Institution: London School of Hygiene & Tropical Medicine (LSHTM)

Unit of Assessment: 2

Title of case study: Generating data and solutions to save newborn lives

Period when the underpinning research was undertaken: 2005-2016

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed:
Joy Lawn	Professor	15/03/2013-present
Simon Cousens	Professor	01/10/1985-present
Hannah Blencowe	Assistant Professor	11/10/2010-present

Period when the claimed impact occurred: 2014-2020

Is this case study continued from a case study submitted in 2014? No

1. Summary of the impact (indicative maximum 100 words)

LSHTM researchers brought newborn deaths and stillbirths onto the global agenda, publishing the first national estimates of the causes of newborn deaths and the numbers of stillbirths around the world. Nearly all (99%) of the 5 million neonatal deaths each year were in low- and middle-income countries (LMICs), yet were invisible on the global health and political agenda. LSHTM research made them visible, leading to targets for preventing these deaths being included in the United Nation's Sustainable Development Goals, and innovations in communities and hospitals saving babies' lives daily. The Every Newborn Action Plan, informed by LSHTM research, has been integrated into the national health strategies of 78 countries with high newborn mortality and stillbirth rates.

2. Underpinning research (indicative maximum 500 words)

There was remarkable progress in maternal and child survival between 1990 and 2015 (the Millennium Development Goal era), but reductions in newborn deaths progressed about 30% more slowly. Deaths in the neonatal period (the first 28 days after birth) and stillbirths (from 28 weeks gestation) were unmeasured, with no global reduction targets, and considered too complex to prevent. To address this huge problem, counting births and deaths around the time of birth was crucial, as well as more research into the determinants of newborn deaths in low- and middle-income settings where the majority of deaths happen.

Cousens was part of a team led by Lawn (before Lawn joined LSHTM in 2013) that defined the burden and causes of newborn deaths worldwide for the first time. The team analysed data from 194 countries and multiple data types (vital registration, perinatal audits, and verbal autopsy) to produce nationally representative estimates. Epidemiological analyses described when deaths occur (1 million on their birth day), where (which regions and increasingly in hospitals), and why (causes of mortality). These findings were published in The Lancet series on Neonatal Survival in 2005 (3.1) and provided the first national and worldwide estimates for neonatal causes of death, estimating that 4 million babies died per year in the first four weeks of life. Few neonatal deaths were found to occur in countries with high coverage of healthcare facilities and vital registration. Further analysis highlighted there was a lack of reliable data on cause of death in settings with the highest volume of neonatal deaths (3.2).

Lawn joined LSHTM as a professor in 2013 and led a wider team on the 2014 Every Newborn Lancet series. 'Every Newborn: progress, priorities and potential beyond survival' reviewed the status of newborn health and progress since the 2005 Neonatal Survival series to inform accelerated action in countries and globally (3.3). The 2014 series presented an updated picture of newborn survival and trends, including analyses of 60 countries, to inform the first global target for neonatal deaths and stillbirths. Globally in 2012, the main causes of newborn mortality were

found to be: complications from preterm birth (1.03 million, 36%), intrapartum-related conditions (previously called birth asphyxia; 0.66 million, 23%), and infections (notably sepsis, meningitis, and pneumonia; 0.66 million, 23%). Intrapartum-related conditions (27%) and preterm birth (41%) dominated in the early neonatal period, and infections (48%) were common in the later period. This 2014 series also analysed data from the 12 countries accounting for over 60% of neonatal deaths, to understand bottlenecks in health systems and inform more rapid prevention of mortality.

To identify the effectiveness of interventions in preventing these newborn deaths, and support prioritisation of resource allocation, LSHTM staff contributed to systematic reviews and modelling of lives that might be saved through essential interventions. In 2010, they published the first meta-analysis showing the mortality effect of kangaroo mother care (KMC), a method of care for preterm infants with low birth weight involving skin-to-skin contact, usually with the mother (3.4). This work showed that KMC reduced deaths among preterm babies in hospital by approximately 40%, and is highly effective in reducing severe morbidity.

To improve the evidence base on stillbirths, Cousens and Blencowe in 2011 (3.5) and Lawn, Blencowe, and Cousens in 2016 (3.6) and co-authors produced two series on stillbirths in The Lancet. They provided the first World Health Organization-approved estimates of stillbirth rates per country. 2.65 million stillbirths were estimated to occur worldwide in 2008. These series included evidence for how to include stillbirth prevention in existing health systems in LMICs. Using WHO estimates and Demographic Health Survey data, the team analysed data from approximately 200 countries and found that 98% of stillbirths occurred in LMICs, with the majority occurring in south-central Asian and sub-Saharan Africa countries.

3. References to the research (indicative maximum of six references)

3.1 Lawn JE***, Cousens S**, Zupan J, Lancet Neonatal Survival Steering Team. 2005. 4 million neonatal deaths: when? Where? Why? *The Lancet.* 365(9462):891-900. doi: 10.1016/S0140-6736(05)71048-5

3.2 Lawn JE*, Wilczynska-Ketende K, **Cousens SN**. 2006. Estimating the causes of 4 million neonatal deaths in the year 2000. *International Journal of Epidemiology*. 35(3):706-18. doi: 10.1093/ije/dyl043

3.3 Lawn JE, Blencowe H, Oza S, You D, Lee ACC, Waiswa P et al. 2014. Every Newborn: progress, priorities and potential beyond survival. *The Lancet*. doi:10.1016/S0140-6736(14)60496-7 (as part of Every Newborn 5-paper series)

3.4 Lawn JE***,** Mwansa-Kambafwile J, Horta BL, Barros FC, **Cousens S**. 'Kangaroo mother care' to prevent neonatal deaths due to preterm birth complications. 2010. *International Journal of Epidemiology*. 9 Suppl 1(Suppl 1):i144-54. doi: 10.1093/ije/dyq031.

3.5 Lawn JE***, Blencowe H**, Pattinson R, **Cousens S**, Kumar R, Ibiebele I, Gardosi J, Day LT, Stanton C, Lancet's Stillbirths Series steering committee. 2011. Stillbirths: Where? When? Why? How to make the data count? *The Lancet.* 377(9775):1448-63. doi: 10.1016/S0140-6736(10)62187-3

3.6 Blencowe H, **Cousens S**, Jassir FB, Say L, Chou D, Mathers C, Hogan D, Shiekh S, Qureshi ZU, You D, **Lawn JE,** Lancet Stillbirth Epidemiology Investigator Group**.** 2016. National, regional, and worldwide estimates of stillbirth rates in 2015, with trends from 2000: a systematic analysis. *The Lancet Global Health*. 4(2):98-108. doi: 10.1016/S2214-109X(15)00275-2

*prior to Lawn joining LSHTM

We believe this body of research meets the 'at least 2*' definition given its reach, significance and rigour.

4. Details of the impact (indicative maximum 750 words)

This programme of research provided high-quality, multi-country data which was crucial for accountability, programme implementation and allocation of resources to prevent newborn deaths and stillbirths. Developing and analysing databases on births and deaths around the time of birth resulted in high-quality evidence to inform what should be prioritised. Systematic review of evidence on interventions enabled actions to be recommended for policy guidelines and programme implementation. This meant that mothers and babies had improved access to services, and led to better health outcomes for newborns.

Informing international targets for newborn mortality and stillbirths

The Lancet Every Newborn Series was published in 2014 and led directly to the development of the United Nations Every Newborn Action Plan (ENAP). Led by UNICEF and the World Health Organization (WHO), ENAP presented evidence-based solutions to prevent newborn deaths and stillbirths, and set out a path to 2020 with global milestones (5.1). The ENAP strategic objectives for ending preventable maternal and neonatal mortality and stillbirths included strengthening and investing in care around the time of birth, strengthening health systems to optimise organisation and delivery of care, minimising inequities to reach every woman and newborn, harnessing the power of communities and societal input, and improving data for decision making and accountability. The plan, based on evidence presented by LSHTM and co-authors in the Every Newborn Series, was endorsed by all 194 member states of the WHO at the 67th World Health Assembly (WHA) in May 2014. It led to a WHA resolution requesting that the WHO Director-General monitor progress and report periodically to the WHA until 2030 (5.2).

The Lancet series and linked action plan was supported by more than 80 partners and donors and proposed national targets as follows:

- 12 or fewer neonatal deaths per 1000 live births in every country by 2030.
- 12 or fewer stillbirths per 1000 total births in every country by 2030.

The WHA resolution resulted in the Sustainable Development Goal framework including the first global target for neonatal mortality reduction (specifically target 3.2, for all countries to aim to reduce neonatal mortality to at least as low as 12 deaths per 1,000 live births). Targets for both newborn deaths and stillbirths were also included in the United Nations Secretary-General's Every Women Every Child Strategy and monitoring framework.

Progress towards reducing stillbirth and newborn deaths

In 2014, a global ENAP partnership was established, focused on country implementation, advocacy and metrics to help achieve the targets and milestones in the plan. The country implementation group developed the Every Newborn Tracking Tool in 2014, which was piloted in 10 countries between October and December 2014. It was revised in 2015 and shared with 28 focus countries for their input, chosen on the basis of their high burden of neonatal mortality. The tool was designed to track ENAP implementation and progress towards national milestones, as a standard tracking tool for use in all countries. The essential care elements embedded in the tool, which drew on evidence produced by LSHTM, are now mainstream in many national newborn programmes in LMICs.

90 countries completed the Every Newborn Tracking Tool in 2018. As of 2019, 87% of those countries (78 countries) have completed a newborn action plan and defined newborn mortality reduction targets. 10 countries had a reduction of between 3.7 and 4.8 newborn deaths per 1000 live births since 2013. These countries, termed 'fast-progressors', demonstrated how sustainable progress can be realised by leadership for newborn health at the national level, undertaking essential planning and investment, and through focused implementation of inputs which improve quality of care. Improvements based on the ENAP guidance included policies supporting free maternal and newborn care, audits of stillbirth and neonatal deaths, strengthening midwifery education, inpatient care for sick newborns, and inclusion of lifesaving medical products and technology in national essential medicines lists (such as antenatal corticosteroids, chlorhexidine for cord care, and newborn resuscitation devices) (5.3). The tracking tool specifically mapped the

ability of countries to monitor the implementation of four high-impact interventions of neonatal resuscitation, treatment of infection, kangaroo mother care, and antenatal corticosteroid use, which were being used in 75 countries as of 2018 (5.4).

As a result of LSHTM and partners' research demonstrating the effectiveness of kangaroo mother care (KMC) for survival of low-birth-weight infants, WHO published their first guidelines in 2015 on care of preterm labour and of preterm infants to include KMC as an intervention (5.5). As part of the Healthy Newborn Network, a KMC Acceleration Partnership addressed barriers to effective implementation of KMC globally, funded by the Bill & Melinda Gates Foundation. The partnership included approximately 70 KMC stakeholders including researchers, clinicians, government officials, programme managers, international organisations and non-governmental organisations (5.6).

Innovation to give babies a better chance of survival wherever they are born

The Every Newborn Plan and Tracking Tool also crucially shone a light on gaps and areas where national governments were doing too little to reduce newborn deaths and low birth weight. LSHTM-led analyses demonstrated that at current rates of progress, it will be more than a century before African newborns have the same chance of survival as a baby born in the UK, yet most newborn deaths could be prevented by effective use of medical technology. In October 2019, a new GBP50 million partnership to reduce preventable newborn deaths in Africa was announced. The NEST360 partnership, co-founded by Lawn, includes LSHTM, Rice University's Institute for Global Health in the US, and 16 other institutions (12 based in Africa), as well as the governments of Malawi, Kenya, Tanzania and Nigeria. NEST (Newborn Essential Solutions and Technologies) is a bundle of affordable and innovative medical devices and diagnostics selected to address the major causes of death for small and sick newborns. The partnership aims to roll out, test and implement NEST in a sustainable, evidence-based way, with LSHTM leading on implementation research and evaluation, supporting the UN target of halving newborn deaths by 2030 (5.7).

Open access education

Lawn and others developed two Massive Open Online Courses (MOOCs). 'The Lancet Maternal Health Series' course ran 11 times from 2017 to 2020, with over 9,000 participants, hosted on the online platform FutureLearn. The course presented material from a range of maternal health experts and evidence across disciplines and was designed for those considering or undertaking postgraduate study in maternal or neonatal health. A second online course, 'Improving the Health of Women, Children and Adolescents', presented the latest data, priorities and debates about the health of adolescents, mothers, newborns and children worldwide. The course has run 9 times to between 2015 and 2020, with over 33,000 learners consisting of healthcare professionals or those working in a health organisation, and those interested in the health of women, children and adolescents (5.8)

5. Sources to corroborate the impact (indicative maximum of 10 references)

5.1 World Health Organization. Every Newborn: an action plan to end preventable deaths. 2014.

- Underpinned by Every Newborn Lancet Series (reference 9). Lawn credited as part of writing team.

5.2 The sixty-seventh World Health Assembly. Agenda item 14.2. 24 May 2014. Newborn health action plan.

- WHA resolution endorsing newborn health action plan and recommendations

5.3 World Health Organization/ UNICEF. Reaching the every newborn 2020 targets and milestones. Draft Executive Summary. May 2019. Data from the Every Newborn Tracking Tool 2018-2019.

- 2019 progress report, contains details of fast progressors

5.4 World Health Organization/ UNICEF. Healthy Newborn Network. Every Newborn Action Plan Country Progress Tracking Report.

- Details of ENAP tracker including structure

5.5 World Health Organization. WHO recommendations on interventions to improve preterm birth outcomes. 2015. Preterm WHO guidance.

- Lawn acknowledged for systematic reviews. References 6, 7, 15, 22
- KMC included for first time
- Lawn acknowledged as external expert involved in preparation of guideline

5.6 Healthy Newborn Network. KMC Acceleration Partnership. Accessed at: www.healthynewbornnetwork.org/kap

5.7 Nest360, accessed at : www.nest360.org

5.8 The Lancet Maternal Health series: global health research and evidence. Online course accessed at: www.futurelearn.com/courses/maternal-health

Improving the health of women, children and adolescents: from evidence to action. Online coursed accessed at: www.futurelearn.com/courses/women-children-health