

Child health and nutrition in Peru within an antipoverty political agenda: a Countdown to 2015 country case study



Luis Huicho, Eddy R Segura, Carlos A Huayanay-Espinoza, Jessica Niño de Guzman, Maria Clara Restrepo-Méndez, Yvonne Tam, Aluisio J D Barros, Cesar G Victora, and the Peru Countdown Country Case Study Working Group*



Summary

Background Peru is an upper-middle-income country with wide social and regional disparities. In recent years, sustained multisectoral antipoverty programmes involving governments, political parties, and civil society have included explicit health and nutrition goals and spending increased sharply. We did a country case study with the aim of documenting Peru's progress in reproductive, maternal, neonatal, and child health from 2000–13, and explored the potential determinants.

Methods We examined the outcomes of health interventions coverage, under-5 mortality, neonatal mortality, and prevalence of under-5 stunting. We obtained data from interviews with key informants, a literature review of published and unpublished data, national censuses, and governmental reports. We obtained information on social determinants of health, including economic growth, poverty, unmet basic needs, urbanisation, women's education, water supply, fertility rates, and child nutrition from the annual national households surveys and the Peruvian Demographic and Health Surveys. We obtained national mortality data from the Interagency Group for Child Mortality Estimation, and calculated subnational rates from 11 surveys. Analyses were stratified by region, wealth quintiles, and urban or rural residence. We calculated coverage indicators for the years 2000–13, and we used the Lives Saved Tool (LiST) to estimate the effect of changes in intervention coverage and in nutritional status on mortality.

Findings From 2000 to 2013, under-5 mortality fell by 58% from 39·8 deaths per 1000 livebirths to 16·7. LiST, which was used to predict the decline in mortality arising from changes in fertility rates, water and sanitation, undernutrition, and coverage of indicators of reproductive, maternal, neonatal, and child health predicted that the under-5 mortality rate would fall from 39·8 to 28·4 per 1000 livebirths, accounting for 49·2% of the reported reduction. Neonatal mortality fell by 51% from 16·2 deaths per 1000 livebirths to 8·0. Stunting prevalence remained stable at around 30% until 2007, decreasing to 17·5% by 2013, and the composite coverage index for essential health interventions increased from 75·1% to 82·6%, with faster increases among the poor, in rural areas, and in the Andean region. Socioeconomic, urban–rural, and regional inequalities in coverage, mortality, and stunting were substantially reduced. The proportion of the population living below the poverty line reduced from 47·8% to 23·9%, women with fewer than 4 years of schooling reduced from 11·5% to 6·9%, urbanisation increased from 68·1% to 75·6%, and the total fertility rate decreased from 3·0 children per woman to 2·4. We interviewed 175 key informants and they raised the following issues: economic growth, improvement of social determinants, civil society empowerment and advocacy, out-of-health and within-health-sector changes, and sustained implementation of evidence-based, pro-poor reproductive, maternal, neonatal, and child health interventions.

Interpretation Peru has made substantial progress in reducing neonatal and under-5 mortality, and child stunting. This country is a good example of how a combination of political will, economic growth, broad societal participation, strategies focused on poor people, and increased spending in health and related sectors can achieve significant progress in reproductive, maternal, neonatal, and child health. The remaining challenges include continuing to address inequalities in wealth distribution, poverty, and access to basic services, especially in the Amazon and Andean rural areas.

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Introduction

Countdown to 2015 is a global initiative for tracking progress towards the UN Millennium Development Goals (MDG) 4 (to reduce under-5 child mortality by two-thirds between 1990 and 2015) and 5 (to reduce maternal mortality by three-quarters between 1990 and 2015) in 75 countries where most maternal and child deaths occur. The 2014 Countdown report¹ highlights that

deaths of under-5 children have almost halved globally since 1990, but it also warns that fewer than 12 countries are to reach MDG4. In 42 of 62 Countdown countries with data, more than 30% of under-5 children are stunted.¹ The data reports are complemented by country case studies, particularly where substantial progress has been achieved, such as Bangladesh, Niger, and Tanzania.^{2–4}

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*Members listed at end of report

Centro de Investigación para el Desarrollo Integral y Sostenible and School of Medicine,

Universidad Peruana Cayetano Heredia, Lima, Peru

(Prof L Huicho MD,

C A Huayanay-Espinoza BSc);

Universidad Nacional Mayor de San Marcos, Lima, Peru

(Prof L Huicho); Instituto

Nacional de Salud del Niño,

Lima, Peru (Prof L Huicho);

Universidad Peruana de

Ciencias Aplicadas, Lima, Peru

(E R Segura MD); Ministerio de

Economía y Finanzas, Lima,

Peru (J N de Guzman MPH);

International Center for Equity

in Health, Federal University of

Pelotas, Pelotas, Brazil

(M C Restrepo-Méndez PhD,

Prof A J D Barros MD,

Prof C G Victora MD); and

Institute for International

Programs and Department of

International Health,

Bloomberg School of Public

Health, Johns Hopkins

University, Baltimore, MD, USA

(Y Tam MHS)

Correspondence to:

Prof Luis Huicho, Centro de

Investigación para el Desarrollo

Integral y Sostenible and School

of Medicine, Universidad

Peruana Cayetano Heredia,

L133, Lima, Peru

lhuicho@gmail.com

For the UN Millennium Development Goals see <http://www.un.org/millenniumgoals/>

Research in context

Evidence before this study

Peru is one of a handful of middle-income countries to have achieved the UN Millennium Development Goals (MDGs) 4 to reduce under-5 child mortality by two-thirds between 1990 and 2015, the nutrition indicator for MDG1 of halving the number of children who are underweight, and major reductions in neonatal mortality and child stunting. Even more remarkably, the gap has narrowed between rich and poor. We built our country case study on findings from previous studies about maternal and child health in Latin America and Peru. We searched in PubMed for all articles published between Jan 1, 2000, and March 8, 2015, using the search terms “Reproductive Health” AND Peru; ([Maternal Health] or [Maternal Mortality]) AND Peru; ([Neonatal Health] or [Neonatal Mortality]) AND Peru; ([Newborn Health] or [Newborn Mortality]) AND Peru; ([Child Health] or [Child Mortality]) AND Peru. We used the same search strategy for Latin America. Among the 2236 papers we identified, only six attempted to describe factors underlying progress achieved in reproductive, neonatal health or child health, and nutrition in Peru or Latin America. Two described changes in social determinants and health systems and broad health outcomes in Latin America, one described changes related to neonatal health progress in Peru, and three explained changes in diverse factors and

progress in maternal and child health in Brazil, Chile, and Mexico. An additional search in the webpages for relevant organisations (WHO, UNICEF, the World Bank, and The Partnership for Maternal, Newborn and Child Health) yielded a study on success factors in ten fast-track countries including Peru that relied on a qualitative study, and highlighted policy and programme lessons. We used Google with the same search terms that we used for published articles, and recommendations from experts, to search for unpublished material.

Added value of this study

Our study highlights the remarkable progress that Peru has made in child health and nutrition. Progress was made as a result of several contributing factors, including improvements in the social determinants of health, coordinated cross-sectoral antipoverty strategies, geographical targeting, health-sector reforms, and campaigns aimed at increasing coverage and equity of evidence-based health interventions.

Implications of all the available evidence

The main lesson learned is that the combination of macropolicy changes that are consistently focused on poor people, as well as a scaling up of specific interventions within a context of changing programmes, has led to measurable, equitable, and sustainable progress in the health of children in Peru.

Among all Countdown countries, Peru has had the second highest rate of reduction in under-5 mortality rate (U5MR; 6·2% reduction per year, down to 17 per 1000 in 2015). The maternal mortality rate in Peru has also reduced, by 4·2% a year (down to 89 per 1000 in 2013), and the nutrition indicator for MDG1 of reducing the number of children who are underweight by half has also been met.⁵ Recently, Peru was ranked first among all low-income and middle-income countries in the reduction of early neonatal mortality.⁶ Stunting prevalence remained stable at around 30–40% of children under 5 years from 1992 to 2007, followed by a rapid decline.⁵ These achievements led Countdown to commission a case study aimed at documenting the progress in reproductive, maternal, neonatal, and child health in Peru and understanding their determinants, with particular emphasis on how different social groups have benefited from progress. This focus is particularly relevant to Latin America, where health inequalities persist as a major challenge.^{7,8}

Peru is an upper-middle-income country that comprises vast, rural areas that are difficult to reach in the Andes and the Amazon basin. Since the 2000s, after a troubled period with dictatorships and guerrilla warfare, the country has transitioned to democracy and political stability.⁹ Concurrently, Peru has had continued economic growth, and important policy and programmatic changes, both in the health sector and others. Despite such progress, Peruvian society, which embodies rich

cultural, ethnic, and social diversity, continues to show striking social disparities.

In this study, we assessed trends in health and nutrition of newborn babies and older children in Peru from 2000 to 2013, and explored potential causes of the changes observed, including social determinants of health, health systems, policies and financing, and the implementation of specific public health interventions in reproductive, maternal, neonatal, and child health in this period.

Methods

Study design and implementation

We did a country case study for Peru based on data from 2000 to 2013. We obtained data from several primary and secondary sources. Information on health systems and policy changes was obtained from key informants—including programme managers and health-care providers—through individual in-depth interviews and group discussions. We identified potential participants, all based in Peru, among representatives of national and regional governments, civil society, academia, and non-governmental organisations. Through snowball sampling, we identified informants who were familiar with policy, programming, and financing in the health and social development sectors since the 1990s. They were invited to participate in workshops where the objectives and preliminary results of our study were presented and discussed. We asked participants to describe the changes that took place in the country since

the 1990s that could have affected trends in maternal and child health and nutrition indicators. We specifically requested them to address social determinants, out-of-health-sector and within-health-sector policies, and programmes, financing, and implementation of specific interventions. We did follow-up face-to-face or telephone in-depth interviews to refine the messages about possible drivers of progress achieved in reproductive, maternal, neonatal, and child health. This was supplemented by a literature review of published and unpublished materials. We searched in PubMed for all articles published between Jan 1, 2000, and March 8, 2015, and used Google plus recommendations from experts to search for unpublished material. Information on contextual factors (ie, potential determinants of health) was obtained from the annual national household surveys (ENAHO),¹⁰ and from the Peruvian Demographic and Health Surveys (DHS).¹¹ These factors included economic growth, poverty, unmet basic needs, urbanisation, women's education, water supply, and fertility rates (appendix p 2). All information was disaggregated at the level of the 24 departments in the country.

We obtained information on implementation of the JUNTOS conditional cash transfer programme (ie, the percentage of rural families that are beneficiaries), and use of the Seguro Integral de Salud (SIS) Comprehensive Health Insurance System (number of annual under-5 outpatient preventive and clinical attendances per total under-5 population) from government reports.^{12,13} Information on expenditure on activities in reproductive, maternal, neonatal, and child health was obtained from the Ministry of Economy and Finance,¹⁴ and disaggregated into reproductive, maternal, neonatal, and under-5 child costs (appendix p 2).

Outcomes and statistical analysis

We explored four outcomes: under-5 mortality rates (U5MR), neonatal mortality rates (NMR), health interventions coverage, and prevalence of under-5 stunting. We estimated health interventions coverage, mortality rates, and stunting prevalence through reanalyses of 11 nationally representative DHS done in 2000, and annually from 2004 to 2013. The DHS programme started in the 1980s and has produced nearly 400 surveys in more than 100 low-income and middle-income countries (LMIC); 462 107 women were interviewed in the 11 available DHS from 2000 to 2013. Along with the Multiple Indicator Cluster Surveys, DHS became the most important source of health information for LMICs. DHS, which are nationally representative are based on a two-stage cluster sampling design, in which a cluster—the primary sampling unit—is most often a census tract, each country region being typically a sample domain. These surveys cover a wide range of topics related to living standards, work, contraception, health, nutrition, birth histories, etc, with specific questionnaires applied to the household head, women aged 15–49 years

(including questions about children under 5), and men aged 15–49 years. Rutstein and Rojas¹⁵ provide more detailed information about DHS.

The following coverage indicators were calculated: demand for family planning satisfied; antenatal care (≥ 4 visits); skilled attendant at birth; coverage with BCG, diphtheria, pertussis, and tetanus (DTP; three doses), and measles vaccines; care seeking for pneumonia; and oral rehydration therapy (appendix p 3). We also estimated the composite coverage index, a weighted mean of the coverage of eight preventive and curative interventions covering four steps of the continuum of care (family planning, maternity care, child immunisation, and case management).¹⁶ Stunting prevalence was defined as the percentage of children younger than 5 years whose height or length for age was less than 2 SDs from the median, according to WHO growth standards.¹⁷ Coverage indicators, under-5 mortality rates (U5MR), and stunting prevalence were estimated by country region, wealth quintiles (based on household asset indices), and by place of residence (urban or rural).¹⁶ All national and stratified estimates had their respective standard error calculated.

We obtained national trends for U5MR and NMR from the UN Interagency Group for Child Mortality Estimation (IGME).¹⁸ Subnational estimates (by region, wealth quintile, and place of residence) were obtained by pooling information on births and deaths by calendar year for all children born to the women interviewed in the 11 available DHS, to increase the sample size and reduce the variability of the estimates. Thus, mortality rates were calculated for six 3-year periods, from 1996–98 to 2011–13. Mortality estimation from full birth histories has been the main source of mortality estimates for countries without fully implemented important registration systems, and is widely considered reliable.¹⁹ Our estimation used the birth cohort methods proposed by DHS.¹⁵ Information on causes of deaths in under-5 children was obtained from the Child Health Epidemiology Review Group.²⁰

To assess regional trends, we calculated the average annual rates of change for the composite coverage index, stunting, U5MR, and NMR, and their 95% CIs by region (coast, Andes, and Amazon) through variance-weighted regression of log-rates per year, using the whole time series. This approach allows us to use a group-level estimate taking into account its variability, which increases the precision of the analyses. We assessed if the average annual rates of change for each indicator were different among regions by testing for interactions between year and region. We assessed each model in terms of quality of fit, including the distribution of residuals and linearity.

We used the Lives Saved Tool (LiST) to estimate the effect of changes in intervention coverage and in nutritional status on U5MR and NMR from 2000 to 2013.²¹ Predictive variables in the model included changes in fertility, access to improved water, access to improved

See Online for appendix

sanitation, contraceptive use, antenatal care, skilled birth attendance, postnatal care, and child immunisations (DTP, *Haemophilus influenzae* type B, pneumococcal, and rotavirus vaccines); vitamin A supplementation; oral rehydration salts; exclusive breastfeeding; continued breastfeeding; tetanus toxoid in pregnancy; HIV prevention and treatment; and antibiotics for pneumonia. Stunting and wasting prevalence (ie, the percentage of children younger than 5 years whose weight for height was less than 2 SDs from the median, according to WHO growth standards)¹⁷ by age groups were also used as inputs for predicting mortality changes. We then compared the change in mortality rates between 2000 and 2013 projected by LiST with that calculated by IGME, to determine the proportion of mortality reduction due to the change in coverage of the health interventions described. Changes in health and nutrition were interpreted within a conceptual causal framework that includes social determinants, governmental programmes within and outside the health sectors, and the coverage and equity of interventions for reproductive, maternal, neonatal, and child health (appendix p 3).

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

During this period, the U5MR decreased by 58% from 39·8 deaths per 1000 livebirths to 16·7, and NMR decreased by 51% from 16·2 deaths per 1000 livebirths to 8·0. (table and appendix p 6).¹⁸ The table shows the cause-specific mortality rates for under-5 children, as estimated by the Child Health Epidemiology Review Group (see also appendix p 7).²⁰ The rates per 1000 livebirths of several neonatal causes of death—including preterm birth complications, intrapartum-related events, and infections—fell by more than 50%, and postneonatal causes showed even faster declines, so that the proportion of neonatal overall under-5 deaths increased from 40% to 48%. Among postneonatal causes, diarrhoea and pneumonia death rates were reduced by approximately three-quarters (from 3·08 to 0·74 per 1000 livebirths, and from 5·37 to 1·42 per 1000 livebirths, respectively), but injuries only fell by a quarter (from 1·45 to 1·10 per 1000 livebirths). In 2000, all infections represented 10·3% of all under-5 deaths, with a reduction to 2·8% in 2013. Stunting prevalence remained stable at around 30% until 2007, with a 39% reduction thereafter (table and appendix p 8), decreasing to 17·5% in 2013. Preliminary results from the 2014 DHS²² show a further reduction in stunting prevalence in this year to 14·6%. The composite coverage index for essential health interventions increased from 75·1% to 82·6%, with

faster increases among the poor, in rural areas, and in the Andean region. Additionally, underweight prevalence, an indicator for MDG1 on poverty eradication, fell from 10·8% in 1991 to 3·5% in 2013, thus meeting the target.

Several social determinants of health evolved favourably in this period (table), and socioeconomic, urban–rural, and regional inequalities in coverage, mortality, and stunting were substantially reduced. The proportions of families with at least one unmet basic need and of those living under the poverty line were halved. Gross domestic product per capita more than doubled, and the percentage of women with fewer than 4 years of schooling fell by 40%. The total fertility rate decreased from 3·0 children per woman to 2·4, and the urban population increased from 68·1% to 75·6%. Policy tracer indicators for women's and children's health also showed progress (figure 1 and appendix p 4). The table shows the scaling up over time of the JUNTOS conditional cash transfer programme, the SIS Comprehensive Health Insurance System, and per-person expenditure on reproductive, maternal, neonatal, and child health.

We approached 181 key informants. Overall, 175 participated in group discussions during two workshops. Additionally, we did in-depth face-to-face or telephone interviews with the 45 informants who were most knowledgeable about our area of interest. The literature review and the interviews with key informants identified the following aspects as contributing to the observed changes.

Data from the scientific literature suggest that in the 1990s and early 2000s, government and international initiatives aimed at alleviating food insecurity and reducing fertility led to the implementation of several social welfare and family planning programmes (Glass of Milk, Food Supplement for High Risk Groups Programme, Comedores Populares, Desayunos Escolares, National Family Planning Programme, and Reposalud), with a focus on poor and rural areas.^{23,24} Although fertility fell,²³ the welfare programmes failed to reduce child undernutrition.²⁴ In 2005, a new cash transfer programme (JUNTOS) was introduced that included use of maternal and child health preventive and curative services as a conditionality.¹² In 2006, the Integral Nutrition Programme was launched, to integrate existing food supplementation programmes.²⁵

According to key informants, the role of JUNTOS was to break the intergenerational poverty cycle via increased and sustained access to education and health services. In the poorest areas of the country, targeted families receive monthly cash transfers (PEN 100, approximately US\$33).¹² The conditions include school attendance and participation in specific health programmes that provide preventive services such as vaccines and growth monitoring, and management of child illnesses.¹² Women are expected to attend antenatal care at least once every 2 months, and postnatal care soon after delivery, and children under 5 years must attend health and nutrition clinics for growth

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Social determinants and services														
GDP per capita (US\$ per person)	..	1312	1355	1406	1485	1622	1738	1957	2272	2202	2524	2737	3005	3045
At least one unmet basic need	..	38.9%	37.8%	36.2%	34.8%	34.9%	31.7%	30.5%	29.0%	26.9%	24.0%	23.4%	21.7%	20.3%
Below the poverty line	47.8%	51.4%	52.3	51.1%	58.7%	55.6%	49.1%	42.4%	37.3%	33.5%	30.8%	27.8%	25.8%	23.9%
Urban population	68.1%	68.7%	69.3%	69.9%	70.5%	71.1%	71.7%	72.3%	72.9%	73.5%	74.0%	74.6%	75.1%	75.6%
Total fertility rate (children per woman)	3.0	..	..	..	2.5	2.6	2.7	2.5	2.6	2.7	2.6	2.6	2.6	2.4
Women with fewer than 4 years of formal schooling	..	11.5%	11.0%	10.8%	10.6%	9.8%	9.3%	8.7%	8.7%	8.3%	8.2%	7.7%	7.1	6.9%
No access to improved water sources	20.2%	..	..	..	..	20.7%	17.9%	14.4%	16.4%	16.9%	16.6%	15.8%	13.5%	11.1%
JUNTOS coverage of rural families	0	0	0	0	0	1.4%	10.1%	23.0%	27.1%	26.5%	30.2%	30.4%	40.0%	44.3%
Health sector variables														
Number of annual attendances under 5 years per 1000 under-5 individuals	..	..	2.1	2.9	2.1	2.4	2.7	3.1	3.3	3.1	3.7	3.4	3.3	4.7
Per-capita expenditure on reproductive health (constant 2012 US\$ per woman of reproductive age)	..	..	1.07	0.23	0.07	0.01	0.04	0.01	0.01	2.38	2.13	3.63	6.25	6.35
Per-capita expenditure on maternal–newborn health (constant 2012 US\$ per pregnant woman)	34.2	38.8	29.4	175.3	158.9	205.2	203.7	199.3	209.3	258.8	249.5	323.4	512.1	577.4
Per-capita expenditure on child health (constant 2012 US\$ per under-5 child)	8.3	10.7	10.0	10.6	27.4	26.1	28.3	43.2	147.8	63.8	100.1	101.5	148.6	174.5
Specific RMNCH interventions coverage														
Family planning needs satisfied	87.6%	..	..	..	89.4%	90.5%	90.9%	90.8%	89.8%	91.4%	91.8%	92.8%	90.3%	89.2%
At least four antenatal care visits	68.5%	..	..	..	87.0%	86.0%	89.0%	90.8%	92.0%	92.5%	92.9%	94.2%	94.4%	95.08%
Skilled birth attendance	59.3%	..	..	..	71.1%	69.3%	73.1%	76.5%	80.6%	82.5%	83.8%	85.0%	86.7%	89.06%
Care seeking for pneumonia	57.6%	..	..	..	68.0%	65.3%	71.0%	65.6%	73.5%	72.1%	60.8%	67.7%	67.2%	64.44%
Oral rehydration therapy	46.1%	..	..	..	57.1%	62.2%	60.7%	58.3%	59.4%	58.4%	64.2%	64.3%	63.5%	62.44%
Composite coverage index	75.1%	..	..	..	81.0%	80.8%	81.7%	81.2%	81.8%	81.4	81.2%	84.2%	83.9%	82.64%
Health and nutrition outcomes														
U5MR-IGME (deaths per 1000 livebirths)	39.8	36.9	34.3	31.9	29.7	27.7	25.8	24.0	22.4	20.9	19.6	18.4	17.5	16.7
NMR-IGME (deaths per 1000 livebirths)	16.2	15.3	14.5	13.7	12.9	12.2	11.5	10.9	10.3	9.7	9.2	8.7	8.3	8.0
Stunting prevalence in children under 5 years	31.0%	..	..	..	..	29.2%	..	28.6%	27.3%	23.7%	23.0%	19.2%	17.8%	17.5%
Specific causes of death (rates per 1000 livebirths)														
Preterm birth complications	7.0	6.7	6.0	5.6	5.4	5.1	4.6	4.3	4.0	3.8	3.6	3.4	3.2	3.2
Intrapartum-related events	2.9	2.7	2.4	2.3	2.2	2.0	1.8	1.6	1.5	1.4	1.4	1.3	1.2	1.2
Newborn infections	2.8	2.6	2.8	2.6	2.3	2.4	2.1	2.0	1.7	1.6	1.5	1.3	1.3	1.2
Other newborn conditions	1.2	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.7
Congenital abnormalities	2.4	2.2	2.2	2.2	2.1	1.8	2.1	2.2	2.1	2.1	2.0	1.9	1.9	1.8
Pneumonia	5.4	4.6	4.3	3.9	3.3	2.9	2.8	2.5	2.3	2.1	1.8	1.7	1.6	1.4
Diarrhoea	3.1	3.1	2.6	2.3	2.3	2.3	1.5	1.3	1.2	1.1	0.9	0.8	0.7	0.7
Injury	1.5	1.4	1.4	1.4	1.4	1.2	1.2	1.3	1.3	1.4	1.3	1.3	1.2	1.1
Other infections	1.8	1.7	1.6	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.6	0.6
All other causes	12.1	11.0	10.1	9.2	8.6	8.0	7.7	7.0	6.5	5.9	5.6	5.3	5.1	4.8

Variables were access to services, health expenditure, coverage of interventions, mortality, stunting, and causes of death in children under 5 years and newborn babies in Peru. GDP=gross domestic product. ..=not available. JUNTOS=conditional cash transfer programme. RMNCH=reproductive, maternal, neonatal, and child health. U5MR=under-5 mortality rate. NMR=neonatal mortality rate. IGME=United Nations Interagency Group for Child Mortality Estimation. Data were compiled from DHS, national household surveys, government reports, the Ministry of Economy and Finance, the UN Interagency Group for Child Mortality Estimation, and the Child Health Epidemiology Review Group.

Table: National time trends in social determinants of health, access to services, health expenditure, coverage of interventions, mortality, stunting, and under-5 and neonatal causes of death in Peru.

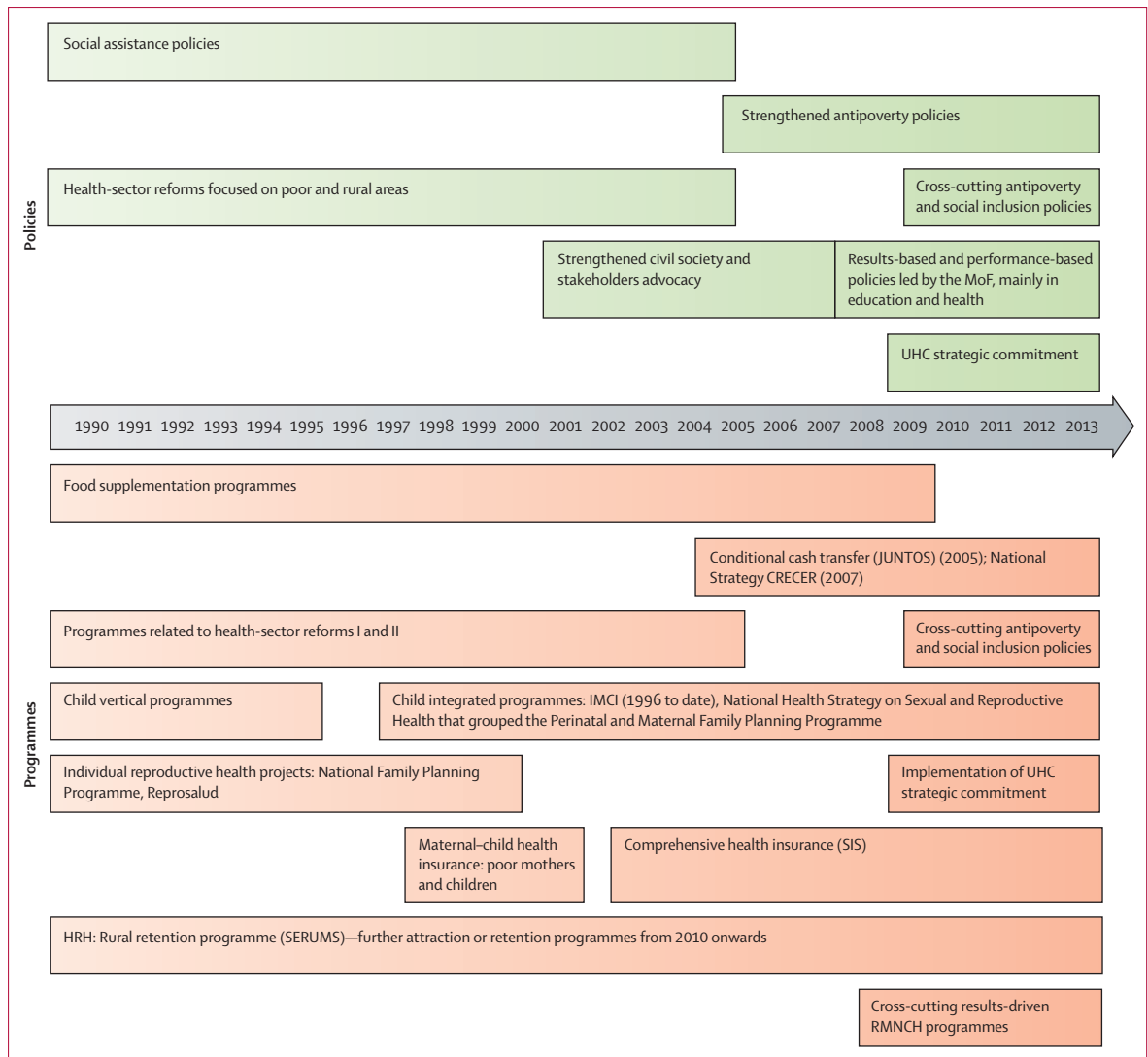


Figure 1: Main policy changes and programmatic activities related to reproductive, maternal, neonatal, and child health in Peru, 1990–2013
 CRECER=National Strategy for Poverty Reduction and Economic Opportunities. MoF=Ministry of Economy and Finance. IMCI=Integrated Management of Childhood Illness. UHC=universal health coverage. HRH=Human Resources for Health. SERUMS=Servicio Rural Urbano-Marginal de Salud. RMNCH=reproductive, maternal, neonatal, and child health.

monitoring, and receive scheduled immunisations and iron, vitamin A, and deworming pills.¹² Efforts to promote household entrepreneurship, microbusiness initiatives, and women’s empowerment have been implemented as a complement to JUNTOS, to ensure sustainability.²⁶

To coordinate various social programmes implemented by different governmental agencies, the National Strategy for Poverty Reduction and Economic Opportunities (CRECER) was launched in 2007.²⁷ This broad programme, unusually, had as one of its explicit targets the reduction of child stunting by 5 percentage points in 5 years.²⁷ To achieve this, the programme aimed at closing the urban–rural gap by focusing on the poorest families, who are concentrated in rural Andean and Amazon regions, and at combining programmes in the areas of health, education,

cash transfer, water and sanitation, housing, and agriculture.^{27,28} The strategy integrated national, regional, and local governments, with strong participation of civil society, international partners, and the private sector.

In 2011, the Ministry of Development and Social Inclusion (MIDIS) was created with the aim of further integrating multisectoral antipoverty and programmes for reproductive, maternal, neonatal, and child health.^{28,29} The programme’s premise was that social inclusion, antipoverty, and economic growth policies are equally essential for full achievement of human and social capital. All programmes are managed by MIDIS, and specific results-based indicators were set to assess the efficiency and impact of the integrated management approach.³⁰ Along with the substantial changes in these antipoverty

programmes, key informants highlighted that major changes also occurred in the sectoral programmes that included decentralisation, and a shift from administrative systems of prioritisation to results-based financing.^{31,32}

Along with the antipoverty initiatives, programmes for reproductive, maternal, neonatal, and child health were strengthened at national and local levels,^{31,32} although key informants stressed that the decentralisation of public health in the 2000s changed the role of the Ministry of Health and substantially reduced its capacity to perform its functions. A health-insurance programme focusing on mothers and children under 5 was launched in 1998, which evolved into the SIS Comprehensive Health Insurance System in 2002.¹³ SIS aims at increasing the delivery of health services at all levels, by removing user fees for poor people, particularly women and children under 5.¹³ The programme involves a targeting procedure whereby potential beneficiaries are entitled to fully subsidised or semicontributory schemes, depending on their income. Families that are above the poverty line are also allowed to become beneficiaries but must pay reduced fees. Key informants noted that SIS has also been instrumental in promoting health reform to accommodate the increased demand for health services, and to ensure an adequate quality of care to justify charging families who are in the semicontributory scheme. The programme is funded by general treasury resources that are used to reimburse public-sector providers affiliated with the Ministry of Health. Since 2009, SIS is being expanded to reach wider population segments, in line with the goal of Universal Health Insurance (AUS), to reach all Peruvians with quality health services.³³ Although falling short of offering universal free health services, Universal Health Insurance aims at minimising user fees and reducing out-of-pocket health expenditures.

After the implementation of the PARSALUD I (Health Sector Reform Support Programme I) in the late 1990s, further health reform initiatives (PARSALUD II) were implemented by the Ministry of Health in 2009, to improve efficiency and equity, with particular focus on poor mothers and children.³⁴ These programmes invested heavily in increasing the provision of equipment and supplies, and the training and deployment of health workers.³⁴ With a unique approach, new child vaccines against rotavirus and pneumococcus were introduced in the poorest areas, and were only scaled up in the wealthier areas after high coverage had been reached in the early implementation districts.^{35,36}

Key informants noted that importantly, the health of mothers and children persisted as a high priority despite several changes in political leadership over time. This prioritisation occurred in the context of a complex decentralisation process,³⁷ which transferred several responsibilities of the Ministry of Health—including the implementation of interventions for reproductive, maternal, neonatal, and child health—to departmental administrations. The coverage of public insurance also

evolved from an emphasis on reproductive, maternal, neonatal, and child health to a broader benefits package.

The participation of civil society, through different mechanisms and organisations such as the National Agreement, the Roundtable Against Poverty, and the Initiative Against Malnutrition, was key to set the reproductive, maternal, neonatal, and child health agenda and to keep it highly visible as a national and subnational priority across governments. The National Agreement is a long-term national dialogue forum established in 2002 by government representatives, the main national political parties, and civil society organisations, committed to respect democracy and prioritise the fight against inequality and poverty.^{38,39} According to key informants, this forum was instrumental in ensuring substantial funding to reproductive, maternal, neonatal, and child health activities.^{40,41} Specific goals included the reduction of poverty, maternal and child mortality, and child stunting, leading to the equitable implementation of specific evidence-based interventions for reproductive, maternal, neonatal, and child health.^{40–42} The plan included mechanisms for monitoring and accountability of the progress,⁴³ and effectively encompassed the health of mothers and children into the political agendas.⁴⁴

The use of scientific evidence to identify the most effective interventions has been particularly prominent in Peru since the publication of the *Lancet* Series on child survival in 2003 and on maternal and child nutrition in 2008.^{45–47} Key informants commented that these two Series are often cited in official documents, and referred to in public by high-ranking officials. The consultation process for prioritising the scale-up of specific interventions for reproductive, maternal, neonatal, and child health involved presenting the best available evidence to multiple stakeholders at national and departmental levels. The process also took into account the multicultural characteristics of Peru and a rights-based approach to health aimed at enhancing access to and use of health care.^{48–50}

Because of its high political visibility, per-person expenditure for reproductive, maternal, neonatal, and child health increased substantially over the study period (table), which was accompanied by the adoption of a results-based budgeting policy, resulting in the implementation of specific cross-cutting programmes for reproductive, maternal, neonatal, and child health (Articulate Nutritional Programme and Strategic Maternal-Neonatal Programme) from 2009 onwards.^{51,52} They were aimed at increasing reduction of maternal, neonatal, and under-5 mortality and stunting, through implementation, monitoring, and assessment of interventions, under the results-based framework.^{51,52}

Furthermore, key informants highlighted that important investments were made for achieving real-time monitoring of progress in reproductive, maternal, neonatal, and child health. Peru is the only country in the world to hold annual

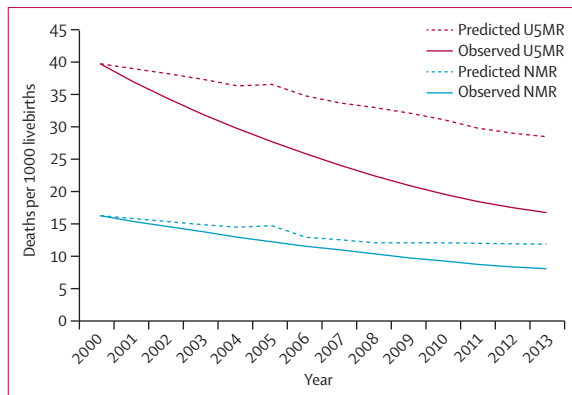


Figure 2: Predicted (LiST) and observed (IGME) under-5 and neonatal mortality rates in Peru

LiST=Lives Saved Tool. IGME=United Nations Interagency Group for Child Mortality Estimation. NMR=neonatal mortality rate. U5MR=under-5 mortality rate.

DHS surveys representative at national and departmental level, for the past 10 years. The National Institute of Statistics and Computing adapted the DHS design to incorporate locally relevant coverage indicators, including information on the coverage of programmes such as SIS and JUNTOS. The DHS sample sizes have increased substantially since 2004, and they reached 27 945 households in 2013. Under-registration of births and deaths remained until 2011 at approximately 50%,^{53,54} although there is evidence of substantial improvement.^{54,55}

On the basis of DHS results, Peru had already reached coverage levels above 60% for most interventions¹¹ for reproductive, maternal, neonatal, and child health by 2000 (table and appendix p 5). Since then, family planning, antenatal care, and skilled birth attendance coverage became almost universal. By contrast, coverage of pneumonia and diarrhoeal case management remained stable at around 60% of episodes. Coverage for BCG, DTP, and measles reached values above 80% in 2013.¹¹ The proportion of children aged less than 6 months who were exclusively breastfed increased from 53.4% in 2000 to 72.3% in 2013,²² to one of the highest proportions in the world,⁵⁶ while the proportion of children aged 12–23 months who received any breastmilk remained stable in this period at around 66%. Other factors that might contribute to stunting prevalence, such as low maternal body-mass index and low birthweight remained stable from 2000 to 2013, less than 2% and 9%, respectively (appendix p 6).

Historically, Peru's coastal region presented higher intervention coverage and lower stunting and child mortality rates than the Andes or the Amazon region (appendix p 9, 10).¹¹ Estimated data from the National Institute of Statistics and Computing show that these regions account for 51%, 39%, and 11% of the country's under-5 children, respectively.⁵⁷ From 2000 to 2013, intervention coverage significantly improved in all regions (appendix p 9). Progress was faster in the Andes than in the other two regions, except for stunting reduction that

was not significantly different (appendix p 10). In the Amazon, intervention coverage increased faster than on the coast; U5MR fell less rapidly than on the coast; for NMR, rates of reduction were similar in both regions (appendix p 10). We did not find evidence of non-linearity in any of the 12 models of log-rates versus year.

LiST was used to predict the decline in mortality arising from changes in fertility rates, water and sanitation, undernutrition, and coverage of indicators for reproductive, maternal, neonatal, and child health (appendix p 12). From 2000 to 2013, LiST predicted that U5MR would fall from 39.8 per 1000 livebirths to 16.7, while reported mortality fell from 39.8 to 16.7 per 1000 livebirths according to IGME (figure 2). The LiST prediction, therefore, accounted for 49.2% of the reduction reported by IGME. The NMR, starting from 16.2 per 1000 livebirths in 2000, was predicted to fall to 11.8 according to LiST, compared with the 8.0 according to IGME. The LiST estimate therefore accounted for 53.8% of the observed reduction.

Eight interventions accounted for 77.5% of the LiST predicted reduction in under-5 mortality from 2000–13: pneumococcal vaccine (15.1%); *H influenzae* type B vaccine (10.9%); labour and delivery management (9.6%); full supportive care for prematurity (8.2%); improvement in breastfeeding practices (7.6%); antenatal corticosteroids for preterm labour (7.5%); thermal newborn care (7.1%), and antibiotics for pneumonia (7.0%; appendix p 25).

Figure 3 shows time trends in the composite coverage index, stunting, and U5MR starting in 1996. For the composite coverage index, the estimates for the richest quintile are somewhat unstable, because of the few children with diarrhoea and pneumonia, and also because of small sample sizes for measles and DTP coverage that are calculated for children aged 12–23 months. There was steady improvement among the poorest mothers and children, although they remained at lower coverage levels than the other four quintiles. The comparison between urban and rural areas shows a strong reduction in inequality from 2000 up to 2008, with little change thereafter. Changes in coverage inequalities for eight preventive and curative interventions encompassing family planning, maternity care, child immunisation, and case management that are part of composite coverage index are in the appendix (p 27).

Socioeconomic inequalities in stunting prevalence were reduced, especially after 2008, because of substantial improvements among Peru's poorest people. Still, data from the DHS show that the prevalence in the poorest quintile was nearly 40% in 2013, almost double the rate observed for the second poorest quintile.¹¹ Additionally after 2008, there was a clear reduction in stunting in rural areas, with little change in urban areas, although rural areas had three times more stunting prevalence than urban areas in 2013. U5MR greatly reduced from 1996–98 to 2011–13 in all wealth quintiles, but particularly

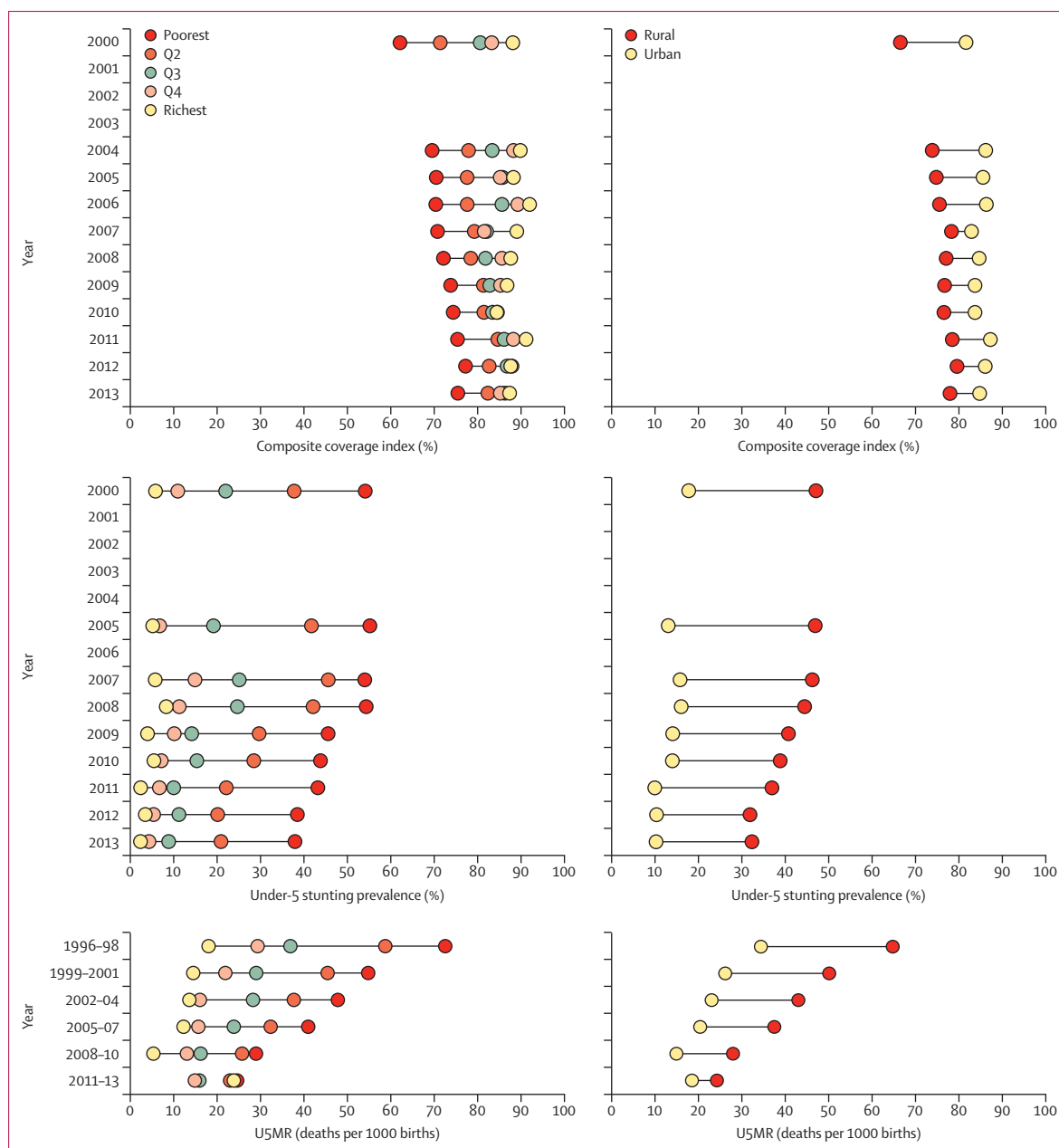


Figure 3: Time trends in wealth and urban-rural disparities in Peru
 Data shown for composite coverage index, stunting, and under-5 mortality rate (U5MR). Q=quintile.

among the poorest people. Urban-rural inequality was also markedly reduced during this period. Results for 2011-13 should be interpreted with caution because these are based on few deaths reported in the 2012 and 2013 DHS surveys only, by contrast with rates for earlier years that are based on a larger number of surveys.

Discussion

In addition to meeting MDG4 and the MDG1 underweight indicator, Peru has made substantial progress in reducing child and maternal mortality—although Peru has not

reached the three-quarters reduction in maternal mortality required by MDG5. Three other aspects of what Peru has achieved are even more noteworthy, because few countries have made similar progress. First, stunting prevalence was reduced by half in an 8-year period, after having been at the highest rates in South America for decades. Second, NMR fell by half since 2000, one of the fastest declines worldwide. Perhaps most importantly, the social, regional, and urban-rural divides that characterised the health of mothers and children were substantially reduced.

Relying on quantitative and qualitative approaches, we attempted to identify the determinants of the positive trends observed in Peru. As a backdrop to the observed changes, the political transition to democracy encouraged a broad process of participation, with strong political will leading to sustained macropolicies and implementation of cross-cutting antipoverty and health programmes. These programmes evolved substantially over time, while retaining a focus on welfare and health of the poor, within a framework of political stability and continued economic growth. Strong civil society participation was also a key element of success, by contributing to the adoption of equitable and sustained policies translated into evolving programmes and interventions, whose performance has been monitored across various governments. Of particular relevance was the inclusion of specific goals for reducing mortality and stunting in broad antipoverty programmes external to the Ministry of Health, thus raising the visibility of reproductive, maternal, neonatal, and child health in the national context. New programmes emphasising reproductive, maternal, neonatal, and child health goals, particularly JUNTOS and CRECER, represented a drastic change from an earlier generation of food-aid programmes.

Peru learned progressively from several years of implementation of vertical programmes and specific interventions for reproductive, maternal, neonatal, and child health. An example of early success was the family-planning programme implemented in the 1990s with strong political support. Free access to contraceptives was associated with lower fertility rates,²³ although controversies emerged because of the compulsory and uninformed sterilisation of women, particularly in rural areas.⁵⁸ Conversely, the implementation of old-fashioned, clientelist, social-assistance programmes was not followed by a reduction of the chronically high levels of stunting.^{25,59–61} Flawed design, insufficient focus on the neediest people, little political commitment, uncoordinated supply of food supplements, insufficient funding, and an absence of coordination with programmes addressing other determinants of malnutrition, were among the factors blamed for the absence of success.^{25,59–61}

By contrast with previous years, the concerted political agreement reached in 2002 was focused on ensuring long-term commitments aimed at reinforcing the democratic system, enhancing social justice, and reducing inequalities. This effort was not a vertical initiative taken only by the central government;⁴² it also benefited from an unusual social and political consensus that included also civil society representatives and even the private sector. Its commitments included the accomplishment of the MDGs, particularly those related to poverty and reduction of child mortality and stunting. Pledges to improve maternal and neonatal health were added more recently, since 2007.⁴⁴

Of note, political will was served by the consistent adoption of sound, evidence-based programmes and

interventions for improving reproductive, maternal, neonatal, and child health, more clearly so after 2005. This unusual combination led to the identification of effective interventions from the public health literature and to the choice of context-specific delivery channels that were then implemented at scale. This led to substantial increases in coverage of interventions such as antenatal and delivery care, and introduction of new vaccines.

The remarkable reduction in stunting is surely multifactorial, and encompasses improvement of social determinants, poverty reduction, and major investments in programmes within and outside the health sector. These included SIS and JUNTOS, introduced in 2002 and 2005, respectively, and the results-based budgeting programmes implemented since 2007. Because stunting is a cumulative process that starts in utero and continues with growth faltering in the first 2 years of life, the effects of any programmes do not occur immediately, so that the drop observed after 2007 was probably due to changes that occurred a few years earlier. In such a context, in which major, interconnected changes are taking place at different levels of the determinants of stunting, the contribution of these factors cannot be estimated in a quantitative way. Nevertheless, prevalence of low birthweight and maternal undernutrition remained stable during the study period, and therefore postnatal growth probably caused the observed trends. National trend data on micronutrient deficiencies are not available. Although the improvement in social determinants was already present in the early 2000s, prevalence only fell after targeted programmes were introduced a few years later, suggesting that the programmes played an important role. There was a sizeable reduction in stunting among the poorest people, from about 55% in 2005 to less than 40% in 2013. Stunting prevalence has been lower than 5% in the richest quintile since 2009, underlining that there is much scope for further improvement among poor people.

The equity lens approach led to innovative approaches. Baseline data on regional inequalities led to the identification of high-risk subpopulations in the Andean and Amazon departments. The next step was to target these groups for multisectoral interventions such as the JUNTOS conditional cash transfers and the SIS health insurance programme. A remarkable example is that the introduction of new vaccines such as the *H influenzae* type B, pneumococcal, and rotavirus vaccines occurred first in the poorest areas of the country.^{35,36} This approach led to the reversal of what happens in the scaling up of many, if not most public health interventions—namely, that new interventions tend to reach the more wealthy, urban populations before trickling down to the rest of the country.^{62,63} After the pro-poor approach in all programmes, we were able to show that gaps in intervention coverage, mortality, and nutrition between rich and poor people, and between urban and rural residents, were substantially reduced over time.

In terms of urban or rural inequalities, progress in rural areas was rapid, but less so in urban settings. Targeting urban poverty might be required as a next step. The regional results suggest that whereas substantial progress was achieved in the Andes, the Amazon region is lagging behind and deserves greater attention in the future.

Simulation analyses using LiST showed that changes in measured coverage and nutritional status explained 59% of the observed U5MR reduction. The remaining 41% of the actual reduction in U5MR, therefore, must have been due to aspects that are not captured by LiST, such as better quality antenatal care and skilled birth attendance offered by strengthened hospitals and primary level health facilities, and improvement in social determinants and poverty reduction. The modelled effect of the new pneumococcal and *H influenzae* type B vaccines is particularly large, because their coverage increased from zero to over 80%, while facility-based interventions such as an increase in skilled birth attendants started from around 60%, and therefore there was less room for improvement. Indicators monitored by the results-based Articulate Nutritional and Maternal-Neonatal Programmes suggest that quality of care has indeed improved in recent years.^{64,65}

The substantial recent drop in stunting prevalence could also be attributed, at least partly, to improved dietary quality,^{66,67} which is also not captured by LiST. Lastly, the LiST models used in the present simulations were based on national averages, and the targeted nature of the multisectoral programmes suggest that coverage increased faster among the highest mortality subgroups of the population, thus leading to a larger effect than had the increases been uniform in all social classes.

The progress achieved in neonatal mortality since the early 2000s is largely attributable to increased coverage due to health-sector reforms leading to improved equipment supply and deployment of trained health professionals across the country, with emphasis on the poorest departments, again within a context of economic growth, progress in social determinants, and poverty reduction. As mentioned, adoption of culturally appropriate practices is likely to have contributed to the reduction of newborn deaths through increased use of health facilities for antenatal and delivery care. Remarkable examples include vertical delivery and waiting houses. The latter are located close to health facilities or within them, and allow pregnant women and their families to stay a few weeks before delivery, increasing the likelihood of skilled birth attendance. Moreover, the introduction of the Strategic Maternal-Neonatal Programme in 2007³² reinforced the accreditation of health facilities to promote high quality emergency obstetric and neonatal care. Implementation of neonatal intensive care units and specialised obstetric units across the country, and close monitoring of quality of prenatal care and of facility-based delivery attendance including neonatal basic and advanced life support, are more recent additions to this programme that still need substantial strengthening. A limitation of

Panel: Challenges remaining for Peru's health system

- Continue to address remaining inequalities in wealth distribution, poverty, and access to basic services, particularly in the Amazon and Andean rural areas
- Renew emphasis on reproductive health, including information on sexual and reproductive rights, and universal and timely access to family planning
- Reinforce recent efforts to tackle systematically the problem posed by unsafe abortions, adolescent pregnancies, and maternal deaths
- Strengthen the ongoing health-sector reform towards universal health coverage, increasing the provision of quality health services
- Further adapt health services to cultural diversity and the specific needs of Indigenous communities
- Enable health services to face more complex causes of maternal, newborn, and child deaths, including the management of pregnancy complications and the provision of neonatal intensive care
- Encourage health workers' deployment in remote and rural areas through efficient incentives
- Improve the health-information system, especially completeness and accuracy of important events registration, to allow real-time measurement of levels and causes of the deaths of women and children
- Overcome scarcity of qualified personnel, inadequate provision of technical equipment, and shortfalls of appropriate guidelines and regulations as specific bottlenecks in the health-information system, particularly at subnational level
- Further improve quality of expenditure, to complement the substantial increase of domestic expenditure on reproductive, maternal, neonatal, and child health, particularly at local level
- Adapt interventions and their implementation to changing urban and rural epidemiological patterns in reproductive, maternal, neonatal, and child health

our analyses is reliance on survey-based estimates for mortality analyses, because important national registration systems faced substantial under-registration, accuracy, and quality problems until recently.

In spite of progress, Peru is still a long way from providing universal, equitable, and effective coverage of interventions for reproductive, maternal, neonatal, and child health to its population. Its U5MR is still about twice as high as that in neighbouring Chile,⁶⁸ and the prevalence of stunting is twice as high as that in Brazil.⁶⁸ Some of the main challenges that remain are summarised in the panel.⁶⁹⁻⁷¹

In conclusion, Peru managed to make major gains in reducing child mortality and stunting from 2000–13, thanks to a unique combination of improvements in social determinants of health, adoption of sustained intersectoral programmes, and health-sector programmes, and scaling up evidence-based interventions for reproductive, maternal, neonatal, and child health. The incorporation of specific health targets in broad antipoverty strategies, with strong participation of civil society, led to increased financial investments targeted at the most deprived areas of the country.

Contributors

LH and CGV conceptualised the study and prepared the technical proposal. CGV served as the liaison to Countdown. LH, CGV, and AJDB conceptualised and carried out the data analyses with support from ERS

CAH-E, and MCR-M. CGV and AJDB provided technical support during the full study process. JNdG contributed in the retrieval and analysis of health financing information and in the health policy and systems analysis. AJDB and MCR-M prepared the DHS data. AJDB estimated the mortality rates on the basis of several DHS. YT carried out the LiST analysis. LH, CGV, and AJDB prepared the first draft of the report. All authors reviewed and contributed to subsequent drafts and approved the final version for publication.

Members of the Peru Countdown Case Study Working Group

Eder Herrera-Perez (Centro de Investigación para el Desarrollo Integral y Sostenible-Universidad Peruana Cayetano Heredia, Lima, Peru; Instituto Nacional de Salud del Niño, Lima, Peru), Charles Huamani (Universidad Nacional Mayor de San Marcos, Lima, Peru), Tania Vásquez (Centro de Investigación para el Desarrollo Integral y Sostenible-Universidad Peruana Cayetano Heredia, Lima, Peru; Instituto Nacional de Salud, Lima, Peru), Patricia Hernandez (Netherlands Interdisciplinary Demographic Institute, Rotterdam, Netherlands).

Declaration of interests

We declare no competing interests.

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