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Building resilient societies after COVID-19: the case for investing in maternal, neonatal, and child health

Chandni Maria Jacob, Despina D Briana, Gian Carlo Di Renzo, Neena Modi, Flavia Bustreo, Gabriella Conti, Ariadne Malamitsi-Puchner, Mark Hanson



Resilient societies respond rapidly and effectively to health challenges and the associated economic consequences, and adapt to be more responsive to future challenges. Although it is only possible to recognise resilience retrospectively, the COVID-19 pandemic has occurred at a point in human history when, uniquely, sufficient knowledge is available on the early-life determinants of health to indicate clearly that a focus on maternal, neonatal, and child health (MNCH) will promote later resilience. This knowledge offers an unprecedented opportunity to disrupt entrenched strategies and to reinvest in MNCH in the post-COVID-19 so-called new normal. Furthermore, analysis of the short-term, medium-term, and longer-term consequences of previous socioeconomic shocks provides important insights into those domains of MNCH, such as neurocognitive development and nutrition, for which investment will generate the greatest benefit. Such considerations apply to high-income countries (HICs) and low-income and middle-income countries (LMICs). However, implementing appropriate policies in the post-COVID-19 recovery period will be challenging and requires political commitment and public engagement.

The life-course implications of MNCH

In the short term, MNCH is measured by maternal and neonatal mortality and other routinely collected outcomes. Although the magnitude and nature of adverse pregnancy outcomes differ within and between HICs and LMICs, in all settings maternal conditions, such as pre-existing obesity and related non-communicable diseases such as diabetes and hypertension, substantially amplify the risks of adverse outcomes.¹

The medium-term effects of poor MNCH operate largely over the first 1000 days of life, from conception to age 2 years, but establish adverse trajectories that persist across the life course and into the next generation.² For example, malnutrition can lead to childhood stunting, overnutrition to obesity, emotional deprivation to altered neurocognitive development, and air pollution to impaired respiratory development. Infants are sensitive to societal factors (eg, family cohesion, parental socioeconomic status,³ family or societal conflict, and environmental factors (eg, toxins, extreme weather events, and earthquakes). These factors can cause damage directly and indirectly (through anxiety and stress), are exacerbated by poverty and demographic factors, and can amplify pre-existing adverse trajectories.

The long-term effects of MNCH have been considered largely in terms of non-communicable diseases, through research encompassing the developmental origins of the health and disease field.² Early studies focused on the associations between low birthweight and later non-communicable diseases, but subsequent research revealed three important concepts. The first is the recognition that low birthweight is a crude proxy for more sensitive biomarkers of risk. These risk factors include preterm birth, ethnicity, and specific causes of growth restriction (eg, maternal smoking and hypertension). Adults who were born preterm have three times the risk of developing metabolic syndrome, and nearly two times the risk of developing type 2 diabetes, hypertension, and stroke,

compared with people who were born at full-term.⁴ Pre-existing maternal non-communicable diseases (eg, diabetes, or pregnancy-related non-communicable diseases such as gestational diabetes) amplify the passing of risk to the next generation.^{2,5} Paternal factors are also important, especially in the preconception period.⁵ As these biomarkers are measurable, they should be incorporated into targeted preventive policies and interventions, alongside an assessment of effect after COVID-19. Second, public health policy making requires knowledge of causation rather than association, and as there is increasing evidence of a causal relationship between early-life exposures and later non-communicable diseases,² this knowledge should be translated into preventive interventions.⁶ Third, growing understanding of the factors initiated in early development that attenuate or amplify health trajectories enables modelling of the likely effect of specific policies (eg, age-specific interventions targeting obesity and sedentary lifestyles) on non-communicable diseases and therefore on population health. Such knowledge is crucial in deciding which policies are likely to be most cost-effective in the economic recession accompanying the COVID-19 pandemic.

Learning from the effect of previous socioeconomic crises on MNCH

Data from several countries show an increase in markers of poor MNCH during socioeconomic shocks, including low birthweight, preterm birth, maternal and infant malnutrition, maternal drug or alcohol misuse, and HIV infection.^{7,8} Retrospective studies of historical cohorts show longer-term increased prevalence of non-communicable diseases—eg, the effects of famine in the Dutch famine of 1944–45,⁹ the Great Leap Forward in China,¹⁰ and the Nigerian Civil War (Biafran conflict) of 1967–70.¹¹ Such socioeconomic shocks act through multiple inter-related pathways.

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Institute of Developmental Sciences, Faculty of Medicine, University of Southampton, Southampton, UK
(C M Jacob MSc, Prof M Hanson DPhil); Southampton NIHR Biomedical Research Centre, Southampton General Hospital, Southampton, UK (C M Jacob, Prof M Hanson); Neonatal Intensive Care Unit, 3rd Department of Pediatrics, National and Kapodistrian University of Athens, Athens, Greece (D D Briana MD, Prof A Malamitsi-Puchner MD); Department of Obstetrics and Gynecology and Centre for Perinatal and Reproductive Medicine, University of Perugia, Perugia, Italy (Prof G C Di Renzo MD); Department of Obstetrics and Gynecology, IM Sechenov First State University of Moscow, Moscow, Russia (Prof G C Di Renzo); Section of Neonatal Medicine, School of Public Health, Faculty of Medicine, Imperial College London, London, UK (Prof N Modi FMedSci); Partnership for Maternal, Newborn and Child Health Board, Geneva, Switzerland (F Bustreo MD); Department of Economics and UCL Social Research Institute, University College London, London, UK (G Conti PhD); and Institute for Fiscal Studies, London, UK (G Conti)

Correspondence to:
Dr Chandni Maria Jacob, Institute of Developmental Sciences MP 887, Southampton University Hospital, Southampton SO16 6YD, UK
c.m.jacob@soton.ac.uk

The global financial crisis of 2008 provided recent lessons about the effects of socioeconomic shocks on MNCH. Excess infant mortality was observed in HICs and LMICs.¹² In some LMICs, a 10% reduction in gross domestic product (GDP) was associated with an 8.5% increase in maternal mortality, disproportionately affecting adolescent mothers.¹³ In Portugal during 2007–14, a 25% increase in low birthweight accompanied the reduction in GDP (growth rate for the period –1%), health expenditure, and social protection, especially for children of migrant mothers.¹⁴ In Greece (one of the European countries most affected by the 2008 financial crisis), GDP fell by at least 15% between 2008 and 2014, and unemployment increased from 7.8% to 26.5%.¹⁵ Overall, stillbirths to women younger than 25 years increased by 42%.⁷ Compared with 2005–07, in 2012–14 the proportion of preterm births (ie, <37 weeks gestation) increased from 8.1% to 12.7%, and of low birthweight (ie, <2500 g) from 6.7% to 11.5%, with mean birthweight decreasing by 64.4 g.⁷ In the USA, the global financial crisis was followed by a deterioration in children's mental health and increased child maltreatment, behavioural problems, and use of special educational services.¹⁶

The effects of the COVID-19 pandemic on MNCH

During pandemics, public focus is inevitably on preserving life, with less attention given to women and children, who are reported to be less susceptible to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection than men or older people.¹⁷ Data show that, at least in HICs, people who have Black, Asian, or minority ethnicity, and who have a low socioeconomic position and pre-existing health conditions (eg, obesity and hypertension), have greater mortality and morbidity from COVID-19 than other populations.¹⁸ However, focusing on individual risk factors ignores the social inequalities that underlie such risk, and that affect social stability and hence community resilience.¹⁹ Both between and within countries, risk varies with the degree of poverty, urbanisation, and social cohesion. However, women are universally more vulnerable than men to socioeconomic and gender inequalities, domestic violence, and economic insecurity; their sexual and reproductive health rights are challenged, and they have less secure employment.^{20,21} The COVID-19 pandemic, by disproportionately affecting women through multiple pathways, threatens to undermine globally the future population's physical and mental health and economic resilience.

The analysis of data from 30 HICs and LMICs suggests that each additional month of lockdown will reduce GDP by 2.5–3%.²² This fall varies among countries, but could be as high as 10–15% with extended lockdown. However, these data underestimate the effect on MNCH, as GDP does not include unpaid work such as breastfeeding, care of children and older people, domestic chores, and food production, which are either exclusively or predominantly done by women. Furthermore, the informal economy

accounts for 61% of the global workforce, and in many LMICs almost half of these workers are women.²³ This sector seldom provides wage protection, job security, sickness pay, or maternity leave. Dropout rates from school are higher for girls during times of crisis⁸ and, because maternal education is of proven societal benefit, this fact adversely affects both the individual girl, and subsequently her children and community.

Investing in MNCH to build population resilience

The global economic recession after the COVID-19 pandemic is likely to result in reduced investment in MNCH in the short term,²⁴ and the immediate effects will be clear. Under-5 mortality, child wasting and stunting, and maternal mortality are likely to increase in LMICs through interrupted food systems and health-care services.²⁰ There might be an increase in preterm and low birthweight babies, as occurred in European countries such as Greece and Portugal after the 2008 recession.^{7,14} A negative effect on family planning, child-health facilities, and routine immunisation coverage is already occurring, as seen previously after outbreaks of Ebola virus outbreak and severe acute respiratory syndrome.²⁰ There are active concerns about increasing amounts of domestic violence, loss of earnings, and food insecurity.²¹

WHO responses to COVID-19 have called for member states to invest in gender-sensitive policies to ensure equitable access to key services.²¹ Recommendations to help mitigate the differential effect of the pandemic on women compared with men included better collection and analysis of data, disaggregated by sex and age, sustained access to sexual and reproductive health services, and effective responses to violence against women.

Implications for policies

The future after the COVID-19 pandemic is uncertain, and infection might remain endemic or seasonal. The recovery phase nonetheless offers unprecedented opportunities to undertake multifaceted actions to promote MNCH as priorities globally (panel). The new normal in both HICs and LMICs will inevitably focus on economic and health policies, providing unique opportunities to empower women, and reduce the gender pay, career, and status gaps that make women more susceptible than men to the effects of socioeconomic shocks.

Policy making at central or local government level involves making difficult choices and the balancing of options. Abundant data show that investing in MNCH offers high rates of return in the medium to longer term, and reduces the burden of short-term adverse outcomes such as maternal mortality, child deaths, and stillbirths.²⁵ Interventions to promote early-childhood health and development, including the training and provision of community health workers (as recommended by the recent WHO–UNICEF–*Lancet* Commission²⁶), offer long-term benefits in reducing non-communicable

disease risk factors, such as obesity. The cost is modest: investing US \$5 per person per year in the 74 countries that, combined, carry 95% of the global MNCH mortality burden is calculated to give up to nine times the return, in socioeconomic terms, by 2035.²⁵ Almost a third of such investments are related to strengthening health systems, especially contraception, preconceptional, antenatal, and postnatal care, plus child health. Similarly, investing in primary care and community health services to improve hygiene, breastfeeding support, and immunisation, reduces under-5 mortality. In the medium term, the engagement of multiple stakeholders (government, health-care providers, teachers, social workers, parents, and young people) will be needed to mitigate the effects on mental health of social distancing and school closures, and to monitor child educational attainment and behaviour after the pandemic.²⁷

At community level, cash transfer and health practitioner home-visit programmes show promise for improving health and educational outcomes in marginalised communities. For example, the Nurse–Family Partnership programme led to an improvement in educational and cognitive outcomes in adolescents in the USA, along with a reduction in government welfare expenditure.²⁸ In Brazil, the Bolsa Familia Conditional Cash Transfer programme provided a safety net for childhood nutrition, food security, and education²⁹ that improved childhood height-for-age and school attendance especially for girls, and reduced fertility rates. Sustaining such schemes requires investment in building the capacity of community health workers in MNCH.

In the longer term, efficient monitoring and surveillance systems for MNCH are needed to help governments to monitor and report on the after-effects of the pandemic efficiently, including behavioural factors and socioeconomic markers, using qualitative and participatory approaches. A reliable evidence base is needed to assess population health and MNCH, including changes in the incidence of preterm birth and low birthweight over time in relation to the COVID-19 pandemic. Collecting such data is challenging, but achievable in both HICs and LMICs. Valuable insights can be obtained from population datasets and linked clinical records, coupled with greater efforts to collect data in specific geographical areas through observational field studies or household surveys.

These insights need to be supported by increased knowledge translation and engagement between communities and policy makers.⁶ Resilient societies will meet future epidemics more effectively; the UN has called for accelerated efforts to develop such resilience in the recovery phase of COVID-19, to achieve its sustainable development agenda that addresses climate change.³⁰

Conclusion

Previous socioeconomic crises reveal short-term, medium-term, and longer-term detrimental effects on

Panel: Priority actions for policies to invest in MNCH to improve population health and resilience in response to the COVID-19 pandemic

- Generate new political will through evidence-informed policy and greater public awareness of the importance of promoting and investing in MNCH services for health, wellbeing, and resilience in the short term and longer term.
- Promote recognition that MNCH care is an essential service and a human right, and initiate immediate pre-emptive interventions to protect or increase it at individual and population levels. These should include investment to sustain access to contraception and reproductive health services, preconceptional care, antenatal care, postnatal care, and child health and development programmes.
- Strengthen primary care and institute and sustain community-based interventions to promote MNCH, such as home visits during and after pregnancy and in the early years to improve hygiene, nutrition, breastfeeding support, contraception services, and immunisation programmes. Explore the use of schemes such as conditional cash transfers to develop motivation and compliance.
- Develop new policies to drive gender equity and reduce the penalties of motherhood (such as providing 6 months parental leave for each parent on a use it or lose it basis), and that acknowledge and support the effects on women's work history and earnings to drive higher breastfeeding rates.
- Increase and sustain training and capacity building for community health workers in MNCH.
- Invest in research and data collection to monitor the immediate and longer-term effect of COVID-19 and the related socioeconomic crisis on MNCH. This investment should include strengthening routine data collection systems and reinstating systems suspended for safety reasons.

MNCH=maternal, neonatal, and child health.

population health, in particular MNCH, productivity, and resilience. Attention urgently needs to be given to measure the effects on MNCH of the COVID-19 pandemic and its resulting economic recession, and to design appropriate responses. Previous crises provide insights that can be translated into policies targeting MNCH and reducing associated gender-based, reproductive, racial, and social inequalities. To be robust and reflective of future resilience, models should incorporate uncompensated work done by women, and assess long-term and shorter-term effects. Societies and political landscapes that protect MNCH are key to withstanding future unpredictable crises.

Contributors

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Declaration of interests

We declare no competing interests.

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References

- 1 GBD 2015 Maternal Mortality Collaborators. Global, regional, and national levels of maternal mortality, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016; **388**: 1775–812.
- 2 Gluckman PD, Buklijas T, Hanson MA. The developmental origins of health and disease (DOHaD) concept: past, present, and future. In: Rosenfeld C, ed. *The epigenome and developmental origins of health and disease*. Cambridge, MA: Academic Press, 2016: 1–15.
- 3 Conti G, Heckman J. The economics of child well-being. In: Ben-Arieh A, Fronesi I, Casas F, et al, eds. *Handbook of child well-being*. London: Springer Nature, 2013: 363–401.
- 4 Sipola-Leppänen M, Vääräsmäki M, Tikanmäki M, et al. Cardiometabolic risk factors in young adults who were born preterm. *Am J Epidemiol* 2015; **181**: 861–73.
- 5 Fleming TP, Watkins AJ, Velazquez MA, et al. Origins of lifetime health around the time of conception: causes and consequences. *Lancet* 2018; **391**: 1842–52.
- 6 Cairney P, St Denny E. *Why isn't government policy more preventive?* Oxford: Oxford University Press, 2020.
- 7 Sdona E, Papamichail D, Ragkou E, Briana DD, Malamitsi-Puchner A, Panagiotopoulos T. Greek economic crisis and impaired perinatal parameters: experience from a public maternity hospital. *J Matern Fetal Neonatal Med* 2018; **31**: 2371–75.
- 8 UNAIDS. Impact of the global economic crisis on women, girls and gender equality. Discussion Paper. August 2012. http://www.unaids.org/en/media/unaids/contentassets/documents/document/2012/discussionpapers/JC2368_impact-economic-crisis-women_en.pdf (accessed April 21, 2020).
- 9 Roseboom T, de Rooij S, Painter R. The Dutch famine and its long-term consequences for adult health. *Early Hum Dev* 2006; **82**: 485–91.
- 10 Song S. Identifying the intergenerational effects of the 1959–1961 Chinese Great Leap Forward Famine on infant mortality. *Econ Hum Biol* 2013; **11**: 474–87.
- 11 Hult M, Tornhammar P, Ueda P, et al. Hypertension, diabetes and overweight: looming legacies of the Biafran famine. *PLoS One* 2010; **5**: e13582.
- 12 Rajmil L, Fernandez de Sanmamed MJ, Choonara I, et al. Impact of the 2008 economic and financial crisis on child health: a systematic review. *Int J Environ Res Public Health* 2014; **11**: 6528–46.
- 13 Ensor T, Cooper S, Davidson L, Fitzmaurice A, Graham WJ. The impact of economic recession on maternal and infant mortality: lessons from history. *BMC Public Health* 2010; **10**: 727.
- 14 Kana MA, Correia S, Peleteiro B, Severo M, Barros H. Impact of the global financial crisis on low birth weight in Portugal: a time-trend analysis. *BMJ Glob Health* 2017; **2**: e000147.
- 15 Organisation for Economic Co-operation and Development. Country statistical profile: Greece 2020/1. Country statistical profiles: key tables from OECD. Jan 27, 2020. https://www.oecd-ilibrary.org/economics/country-statistical-profile-greece-2020-1_g2g9e924-en (accessed April 21, 2020).
- 16 Golberstein E, Gonzales G, Meara E. How do economic downturns affect the mental health of children? Evidence from the National Health Interview Survey. *Health Econ* 2019; **28**: 955–70.
- 17 Clark A, Jit M, Warren-Gash C, et al. Global, regional, and national estimates of the population at increased risk of severe COVID-19 due to underlying health conditions in 2020: a modelling study. *Lancet Glob Health* 2020; **8**: e1003–17.
- 18 Yancy CW. COVID-19 and African Americans. *JAMA* 2020; **323**: 1891–92.
- 19 Penkler M, Müller R, Kenney M, Hanson M. Back to normal? Building community resilience after COVID-19. *Lancet Diabetes Endocrinol* 2020; **8**: 664–65.
- 20 Robertson T, Carter ED, Chou VB, et al. Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study. *Lancet Glob Health* 2020; **8**: e901–08.
- 21 WHO. Gender and COVID-19: advocacy brief. May 14, 2020. <https://apps.who.int/iris/handle/10665/332080> (accessed July 10, 2020).
- 22 Fernandes N. Economic effects of coronavirus outbreak (COVID-19) on the world economy. *SSRN* 2020; published online March 23. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3557504 (preprint).
- 23 Bhan G, Surie A, Horwood C, et al. Informal work and maternal and child health: a blind spot in public health and research. *Bull World Health Organ* 2020; **98**: 219–21.
- 24 Akseer N, Kandru G, Keats EC, Bhutta ZA. COVID-19 pandemic and mitigation strategies: implications for maternal and child health and nutrition. *Am J Clin Nutr* 2020; **112**: 251–56.
- 25 Stenberg K, Axelson H, Sheehan P, et al. Advancing social and economic development by investing in women's and children's health: a new Global Investment Framework. *Lancet* 2014; **383**: 1333–54.
- 26 Clark H, Coll-Seck AM, Banerjee A, et al. A future for the world's children? A WHO–UNICEF–Lancet Commission. *Lancet* 2020; **395**: 605–58.
- 27 Wang G, Zhang Y, Zhao J, Zhang J, Jiang F. Mitigate the effects of home confinement on children during the COVID-19 outbreak. *Lancet* 2020; **395**: 945–47.
- 28 Kitzman H, Olds DL, Knudtson MD, et al. Prenatal and infancy nurse home visiting and 18-year outcomes of a randomized trial. *Pediatrics* 2019; **144**: e20183876.
- 29 Olson Z, Clark RG, Reynolds SA. Can a conditional cash transfer reduce teen fertility? The case of Brazil's Bolsa Familia. *J Health Econ* 2019; **63**: 128–44.
- 30 UN. The Sustainable Development Goals: our framework for COVID-19 recovery. 2020. <https://www.un.org/sustainabledevelopment/sdgs-framework-for-covid-19-recovery/> (accessed July 15, 2020).

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