care.[59] Low quality of care,[60] especially obstetric care,[61] and disrespectful care[62] might discourage attendance or cause women to bypass facilities that are closer to their homes.[60] The health facility births strategy[63,64] needs a functioning health-care system, yet consensus is absent on a phased approach required to achieve this in weaker health systems,[58] such as the use of prevention of infections and post-partum haemorrhage as entry points. Donor funding has been lower for maternal health than for child health, and much lower than that for HIV. Sustained funding is essential to close gaps in midwifery and human resources, and to strengthen the wider health system.

The next question we need to address is why newborn survival has seen little progress and has only received recent attention in Tanzania. Newborn survival was a latecomer on the global health agenda, appearing almost 20 years after maternal survival.[65] The 2005 *Lancet* Neonatal Survival Series catalysed the Tanzanian Newborn Situation Analysis,[66] providing subnational data and focusing on action and implementation, including district-level rollout of IMCI adapted to include ill neonates,[67] kangaroo mother care, and neonatal resuscitation. Tanzania was one of three countries to undertake a national scale-up of neonatal resuscitation in the "Helping Babies Breathe" initiative, with strong national leadership and an evaluation showing significant reduction in neonatal mortality.[68] Tanzania could make rapid progress if high-impact interventions for neonates are now scaled up. However, national and donor funding for newborn health has been low so far. Furthermore, kangaroo mother care, neonatal resuscitation, and

Figure 8: **Lives Saved Tool analysis for Tanzania in 2012 relative to 2000**
The lives saved by each intervention are presented as a proportion of total lives saved attributed to changes in coverage in reproductive, maternal, newborn, and child health services—ie, only those deaths averted that can be explained by change in coverage of interventions. Totals in the pie charts might not add up to 100% because of rounding. LiST=Lives Saved Tool. DTP3= three doses of diphtheria–tetanus–pertussis immunisation. Hib=*Haemophilus influenzae* type b. ACTs=artemisinin combination therapies. PMTCT=prevention of mother to child transmission of HIV. ART=antiretroviral therapy. pPROM=preterm premature rupture of membranes. Full details are available in appendix p 44.

antenatal corticosteroids all need coverage data to enable their scale-up to be tracked.

Tanzania has not shown substantial change in the unmet need for family planning, despite this issue receiving early attention. In the 1980s and early 1990s, family planning was high on the global agenda, and the US Agency for International Development (USAID) was the leading funder. Global attention and funding was lower in the 2000s, especially from USAID,[69] and only recently returned to prominence with Family Planning 2020.[70] Although the contraceptive prevalence rate increased in Tanzania between 1990 and 2010, unmet need for family planning remained high because of rising demand. Large geographical inequities persist, due to both supply and demand bottlenecks. Slow change for the social determinants of health, such as female education and gender empowerment, might also have affected progress. Desired family size remains large in Tanzania and promotion of family planning focuses mainly on birth spacing.

Mortality reduction for women, neonates, and children cannot be attributed to economic progress alone or to one single intervention. High coverage needs sustained focus on implementation at scale. Our analysis emphasises four commonalities: the length of time that the issue had been on the global agenda with consistent international and—most importantly—national attention and leadership; clarity of agreed interventions and especially longer-term consistency with which these are owned and promoted at a national level; the amount of local and official development assistance funding; and focus on implementation and use of data to drive coverage, especially when interventions are deliverable at lower levels of the health system. These findings resonate with analyses of health systems change in other countries, notably Mexico[71] and Brazil,[72] although in these middle-income countries the effect of donor funding is less apparent. For example, in Mexico, an initial focus on disease-specific child health programmes was helped by global attention and funding for EPI, but this was then adapted to vertical programmes for so-called diagonal strengthening of maternal and newborn care and health systems strengthening.[71]

The intention is for Tanzanian health sector function and funding to be led by 5-year health system strategic plans. However, our analysis shows that, since the mid-2000s, policies and strategies have proliferated for different aspects of RMNCH. The many development partners in Tanzania have the potential to support accelerated change or to distract from actual implementation. The government remains the main source of health sector funding, but foreign financing for separate programmes has increased substantially, with especially large project funding from The Global Fund to Fight AIDS, Tuberculosis and Malaria.[41] Despite increased health sector financing, government health budgets (2006–12) remained consistently below the Abuja target of 15%.[41]

Shortages of doctors, nurses, and midwives; inadequate skill mix; and uneven geographical distribution of health-care personnel are key bottlenecks to skilled care at birth and emergency services for ill neonates and children.[73] Between 2004 and 2009, Tanzania's neighbour, Malawi, implemented an emergency human resources plan, achieving 30% more midwives and reducing urban–rural inequities.[74]

On an optimistic note, newborn care is now poised for rapid impact. The Every Newborn Action Plan identifies high-impact interventions focused on quality of care, including the Every Mother Every Newborn quality initiative, and sets specific targets and milestones, including improvement of metrics especially for coverage.[75] The key will be to ensure consistent implementation and improved measurement. Family planning is also poised for revitalisation, with dynamic leadership in the country and new funding through Family Planning 2020, but a focus on the Lake and Western zones with improved data to address both health system and demand bottlenecks will be crucial. Similarly, maternal health could also progress rapidly but needs a strategic focus on implementing what can be done now, while the system, and particularly the human resources sector, is strengthened to reach rural women in particular, especially with midwifery services.

Our analysis has several limitations, which are mainly caused by limitations in the available data, in which many important gaps exist. Tanzania has low coverage of birth registration: only 16% of children younger 5 years have had their births registered.[15] Death registration rates, especially for neonates,[6] are even lower. Therefore, mortality trends rely on estimates from intermittent sampled data, such as Demographic and Health Surveys, with substantial uncertainty or modelled data, such as UN and Institute for Health Metrics and Evaluation estimates. Although these estimates, at least for child mortality, are converging in most countries, in Tanzania these estimates differ. If Institute for Health Metrics and Evaluation estimates are correct, then Tanzania would not be on track to meet MDG 4 or making progress towards MDG 5.[12,13]

Limitations of official development assistance resource flows have been discussed elsewhere,[43] but of greater concern for local accountability are data gaps in national health accounts, which, despite recommendations from the UN Commission on Information and Accountability, can be tracked for RMNCH in few countries, and in most countries cannot be analysed at district level.[5] National health workforce data are improving but cannot be disaggregated by midwifery or other key skills such as neonatal care, both of which are crucial for quality of care at birth. Such data are essential for planning and accountability, and Tanzania is now implementing a web-based human resources information system.

Coverage data are also mainly reliant on 5-yearly household surveys such as Demographic and Health

Panel 2: Three priority strategies for women's and children's health in Tanzania

1) Address unmet need for family planning, particularly in Western and Lake Zones and especially for adolescents, through avoiding stock-outs, greater choice of long-acting contraceptive methods, community provision, and social mobilisation. This approach would also help to alleviate burdens on health and social services, and realise the demographic dividend with potential economic benefits.
2) Address gaps in coverage and quality of care around birth, with a particular focus on women in rural areas, poor women, and neonates. The Every Mother Every Newborn initiative for quality and respectful care at birth will provide impetus,[75] but effects will only occur through high-coverage implementation of effective care, intentionally focused on women living in rural areas and their babies.
3) Continue progress in child health, especially the prevention and management of pneumonia, diarrhoea, malaria, HIV, and undernutrition, ensuring the new focus on newborn care is institutionalised and that the high-impact packages that are ready to implement are scaled up rapidly.

	Sharpened One Plan (by the end of 2015)			Universal coverage (by 2030)	
	Reduction (%)	Mortality rate/ ratio*	Lives saved (n)	Reduction (%)	Lives saved (n)
Under-5 deaths	25%	46	14 500	84%	45 000
Newborn deaths	31%	16	9400	89%	22 000
Deaths in children 1–59 months of age	21%	30	5100	80%	23 000
Maternal deaths	30%	382	1400	83%	3600
Stillbirths	22%	20	2500	76%	11 400
Total lives saved	..	..	18 400	81%	60 000

*All child deaths are per 1000 livebirths whereas all maternal deaths are per 100 000 livebirths. The Sharpened One Plan assumes faster progress for the three priority strategies at the national level. Universal coverage assumes 95% coverage of maternal, newborn, and child health care and that family planning demand is met. Data are from the LiST analysis for Countdown Country Case Study.

Table 2: **Estimated lives saved for women and children by the end of 2015 if the Sharpened One Plan is acted on nationally and by 2030 with universal coverage**

Surveys, which contain substantial gaps, especially for coverage of newborn care. Data from Tanzanian national Health Management Information Systems are available annually, but concerns persist regarding data quality.[76] Selected Health Management Information System data are now used in RMNCH scorecards for every district for accountability at all levels. The scorecards were launched by President Kikwete, are intended for quarterly review, and are on the agendas for Council and Regional decision-making meetings.

Causality cannot be inferred from these analyses, in view of the data limitations and multiple concurrent changes. Our single country multiple linear regression of contextual change had low statistical power compared with multicountry analyses. The LiST analysis is also limited by an absence of coverage data for maternal and newborn care. However, the performance of these two analyses—examining associations between impact, coverage, and context—allows triangulation to better assess plausibility. The accelerated mortality reduction of the under-5 mortality rate in the past 10 years, and especially the past 5 years, aligns with the burst of increased funding and subsequent programme implementation for child health.

This case study emphasises remarkable progress in child survival in Tanzania, despite a fragile health-care system, and identifies priorities to accelerate maternal and newborn survival and family planning. The successes of primary health care for children provide an entry point to build on, while simultaneously investing in the longer-term goal of facility-based health system strengthening, especially human resources for health, and data to track and drive change. Success will need strong leadership and strategic coordination to ensure that these focused interventions contribute to overall health system strengthening, potentially as a diagonal approach.[71] Academics and civil society need to have a more active role to ensure accountability.

Our analyses point to three priority strategies to complete the unfinished agenda for Tanzania's women and children:[77] to address the unmet need for family planning; to address gaps for coverage and quality of care around birth; and to continue progress for child health (panel 2). If these three strategies are implemented nationally, then an additional 18 400 Tanzanian lives could be saved by the end of 2015 (table 2). With universal coverage of RMNCH care, the number of annual Tanzanian deaths would be reduced by more than 80%, saving more than 60 000 lives per year, and ending preventable maternal, newborn, and child deaths and stillbirths (table 2).

Contributors
The analyses and first draft of the report were coordinated by HA-H and JEL with MM and TJ. The coverage and equity analyses were done by HA-H and CR with MM and JEL. The financial analyses were done by MM-A and PB with JB. The health systems policy analyses were done by HA-H and CEA with TJ, JEL, and all the analysis team. The district qualitative data were collected and analysed by MM, and by AM with GM, CK, NR, and AH. The LiST analysis was done by FL with KK and VC and coordinated by HA-H and JEL. All authors and members of the Case Study Group reviewed and contributed to the analyses, interpretation and writing of the report.

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Declaration of interests
HA-H has received grants from the Government of Canada (Foreign Affairs, Trade and Development), the US Fund for UNICEF, and the Bill & Melinda Gates Foundation during the conduct of the study. JEL has received grants from the Government of Canada, the US Fund for UNICEF, and the Bill & Melinda Gates Foundation, during the conduct

of the study. MM-A has received grants from the Bill & Melinda Gates Foundation during the conduct of the study. MM, TJ, FL, GM, CEA, KK, CK, AM, NR, and AH declare no competing interests.

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