

# Unheard, unseen and unprotected: DOHaD council's call for action to protect the younger generation from the long-term effects of COVID-19

## Editorial

**Cite this article:** Roseboom TJ, Ozanne SE, Godfrey KM, Isasi CR, Itoh H, Simmons R, Bansal A, Barker M, Plosch T, Sloboda DM, Matthews SG, Fall CHD, Poston L, and Hanson MA. (2021) Unheard, unseen and unprotected: DOHaD council's call for action to protect the younger generation from the long-term effects of COVID-19. *Journal of Developmental Origins of Health and Disease* 12: 3–5. doi: [10.1017/S2040174420000847](https://doi.org/10.1017/S2040174420000847)





Received: 2 August 2020  
Accepted: 13 August 2020  
First published online: 23 September 2020

### Keywords:

early child development; DOHaD; ECD; first 1000 days; COVID generation; sustainable development; equity

### Address for Correspondence:

Tessa J. Roseboom,  
Email: [tj.roseboom@amsterdamumc.nl](mailto:tj.roseboom@amsterdamumc.nl)

Tessa J. Roseboom<sup>1</sup> , Susan E. Ozanne<sup>2</sup>, Keith M. Godfrey<sup>3</sup>, Carmen R. Isasi<sup>4</sup>, Hiroaki Itoh<sup>5</sup>, Rebecca Simmons<sup>6</sup> , Amita Bansal<sup>6</sup>, Mary Barker<sup>3</sup>, Torsten Plosch<sup>7</sup>, Deb M. Sloboda<sup>8</sup>, Stephen G. Matthews<sup>9</sup>, Caroline H. D. Fall<sup>3</sup>, Lucilla Poston<sup>10</sup>  and Mark A. Hanson<sup>11</sup> 

<sup>1</sup>Department of Obstetrics and Gynaecology, Department of Epidemiology and Data Science, Amsterdam Reproduction and Development, Amsterdam Public Health Research Institute, Amsterdam University Medical Centers, Amsterdam, the Netherlands; <sup>2</sup>University of Cambridge Metabolic Research Laboratories and Medical Research Council (MRC) Metabolic Diseases Unit, Wellcome Trust-MRC Institute of Metabolic Science, Addenbrooke's Treatment Centre, Addenbrooke's Hospital, Cambridge, UK; <sup>3</sup>MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton General Hospital, Southampton, UK; <sup>4</sup>Department of Epidemiology & Population Health, Albert Einstein College of Medicine, New York, NY, USA; <sup>5</sup>Department of Obstetrics and Gynecology, Hamamatsu University School of Medicine, Hamamatsu, Japan; <sup>6</sup>Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA; <sup>7</sup>Department of Obstetrics and Gynaecology, University Medical Center Groningen, University of Groningen, Groningen, the Netherlands; <sup>8</sup>Department of Biochemistry and Biomedical Sciences, McMaster University, Hamilton, Ontario, Canada; <sup>9</sup>Department of Physiology, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada; <sup>10</sup>Division of Women's Health, King's College London, King's Health Partners, London, UK and <sup>11</sup>Institute of Developmental Sciences and NIHR Southampton Biomedical Research Centre, Southampton University Hospital and University of Southampton, Southampton, UK

Globally, we are living through one of the most serious public health crises in recent history. Apart from the obvious health risks, the COVID-19 pandemic is exposing the damaging impact of inequalities. The risk of contracting SARS-CoV-2 infection and of hospitalisation and mortality rates differ greatly amongst different communities and populations. In high-income countries, Black, Indigenous and People of Colour, low socio-economic position communities and those living in high-density population areas appear to be more at risk. In addition, pre-existing conditions such as obesity, type 2 diabetes or hypertension are contributing factors to greater morbidity and mortality for those infected with SARS-CoV-2. Similar sequelae of these pre-existing conditions are emerging in low and middle-income countries, although as yet the data are limited. There is also a disparity in gender-related risk, with men facing greater morbidity and mortality due to COVID-19 than women. It has emerged, however, that women will face greater social and economic consequences of this pandemic. This gender-based discrepancy, combined with little evidence for maternal–fetal transmission of the coronavirus and the disease burden amongst children also being low, may focus health action more on older men than on mothers and children. This concern is a predominant reason for this position paper on behalf of the board of the International DOHaD Society.

There is wide recognition that measures to prevent transmission of the virus have a large impact on the younger generation and on women.<sup>1–5</sup> In many places across the globe, the health, social support and education of children and adolescents and the services for pregnant women, infants and younger children have been significantly disrupted. There have been substantial reductions in access to sexual and reproductive health services including reorganisation of antenatal and maternity care, mental health services; immunisation campaigns have been halted; 90% of schools worldwide have closed and many 'non-essential' health measures and treatments have been postponed. Parents, most often mothers, have had to provide homeschooling whilst working from home. In many communities, levels of domestic violence, food insecurity and poverty have increased dramatically, and these disproportionately affect women and children. In low resource settings and low-income countries, these effects are exacerbated by a loss of earnings in the informal economy (cleaning, child care and food services), which is conducted largely by women, giving another reason for grave concern.

The effects of the economic recession resulting from the pandemic have been widely discussed and are of concern to governments and political advisors everywhere. However, the long-lasting effects on population health have received much less attention, especially those affecting adolescents, women and children. Early life, from embryonic development, through infancy, childhood, adolescence and young adulthood are periods of biological plasticity and

© The Author(s), 2020. Published by Cambridge University Press in association with International Society for Developmental Origins of Health and Disease. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution, and reproduction in any medium, provided the original work is properly cited.

therefore vulnerability, when anatomical structure and physiological function, as well as psychological and physiological control systems, are largely established. These developmental processes, the mechanisms of which have intrigued DOHaD researchers over many decades, constitute the basis of each individual's adaptation to their environment that, in turn, establishes the degree of resilience to challenges in later life. Many of these adaptations are emotional and behavioural. Disruption of the care and support for the younger generation during the COVID-19 pandemic risks leaving lasting scars, with major implications for current and future health, well-being and resilience. The COVID-19 generation grows up on a planet in crisis inheriting the unknown and unpredictable consequences of the global repercussions of the pandemic. The true health burden of the pandemic will inevitably far exceed the number of deaths directly attributable to the virus itself, and will likely extend across multiple future generations.

Although the current situation is unprecedented in the modern world, previous generations have of course encountered equally devastating challenges. Many provided an impetus for important international initiatives that laid the foundations for a better world. Wars, natural disasters and pandemics have all demonstrated that our collective resilience is determined by the least resilient amongst us, generally increasing solidarity. For example, the United Nations was founded in 1945 after the Second World War to maintain peace and promote progress and human rights. The current pandemic could be another impetus for positive change, in our ambition to 'build back better'. This is exemplified in the many calls urging stakeholders to put children at the heart of a new agenda for health.<sup>1-8</sup>

An important scientific lesson from previous crises is that the longest and largest burden of a crisis will be carried by the youngest. We know that people born during crises, such as wars, recessions and natural disasters, have poorer mental and physical health and lower economic outcomes. Men and women who had been prenatally exposed to the Dutch famine of 1944-45, for example, have increased rates of chronic degenerative diseases such as type 2 diabetes, obstructive airway disease, depression and cardiovascular disease.<sup>9</sup> They have smaller brains, poorer cognitive function, lower participation on the labour market and lower income. Similarly, men and women prenatally exposed to the 1918 flu pandemic had increased rates of cardiovascular disease and lower participation in the labour market.<sup>10</sup> This suggests that although it appears that the direct immediate effects of COVID-19 are primarily on adults, the legacy of this pandemic looms large for unborn babies and young children.

Based on lessons learned from previous crises, it is likely that the consequences of the COVID-19 crisis may be felt for decades and even across generations, especially if appropriate action is not taken to protect the most vulnerable – those as yet unborn or in the formative first few years of life. The adversities encountered in the pandemic environment in which they are growing, developing and learning are likely to leave lasting marks on their physical, mental, psychological well-being and consequently on their ability to contribute to society in the future. It is here that the seeds are sown for an escalation of inequality and vulnerability. These individuals, being unseen and unheard, are likely to go unprotected. Moreover, as a quarter of all children born today are not registered<sup>11</sup>, they run the risk of being officially 'left out' of society and not being counted in any follow-up measures of the longer-term effects of COVID-19.

The DOHaD Society calls for protection of the youngest generation and recognition of the immediate need to collect evidence that will inform future policy and pandemic preparedness. Evidence suggests that the negative effects of adversity in prenatal life can be mitigated if antenatal care is sustained.<sup>12</sup> During the Queensland floods of 2011, continuity of care to pregnant women not only protected them against adverse pregnancy outcomes, but also had positive effects on children's future neurodevelopment.<sup>13</sup> Whilst the pandemic persists, this is a critically important message to maternity care providers in all global settings. A post-COVID-19 recovery programme should aim to unify not only the global response to the pandemic, but also a global commitment to mitigate its damaging aftermath by protecting women and children. Attention should be focused on those groups who might seem less affected by COVID-19 in terms of morbidity and mortality, but whose futures will have been influenced by the current pandemic and who will take the biggest toll of the collateral damage from indirect and longer-term effects. Fundamental human rights should be used as a compass to 'build back better', and give voice to those unheard, and particularly to protect women and children. Special care and assistance to mothers, children and education are, after all, fundamental human rights, and the foundation for sustainable futures for all. The IAP (Independent Accountability Panel for Every Woman Every Child Every Adolescent (IAP) report 2020) calls for accountability for women's children's and adolescents' health.<sup>14</sup> As long as there remain governments without the most basic population data, targeting those who need the most help will be difficult. In their recent report, the IAP set out an accountability framework to commit, explain, implement and progress in order to realise the rights of women, children and adolescents. Social justice is fundamental to promoting health in society throughout the life course and across generations. We call on countries to support current and future generations by ensuring that all children's needs are met, from the earliest stages of their lives in accordance with the Convention of the Rights of the Child.

Today's (unborn) children will drive growth and development in our future societies. Helping these children develop their physical, cognitive, psychological and social capacities will benefit not only them but all of our future societies. We must now act to prevent further scarring of the life chances of a generation. The evidence shows that young children have the best chance of maximising their potential when they are well nourished, responsively cared for with learning opportunities from birth onwards, and protected from disease, violence and stress.<sup>15</sup>

Adolescence is a second life stage of rapid development and plasticity, especially for brain development and thus for social, emotional and cognitive maturation and the acquisition of agency. We fear for the impact of lockdown, social isolation, the interruption of education and plummeting career prospects on adolescents health and wellbeing, as well as on their development, including their ability to become successful and nurturing parents in future. Those with mental health problems are at particular risk, and there is early evidence from real-time mortality surveillance in the UK that suicides have increased amongst young people since lockdown started.<sup>16</sup> Mental health services for young people, inadequate in some countries even before COVID-19, need urgent attention. Governments need special policies to protect the life chances of adolescents and young adults.

Stunted human development creates poverty traps that keep generation after generation in poor health and poor education,

with lasting negative effects on the economy and society. We should not only be focusing on preventing transmission of the virus, but must focus on preventing the transmission of adversity from one generation to the next. Failing to make investments in maternal and child care now will have profound effects on our future, these children, their societies, exacerbating inequalities and deepening societal divisions. This can most effectively be done by investing in a good start in life.<sup>17</sup> A potent factor that generates multiplier effects is the transmission of loving values, supporting solidarity and protecting and nurturing our youngest generation. Economic analyses show that investments in early child development deliver returns many times their original worth, thereby providing benefit for future health and wealth, in generations to come.<sup>18</sup>

Currently, little is known about the differential effects of the pandemic on women and children, thus leaving policymakers 'flying blind'. We call for research, response and recovery efforts that support the unseen and unheard. To learn lessons from the current crisis and be better prepared for future ones, we recommend a joint global effort to collect data that informs how adolescents (as future parents), pre-conceptional and pregnant women, children and young families, as well as their health care provision, have been affected and to investigate how different strategies affect the health and well-being of future generations. Across the globe, policy responses to the pandemic vary widely, providing a unique opportunity to study the effects of different approaches on the growth, development and health of the young. To identify which policies are most effective at mitigating harms and promoting benefits, there is an urgent need to collect data for each of the different approaches. Ideally, we should not only count but also recount and use both quantitative and qualitative methods to collect evidence on how the pandemic affects individuals across the globe. Examples of best practices should be identified and shared to inform the future response to outbreaks. This will usher in a new agenda of preventive health policy to provided resilient health systems that protect populations from major health emergencies in the future. It will be essential to help provide the evidence needed to shape policy to keep all citizens equally safe, sheltered and secure.

Such studies will help us answer questions such as:

Direct biological effects of exposure to SARS-Cov-2.

- How does exposure to the pandemic in early life (prenatal, early postnatal, childhood or adolescence) affect pregnancy outcomes (e.g. stillbirth, preterm birth, fetal growth rate, gestational diabetes mellitus etc.), infant growth, neurodevelopment, health and educational attainment?
- Are there long-term effects on the physical and mental health of the mother?
- What is the influence of maternal ethnicity, co-morbidities, e.g. body mass index, diabetes as well as age, and gestational age of exposure on these outcomes?
- What are the underlying mechanisms contributing to adverse maternal and neonatal outcomes, e.g. direct viral exposure, indirect inflammatory pathways, placental dysfunction; and in the infant do persistent changes in gene expression through epigenetic pathways contribute to any developmental consequences?

Indirect effects.

- Do COVID-19-related changes in the delivery of antenatal, postnatal and paediatric care (e.g. telemedicine, fewer hospital

appointments, shifts to community care) contribute to any adverse consequences for mother and child?

- Do any elements of changes in antenatal, postnatal and paediatric care contribute to improvement in maternity and child outcomes?
- Do efforts to sustain antenatal and child care protect women and children from negative effects of the pandemic?
- Does continued education (online or in person) affect growth, development, health and educational attainment in children?
- To what extent do greater poverty, food insecurity, poorer access to health care, water sanitation and hygiene (WASH), increased domestic violence, climate and geographical setting exaggerate adverse outcomes?

## References

1. Generation coronavirus? *Lancet* 2020; 395: 1949.
2. Prioritising children's rights in the COVID-19 response. *Lancet Child Adolescent Health* 2020; 4: 479.
3. Clark H, Coll-Seck AM, Banerjee A *et al.* A future for the world's children? A WHO Unicef Lancet commission. *Lancet* 2020; 395: 650–658.
4. Black MM, Lutter CK, Trude ACB. All children surviving and thriving: re-envisioning UNICEF's conceptual framework of malnutrition. *Lancet* 2020.
5. Wenham C, Smith J, Davies SE, *et al.* Women are most affected by pandemics – lessons from past outbreaks. *Nature* 2020; 583, 194–19
6. Sher J. Fetal alcohol spectrum disorders: preventing collateral damage from COVID-19. *Lancet* 2020; [https://doi.org/10.1016/S2468-2667\(20\)30159-6](https://doi.org/10.1016/S2468-2667(20)30159-6)
7. Roseboom TJ. Violence against women in the COVID-19 pandemic: why we need upstream approaches to break the intergenerational cycle. *BMJ* 2020;369:m2327
8. Penkler M, Muller R, Kenney M, Hanson M. Back to normal? Buiding community resilience after COVID-19. *The Lancet Diabetes and Endocrinology* 8:664–5.
9. Roseboom TJ. Epidemiological evidence for the developmental origins of health and disease: effects of prenatal undernutrition in humans. *J Endocrinol* 2019; 242: 242:T135–44.
10. Almond D. Is the 1918 influenza pandemic over? Long term effects of in utero influenza exposure in the post-1940 US Population. *J Polit Econ* 2006; 114: 672–712.
11. <https://data.unicef.org/topic/child-protection/birth-registration/> accessed 17 July 2020
12. Kildea S, Simcock G, Liu A, *et al.* Continuity of midwifery carer moderates the effects of prenatal maternal stress on postnatal maternal wellbeing: the Queensland flood study. *Arch Women's Mental Health* 2018; 21: 203–214.
13. Simcock G, Kildea S, Kruske S, LaPlante DP, Elgbeili G, King S. Disaster in Pregnancy: Midwifery Continuity Positively Impacts Infant Neurodevelopment, QF2011 Study. *BMC Pregnancy Childbirth* 2018; 18: 309.
14. Independent Accountability Panel for Every Woman Every Child Every Adolescent (IAP). *Caught in the COVID-10 Storm: women's, children's. and adolescent's health in the context of UHC and the SDGs.* Geneva: IAP, 2020. <https://iapewec.org/reports/annual-reports/iap-2020-report/> (accessed 17 July 2020).
15. Black MM, Walker SP, Fernald LCH, *et al.* Early childhood development coming of age: science through the life course *Lancet* 2017; 389 (10064), P77–P90.
16. Child Suicide Rates; during the COVID-19 Pandemic in England: Real-time Surveillance. National Child Mortality Database. 2020 Healthcare Quality Improvement Partnership (HQIP)
17. Heckman JJ. Skill formation and the economics of investing in disadvantaged children. *Science* 2006; 312:1900–2.
18. Heckman JJ, Karapakula G. *Intergenerational and Intragenerational externalities of the Perry Preschool project. IZA discussion papers, no 12363.* Bonn: Institute of Labor Economics, 2019.