



Prioritising health-care strategies to reduce childhood mortality, insights from Child Health and Mortality Prevention Surveillance (CHAMPS): a longitudinal study



Zachary J Madewell, Cynthia G Whitney, Nega Assefa, Quique Bassat, Shams El Arifeen, Emily S Gurley, Amara Jambai, Karen L Kotloff, Shabir A Madhi, Inacio Mandomando, Ikechukwu U Ogbuanu, Dickens Onyango, J Anthony G Scott, Samba O Sow, Beth A Tippet Barr, Dianna M Blau

Abstract

Background Globally, mortality in children younger than 5 years has been decreasing over the past few decades, but high under-5 mortality persists across regions of sub-Saharan Africa and southern Asia. Interventions—such as improved quality of clinical and antenatal care, better access to emergency obstetrical procedures, better triage and risk stratification, better immunisation coverage, or infection control measures—could substantially reduce deaths, but it is unclear which strategies could save the most lives. We aimed to use data from the Child Health and Mortality Prevention Surveillance (CHAMPS) network to examine which health-care and public health improvements could have prevented the most deaths.

Methods We used standardised, population-based, mortality surveillance data collected by CHAMPS from seven sites (Bangladesh, Ethiopia, Kenya, Mali, Mozambique, Sierra Leone, and South Africa) to understand preventable causes of death in children younger than 5 years. Deaths were investigated with minimally invasive tissue sampling, a post-mortem approach using biopsy needles for sampling key organs and body fluids. For each death, an expert panel reviewed case data to determine whether the death was preventable and (if preventable) provided recommendations as to how the death could have been avoided. We evaluated which health system improvements could have prevented the most deaths among those who underwent minimally invasive tissue sampling for each age group: stillbirths, neonatal deaths (aged <28 days), and infant or child deaths (aged 1 month to <5 years).

Findings We included 1982 eligible deaths (with minimally invasive tissue sampling performed) that occurred between Dec 9, 2016, and Feb 29, 2020, including 556 stillbirths, 828 neonatal deaths, and 598 child deaths. Of these 1982 deaths across all seven CHAMPS sites, 393 (71%) stillbirths, 583 (70%) neonatal deaths, and 487 (81%) child deaths were deemed preventable. The most recommended measures to prevent deaths were improvements in antenatal or obstetric care (recommended for 44% of stillbirths and 31% of neonatal deaths), clinical management and quality of care (stillbirths 26%, neonates 32%, children 46%), health-seeking behaviour (children 24%), and health education (children 22%). Given that 70% of under-5 deaths are stillbirths and neonatal deaths, an intervention that focuses on these age groups (eg, improved antenatal care) could prevent the most under-5 deaths.

Interpretation These data indicate areas in which greater focus on improving existing systems could prevent the most deaths. Investments in interventions such as better access to antenatal care, improvements in clinical practice, and public education campaigns could substantially reduce child mortality.

Funding Bill & Melinda Gates Foundation (OPP1126780).

Copyright © 2022 The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 license.

Contributors

ZJM, DMB, and CGW drafted and revised the abstract. ZJM conducted the analysis. DMB, NA, QB, SEA, ESG, AJ, KKK, SAM, IM, IUO, DO, JAGS, SOS, and BATB participated in protocol development and coordinated the clinical and diagnostic data collection. All authors reviewed the draft and approved the decision to submit for publication.

Declaration of interests

We declare no competing interests.

Acknowledgments

CHAMPS would like to extend its sincerest thanks to all the families who participated in this study.

Kisumu, Kenya (D Onyango MD);
Department of Infectious
Disease Epidemiology, London
School of Hygiene & Tropical
Medicine, London, UK
(J A G Scott FMedSci); Ministère

de la Santé, Centre pour le
Développement des Vaccins,
Bamako, Mali (S O Sow MD);
Centers for Disease Control and
Prevention Kenya, Kisumu,
Kenya (B A Tippet Barr DrPH)

Correspondence to:
Dr Zachary J Madewell, Center for
Global Health, Centers for Disease
Control and Prevention, Atlanta,
GA 30329, USA
ock0@cdc.gov

Published Online
March 31, 2022

Center for Global Health,
Centers for Disease Control and
Prevention, Atlanta, GA, USA
(Z J Madewell PhD, D M Blau PhD);
Emory University, Emory Global
Health Institute, Atlanta, GA,
USA (C G Whitney MD);

Haramaya University, College of
Health and Medical Sciences,
Harar, Ethiopia (N Assefa PhD);
Unversitat de Barcelona,
ISGlobal-Hospital Clínic,
Barcelona, Spain (Q Bassat MD);
Centro de Investigação em
Saúde de Manhíça, Maputo,
Mozambique (Q Bassat,
I Mandomando PhD); Institutó
Catalana de Recerca I Estudis
Avançats, Barcelona, Spain
(Q Bassat); Universitat de

Barcelona, Pediatrics
Department, Hospital Sant Joan
de Déu, Esplugues, Barcelona,
Spain (Q Bassat); Consorcio de
Investigación Biomédica en Red
de Epidemiología y Salud
Pública, Madrid, Spain
(Q Bassat); International Center
for Diarrhoeal Diseases
Research, Dhaka, Bangladesh
(S El Arifeen DrPH,

E S Gurley PhD); Department of
Epidemiology, Johns Hopkins
Bloomberg School of Public
Health, Baltimore, MD, USA
(E Gurley); Ministry of Health
and Sanitation, Freetown,
Sierra Leone (A Jambai MD);

Department of Pediatrics and
Department of Medicine, Center
for Vaccine Development and
Global Health, University of
Maryland School of Medicine,
Baltimore, MD, USA
(K L Kotloff MD); University of
the Witwatersrand, South
African Medical Research

Council Vaccines and Infectious
Diseases Analytics Research
Unit, Johannesburg,
South Africa (S A Madhi PhD);
Instituto Nacional de Saúde,
Maputo, Mozambique

(I Mandomando); Crown Agents,
Freetown, Sierra Leone
(I U Ogbuanu MD); Kisumu
County Department of Health,