





# BMJ Open Impact of major disease outbreaks in the third millennium on adolescent and youth sexual and reproductive health and rights in low and/or middle-income countries: a systematic scoping review protocol

Hossein Akbarialiabad ,<sup>1</sup> Rahul Shidhaye,<sup>2</sup> Pallavi Shidhaye,<sup>3</sup> Pim Cuijpers ,<sup>4</sup> Marcia R Weaver ,<sup>5</sup> Mina Bahrololoom,<sup>1</sup> Sarah Kiburi,<sup>6</sup> Irene N Njuguna,<sup>7</sup> Mohammad Hossein Taghrir,<sup>1</sup> Manasi Kumar <sup>8,9</sup>

**To cite:** Akbarialiabad H, Shidhaye R, Shidhaye P, *et al.* Impact of major disease outbreaks in the third millennium on adolescent and youth sexual and reproductive health and rights in low and/or middle-income countries: a systematic scoping review protocol. *BMJ Open* 2022;**12**:e051216. doi:10.1136/bmjopen-2021-051216

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-051216>).

Received 13 March 2021  
Accepted 17 February 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

## Correspondence to

Dr Manasi Kumar;  
manni\_3in@hotmail.com

## ABSTRACT

**Introduction** Sexual and Reproductive Health and Rights (SRHR) of young people continue to present a high burden and remain underinvested. This is more so in low and middle-income countries (LMICs), where empirical evidence reveals disruption of SRHR maintenance, need for enhancement of programmes, resources and services during pandemics. Despite the importance of the subject, there is no published review yet combining recent disease outbreaks such as (H1N1/09, Zika, Ebola and SARS-COV-2) to assess their impact on adolescents and youth SRHR in LMICs.

**Methods and analysis** We will adopt a four-step search to reach the maximum possible number of studies. In the first step, we will carry out a limited preliminary search in databases for getting relevant keywords (appendix 1). Second, we will search in four databases: Pubmed, Cochrane Library, Embase and PsycINFO. The search would begin from the inception of the first major outbreak in 2009 (H1N1/09) up to the date of publication of the protocol in early 2022. We will search databases using related keywords, screen title & abstract and review full texts of the selected titles to arrive at the list of eligible studies. In the third stage, we will check their eligibility to the included article's reference list. In the fourth stage, we will check the citations of included papers in phase 2 to complete our study selection. We will include all types of original studies and without any language restriction in our final synthesis. Our review results will be charted for each pandemic separately and include details pertaining to authors, year, country, region of the study, study design, participants (disaggregated by age and gender), purpose and report associated SRHR outcomes. The review will adhere to the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews guideline (PRISMA-ScR).

**Patient and public involvement** Patients or public were not involved in this study.

**Ethics and dissemination** Ethical assessment is not required for this study. The results of the study will be

## Strengths and limitations of this study

- Our systematic scoping review protocol minimises the possibility of duplications and engages a stringent peer-review process to arrive at meaningful search outcomes around Sexual and Reproductive Health and Rights (SRHR) impacts.
- Our strategy will include four stepped approach of searching and sifting through studies, maximising our effort to reach all eligible studies.
- Using International Conference on Population and Development as our guiding framework to elicit key outcomes, we will study adolescent SRHR rigorously and report these outcomes keeping our framework guidelines in mind.
- There could be other localised and globally impacting diseases outbreaks to consider other than what we focused on that merit further scrutiny.

presented in peer-reviewed publications and conferences on adolescent SRHR.

## INTRODUCTION

The beginning of sexual maturation differs based on sex, country, culture and religious context.<sup>1</sup> We know that adolescents are accessing services earlier, but the use of these services tends to be inconsistent.<sup>2</sup> The risk of neglecting the adolescent sexual and reproductive health could impose a life-lasting impact on them. For women, adolescent pregnancy and motherhood may be mentally and physically challenging.<sup>3,4</sup> It may also impede further academic and educational achievements and economic potential.<sup>5</sup> There is a high risk of sexually transmitted infections, including HIV, reproductive coercion and

violence in both sexes, with severe impacts seen especially for girls.<sup>6</sup> In 2016, it was found that 15–19-year-old adolescents in developing countries had over 21 million pregnancies, and approximately than half of them (12 million) resulted in child delivery.<sup>7</sup> The number of unintended pregnancies in girls between 15 and 19 years were around 10 million, and about 55% of these unintended pregnancies resulted in abortion.<sup>8,9</sup> Nearly, 70% of the total abortion attempts at the ages of 15–19 lead to unsafe abortions that can trigger catastrophic health effects.<sup>9</sup> In the Global Burden of Disease 2015 report, the maternal mortality rate was highest in 10–14-year-old girls. The ratio was as high as 278/100 000 (95% UI 229 to 339).<sup>10</sup> Additionally, pregnancy and delivery-related complications cause more mortality in 15–19-year-old girls than other age groups.<sup>11</sup>

## RESEARCH QUESTION

What is the existing evidence regarding the impact of the Zika virus, H1N1/09, Ebola and SARS- COV-2 outbreaks on adolescents and youth SRHR in LMICs?

## Value of the proposed review

Adolescents and young people have Sexual and Reproductive Health and Rights (SRHR) needs that become neglected and more complex during the disasters and outbreaks.<sup>12</sup> Besides this, we have to underscore that their life experience is limited, and their decision-making abilities are still evolving. Consequently, their coping mechanisms and judgement capabilities to navigate complex circumstances triggered by these extraordinary disease outbreaks are also limited. Despite this developmental challenge, these crises offer a belated opportunity for governments to fill the gaps in sex education and provide access to contraceptives, safer motherhood, safer abortion and empowerment programmes to address inequities in SRHR and protect vulnerable adolescents in time. If governments do not take such opportunities, future outbreaks can further compound the public health burden, including exacerbation of mental health issues, gender inequalities and social injustices in society. We know that these social determinants of adolescent health are tied together, and this review will help understand the existing evidence and gaps. We have prioritised studying four significant outbreaks since 2000: swine influenza virus (H1N1/09), Ebola virus, Zika virus and SARS-CoV-2 and their impacts on the SRHR of young and adolescents in low and middle-income countries (LMICs).

## Influenza (H1N1/09)

On the first July 2009, the WHO acknowledged that the influenza outbreak had become pandemic and called it the Pandemic H1N1/09 virus, popularly known as “swine influenza”. Pregnant women were considered a high-risk group for H1/N1, as there was a higher rate of spontaneous abortion, preterm birth, low birth weight, fetal disease as well as increased hospitalisation and maternal

death.<sup>13–15</sup> In a study at the outset of the pandemic in Australia and New Zealand, 9% of patients admitted to the intensive care units were pregnant, a high proportion, given that 1% of the Australasian population were pregnant.<sup>16</sup> A global pooled analysis revealed that pregnant women had a 3.5–25.3-fold higher risk of hospitalisation compared with non-pregnant women of childbearing age.<sup>17</sup> Due to the high mortality and morbidity rate in for pregnant women, vaccination of pregnant women was prioritised. However, studies show that poor vaccine uptake in pregnant women possibly a result of concerns regarding adverse effects.<sup>18,19</sup> Despite multiple studies showing that influenza vaccines are safe and have no significant threat to pregnancy, including spontaneous abortion, stillbirth and congenital malformations.<sup>20–22</sup>

## Zika virus

In March 2015, a group of patients were admitted in Brazil with rash, fatigue and arthralgia, caused by the Zika Virus. In October, that year, a few reports showed that the mother–newborn transmission of the virus<sup>23</sup> might lead to fetal loss, preterm delivery and microcephalic (small head) babies, cumulatively known as congenital Zika syndrome.<sup>24</sup> Case reports showed high semen viral load, 10 000 times higher in semen than in blood in one case.<sup>25,26</sup> The transmission of the virus in humans is via sexual contact, blood transfusion and organ transplantation.<sup>27–29</sup> Combining the sexual transmission of the virus between partners and vertical transmission to the fetus, the WHO recommendations were adoption of safer sex practices, abstinence during pregnancy and emergency contraception.<sup>23</sup> To date, a total of 86 countries have reported evidence of Zika infection.<sup>30</sup>

In mid-January 2016, the health ministers of multiple Latin American countries recommended postponing pregnancy for at least 6–24 months. This seemed too idealistic and unrealistic, as more than half of the region’s pregnancies have been unintended.<sup>31</sup> In addition, inadequate sex education, difficulty accessing contraception, high rape prevalence and local cultural constraints resulted in many women not adopting proper advice.<sup>32</sup> Latin American countries have a relatively wide range of restrictive laws in SRHR. In El-Salvador, a self-induced abortion may lead to a penalty as high as 40 years of incarceration.<sup>33</sup> On the other hand, in response to the Zika virus, the Colombian Ministry of Health declared that women have the right to have self-induced miscarriages. Nevertheless, due to poor education and scarcity of information, women are not well informed about the risk and their abortion rights.<sup>32</sup> This was reflected by the fact that the rate of contraception usage did not change in Columbia during the outbreak in 2015–2016.<sup>34</sup>

## Ebola virus

Ebola haemorrhagic fever is one of the fatal outbreaks within history. By the end of 2016, an estimated 11 310 deaths resulted from 28 618 definite cases, a staggering 40% mortality.<sup>35</sup> The transmission route is through

contact with infected patient's blood or secretions and direct contact (mucus membrane and injured cutaneous tissue). Even after recovery, the virus may exist in the semen of cases for up to 7 weeks later.<sup>36</sup> Burial ceremonies that require direct contact with the dead bodies contribute to Ebola transmission.<sup>37</sup> The latter endanger women as they have significant roles in the ceremony. Pregnant women can also transmit the virus to their babies either in-utero or through breastmilk.<sup>38–40</sup>

In the past century, multiple outbreaks of the Ebola virus occurred; the first one was in Zaire (currently known as the Democratic Republic of the Congo) and Sudan in 1976. The second outbreak occurred in Sudan around 1979. The third epidemic was in Gabon, 1996. In this century, Northern Uganda faced the fourth epidemic in the fall of 2000. The 2014–2016 Ebola virus epidemic was the largest outbreak of the Ebola, considered a pandemic<sup>41 42</sup>. The outset was from Guinea and then moved to other countries such as Liberia and Sierra Leone. The current outbreak (2018– now) in the eastern Democratic Republic of Congo is the last reported outbreak.<sup>43</sup>

WHO Advisory Group on the Ebola Virus Disease Response recommended that the male who survived the Ebola virus disease practice hygiene and safer sex until 1 year from symptom beginning or after two negative semen specimens for the Ebola virus. In some patients after recovery, Ebola virus can persist in several tissues, such as testicles, the eye and the central nervous system.<sup>44</sup> In women who have contracted the disease during pregnancy, the virus remains in the placenta, amniotic fluid and fetus. In those women who have been infected during breastfeeding, the virus could persist in breast milk.<sup>38 45–50</sup>

Ebola revealed many problems in adolescence SRHR in Africa.<sup>51</sup> It is well established that in humanitarian crises and disasters, women and girls are more vulnerable to gender-based violence (GBV).<sup>52 53</sup> Multiple studies showed that in Sierra Leone, during the Ebola outbreak, the rate of adolescent pregnancy, rape, sexual and gender-based violation increased.<sup>51 54 55</sup> United Nations Department of Political Affairs estimates that the teenage pregnancy rate increased by 65% during the outbreak.<sup>56</sup> More girls were forced into prostitution/transactional sex due to family members' loss and financial insecurity.<sup>57</sup> This makes the girls two times victims, as pregnant girls are forbidden to attend school in Liberia and Sierra Leone.<sup>58</sup> In Sierra Leone, Ebola increased the fear of clinic attendance and impacted newborn and maternal care by disrupting the health services. This led to 549 maternal deaths, 2161 neonatal deaths and 883 still births in the year 2014–2015.<sup>59</sup> The studies showed that even after pandemics in Liberia and Sierra Leone, the level of contraceptive care and family planning had returned or exceeded the baseline level after 6 months<sup>60</sup> to 24 months.<sup>61</sup> After 6 months of the outbreak in Guinea, the number of family planning sessions and prenatal care visits did not reverse to the prior level, harshly influencing the already insufficient care level.<sup>60</sup>

## SARS-CoV-2

In late 2019, multiple patients were diagnosed with a pneumonia-causing virus. Numerous subsequent studies showed a beta-coronidae family virus named 'SARS-CoV-2' by WHO to be the causative agent. In March 2020, the WHO declared SARS-CoV-2 a pandemic and called the disease 'coronavirus disease of 2019', or simply 'COVID-19'. Currently, there is no substantial evidence that the virus is transmitted sexually or through breast feeding. The possibility of vertical transmission is controversial. However, a recently published systematic review and meta-analysis suggest that a minority of pregnant women can transmit the virus to newborns.<sup>62</sup>

As the COVID-19 escalated, many countries adopted lockdown measures to mitigate the virus spread. The pandemic disrupted the supply chain of key contraceptive commodities.<sup>63</sup> In practice, most governments categorised sexual and reproductive health (SRH) services as non-essential and forced them to close. In late April 2020, United Nations Population Fund predicted an estimated 7 million unintended pregnancies would occur,<sup>64</sup> as a result of lack of access to SRH services like contraception and safe abortion care and time-sensitive potentially life-saving services.<sup>65</sup>

COVID-19 has forced nearly 1.4 billion children and youths out of school/university, including 743 million girls globally.<sup>66</sup> This has raised concerns around long-term impact on their lives. As in addition to increasing poverty levels, they might also experience increased sexual and GBV, furthering the need not only for remediation and support services but also access to emergency contraception and other reproductive health services.<sup>67</sup> COVID-19 has impacted health systems and services severely globally. It has also led to closure of educational institutions', public places for recreation and leisure, and has impacted movement.<sup>68</sup> The protracted closures across the world have increased concerns around mental well-being and the availability/accessibility of critical SRH services for adolescents in LMICs.<sup>69</sup>

The Guttmacher institute predicted that with a hypothetical 1 year 10% decline in the use of short and long-acting contraceptives in LMICs during the COVID-19 pandemic, 49 million women would lose their access to contraception of their choice. They estimated that around 15 million unintended pregnancies might occur, leading to an additional 1.7 million deliveries, 2.6 million newborns with significant complications, 168 000 newborn deaths and 28 000 maternal deaths. The second hypothesis was that with a yearly 10% shift of safe abortion to unsafe abortion, an additional 3.3 unsafe abortions might occur in LMICs, and 1000 maternal deaths are expected.<sup>63</sup> We know that the impact is possibly more than a 10% decline in such services, as frontline partners have predicted a slip could be up to 80%.<sup>70</sup> In India, by March 2020, compared with December 2019, a 36% decrease in injectable contraceptives use and a 21% reduction in Intrauterine device (IUD) insertion were reported. Simultaneously, the distribution of the condoms and oral contraceptive pills



**Table 1** PICOS format in this review**PICOS framework for systematic reviews**

Population	Adolescents and youths living in LMICs ages 10–24 years
Intervention/exposure	SARS-CoV-2, Zika, H1N1 and Ebola-related disruptions
Comparative/control intervention	n/a
Outcome	SRHR (sexual well-being, sexual health and illness outcomes, reproductive health and illnesses, sexual and reproductive health services outcomes)
Study designs	All types of original articles

PICOS stands for Population, Intervention or exposure, Comparative or Control Intervention, Outcome and Study Design. LMICs, low and middle-income countries; SRHR, Sexual and Reproductive Health and Rights.

dipped 23% and 15%, respectively. The COVID-19 has interrupted the prevention programmes and impacted the household economic status and is expected to result to 13 million child marriages and two million female genital mutilations in the next decade.<sup>54</sup> The health record analysis showed a 68% reduction in HPV vaccination from February to early April 2020.<sup>71</sup>

We aim to conduct a scoping review to map the range, extent and nature of effects of H1N1, Ebola virus, Zika virus and SARS-CoV-2 on SRHR among adolescents and youth in LMICs. Our goal is to identify current evidence in the literature, identify research gaps and suggest future research. The details pertaining to population, exposure and outcomes are provided in [table 1](#). Our data charting table is also available in (online supplemental table A-1).

**OBJECTIVE**

What is the existing evidence regarding the impact of the H1N1/09, Ebola, Zika virus and SARS-CoV-2 outbreaks on adolescents and youth SRHR in LMICs?

**METHOD**

We will use Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews Statement, showed in online supplemental figure 1, to report the findings of our review.<sup>72</sup>

**Patient and public involvement**

Patients or public were not involved in this study.

**Eligibility criteria study designs**

We will include cross-sectional studies, case-control, cohort studies, clinical trials and qualitative studies.

**Participants/population**

As per WHO definition of young people, we are considering ages 10–24 to denote adolescents and youth.

**Exposure/intervention**

This study is designed to assess the impact of the H1N1/0, Ebola virus and Zika virus, and SARS-CoV-2 on adolescents and youth SRHR in LMICs. The review will include work published after 2009.

**Control**

There is no control group in this review.

**OUTCOME**

We will focus on the SRHR of adolescents and youth in LMICs. SRHR would consist of SRH access and services outcomes, sexual health and well-being and illness outcomes, reproductive health, reproductive health, rights and illnesses, SRH access and services outcomes.

Our proposed outcome indicators inspired by the International Conference on Population and Development Programme of Action and sustainable development goal 2030<sup>73 74</sup> are summarised in [table 2](#).

**Timing**

The first significant outbreak of the third millennium was the H1N1/09 (swine influenza) in 2009; hence, all the papers published from 2009 until 2021 will be included.

**Setting**

Our study will focus on LMICs. LMICs were defined according to the 2020–2021 World Bank classification.<sup>75</sup>

**Language**

Our review compiles articles with no language restriction. We will use Google Translate for the primary translation of abstracts of non-English articles. In case the abstract of the article fits the scope of this review, we will request the experts in SRHR familiar with that specific language, to evaluate the paper based on the inclusion/exclusion criteria and extract the data. Alternatively, we will request official language translation centres to make the English version of the article for our evaluation.

**EXCLUSION CRITERIA**

- ▶ all non-original papers
- ▶ Those irrelevant to the SRHR
- ▶ Studies that do not include adolescents and youth (10–24 years old)
- ▶ Studies from countries not categorised as LMICs
- ▶ Those not relevant to Zika virus, Ebola virus, H1N1/09 and SARS-COV-2 outbreaks.
- ▶ Full text is not available for evaluation
- ▶ If the population comprises of other ages besides 10–24, we will include it if data are disaggregated by age group or subgroup analysis on age 10–24. If they

**Table 2** The outcomes in our review

Category of outcome(s)	Sub-category of interest
A) Contraception	▶ The proportion of adolescent and youth have access to contraceptive agent or procedures during the outbreaks
B) SRH service availability and access	<ul style="list-style-type: none"> <li>▶ The proportion of facilities providing SRHR services for adolescents and youth during the outbreaks</li> <li>▶ The proportion of health facilities providing postabortion care and postpartum care for adolescent and youth and also services for those who have contracted HIV in our target group during the outbreaks</li> </ul>
C) Knowledge about SRHR	▶ The proportion of adolescent and youth have basic knowledge on SRHR during the pandemics
D) Adolescent fertility	<ul style="list-style-type: none"> <li>▶ The adolescents and youth's birth rate during the outbreaks</li> <li>▶ The proportion of pregnancies related to those 24 years old and below during the outbreaks</li> </ul>
E) Quality of care, including respect for rights	<ul style="list-style-type: none"> <li>▶ The proportion of females are knowledgeable about side effects of their contraceptive method of choice and how to deal with adverse effects and also are familiar with other methods of contraception during the outbreaks</li> <li>▶ The universal access to contraceptives and SRHR information during outbreaks in national policy actions during the outbreaks</li> <li>▶ An indicator reflective of respectful care and human rights in the provision of SRH information and services during the outbreaks</li> </ul>
F) Prevention of sexually transmitted infections	▶ The rate of HPV vaccination during the epidemics
G) Abortions:	<ul style="list-style-type: none"> <li>▶ Number of unsafe abortions during outbreaks</li> <li>▶ Number of facilities provide safe abortions services; or if it's illegal, the number of facilities providing the services when unsafe abortions become complicated during the outbreaks</li> </ul>
H) Comprehensive sexuality education	▶ The proportion of school/facilities providing comprehensive sexual education during the outbreaks
I) Gender equality in SRHR	▶ Whether adolescents and youth's sexual autonomy within marriage is respected during the outbreaks

SRHR, Sexual and Reproductive Health and Rights.

have included vivid results about this age group, we will consist of their study.

- ▶ Animal studies

### INFORMATION SOURCES

We will look at four databases in our review: Pubmed, Cochrane Library, Embase and PsycINFO.

### Search

Online supplemental table A-2 shows our proposed search strategy in Pubmed. Online supplemental tables A-3 to A-5 is our search strategy for each of the other target databases (Cochrane Library, Embase, PsycINFO).

### Selection of sources of evidence

A four-step search strategy is being followed in this study. First, the authors have done a preliminary (and limited) search in several databases (Pubmed and Google Scholar) on this topic. We assessed the keywords, abstract

and several full texts to reach our study's final keywords. We discussed our search strategy multiple times until all authors reached a consensus reflected in online supplemental table 3-8. Following the duplication removal, title/abstract and full-text screening of studies using RAYYAN,<sup>76</sup> we will choose our relevant evidence considering the inclusion/exclusion criteria.

In the third step, we will check the articles' reference lists to find more relevant studies. Finally, we will look for studies that have cited or included studies and check them for their eligibility. Any discrepancy would be addressed via discussion until consensus is reached in each stage. Two authors worked separately in all searching and extraction stages, and discrepancies would be resolved through discussion.

## Data charting process

After choosing the eligible papers, two authors will separately extract the required items based on the extraction excel sheet form designed and approved by researchers for the process.

## Data items

Following the selected papers' primary selection and inclusion and extracting the results, the tabulation phase begins. We will categorise the extracted data based on the items mentioned before. We will extract the following data: authors, year, country and continent (region of the study), study design, participants (differentiated by age and gender), purpose and main findings. Any disagreements in the process of data extraction will be resolved through discussion until consensus. We will also indicate the country's income level where studies are being done (low, lower-middle and higher-middle income).

## Critical appraisal of individual sources of evidence and synthesis of result

Based on the nature of scoping review, we will neither synthesise the findings/results, nor critically appraise the papers, which is more applicable by performing a systematic review.<sup>77</sup> However, publications and the mentioned data would be summarised and categorised.

## Ethics and dissemination

As the nature of the work is a scoping review of the currently published papers in peer review journals, ethical approval is not required for this study. The results of the study will be presented in a peer-reviewed publication.

## Author affiliations

<sup>1</sup>Trauma Research Center, Shahid Rajaee (Emtiaz) Trauma Hospital, Shiraz University of Medical Sciences, Shiraz, Iran

<sup>2</sup>Pravara Institute of Medical Sciences, Loni, India

<sup>3</sup>Division of Clinical Sciences, ICMR-National AIDS Research Institute, Pune, India

<sup>4</sup>Department of Clinical, Neuro and Developmental Psychology, Amsterdam Public Health Research Institute, WHO Collaborating Centre for Research and Dissemination of Psychological Interventions, VU University Amsterdam, Amsterdam, Netherlands

<sup>5</sup>Departments of Health Metrics Sciences and Global Health, University of Washington, Seattle, Washington, USA

<sup>6</sup>Department of Psychiatry, Mbagathi Hospital, Nairobi Metropolitan Services, Nairobi, Kenya

<sup>7</sup>Research & Programs, Kenyatta National Hospital, Nairobi, Kenya

<sup>8</sup>Brain and Mind Institute, Aga Khan University, Kenya

<sup>9</sup>Department of Psychiatry, University of Nairobi, Nairobi, Kenya

**Contributors** HA and MK developed the concept and wrote the early draft. RS, PS, MHT, PC, MRW, SK, IN and MB edited the early draft. All authors approved the final version.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors. MK is funded by Fogarty International Centre's K43 TW010716-04 mechanism that supported her time given to this paper.

**Competing interests** None declared.

**Patient consent for publication** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Supplemental material** This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been

peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

## ORCID iDs

Hossein Akbarialiabad <http://orcid.org/0000-0003-2018-6378>

Pim Cuijpers <http://orcid.org/0000-0001-5497-2743>

Marcia R Weaver <http://orcid.org/0000-0003-2736-4085>

Manasi Kumar <http://orcid.org/0000-0002-9773-8014>

## REFERENCES

- Chandra-Mouli V, McCarraher DR, Phillips SJ, *et al.* Contraception for adolescents in low and middle income countries: needs, barriers, and access. *Reprod Health* 2014;11:1.
- Blanc AK, Tsui AO, Croft TN, *et al.* Patterns and Trends in Adolescents' Contraceptive Use and Discontinuation in Developing Countries and Comparisons With Adult Women. *Int Perspect Sex Reprod Health* 2009;35:063–71.
- WHO. Adolescent pregnancy. Available: <https://www.who.int/en/news-room/fact-sheets/detail/adolescent-pregnancy> [Accessed 27 Dec 2020].
- Hodgkinson SC, Colantuoni E, Roberts D, *et al.* Depressive symptoms and birth outcomes among pregnant teenagers. *J Pediatr Adolesc Gynecol* 2010;23:16–22.
- Raj A, Boehmer U, UJJVaw B. Girl child marriage and its association with national rates of HIV, maternal health, and infant mortality across 97 countries. *Violence Against Women* 2013;19:536–51.
- Organization WH. Global standards for quality health-care services for adolescents: a guide to implement a standards-driven approach to improve the quality of health care services for adolescents 2015.
- Darroch JE, Woog V, Bankole A. Adding it up: costs and benefits of meeting the contraceptive needs of adolescents 2016.
- Sully E. *Adding it up: investing in sexual and reproductive health* 2019. New York: Guttmacher Institute, 2020. 2019.
- Darroch JE, Woog V, Bankole A. Costs and benefits of meeting the contraceptive needs of adolescents 2016.
- Gore FM, Bloem PJ, Patton GC. Global burden of disease in young people aged 10–24 years: a systematic analysis 2011;377:2093–102.
- Neal S, Matthews Z, Frost M. Childbearing in adolescents aged 12–15 years in low resource countries: a neglected issue. *New estimates from demographic and household surveys in 42 countries* 2012;91:1114–8.
- Guessoum SB, Lachal J, Radjack R, *et al.* Adolescent psychiatric disorders during the COVID-19 pandemic and lockdown. *Psychiatry Res* 2020;291:113264.
- Briand S. Epidemiology and illness severity of pandemic (H1N1) 09 virus. In: *World Health organization strategic Advisory group of experts on immunization extraordinary meeting*. Geneva, Switzerland, 2009.
- WHO guidelines Approved by the guidelines review Committee. pregnancy and pandemic influenza A (H1N1) 2009: information for programme managers and clinicians. Geneva: *World Health Organization Copyright © World Health Organization* 2010;2010.
- Somerville LK, Basile K, Dwyer DE, *et al.* The impact of influenza virus infection in pregnancy. *Future Microbiol* 2018;13:263–74.
- AIJUNEJo M. Critical care services and 2009 H1N1 influenza in Australia and New Zealand 2009;361:1925–34.
- Van Kerkhove MD, Vandemaële KAH, Shinde V, *et al.* Risk factors for severe outcomes following 2009 influenza A (H1N1) infection: a global pooled analysis. *PLoS Med* 2011;8:e1001053.
- Drees M, Johnson O, Wong E, *et al.* Acceptance of 2009 H1N1 influenza vaccine among pregnant women in Delaware. *Am J Perinatol* 2012;29:289–94.
- McCarthy EA, Pollock WE, Nolan T. Improving influenza vaccination coverage in pregnancy in M elbourne 2010–2011 2012;52:334–41.



- 20 McMillan M, Porritt K, Kralik D, *et al.* Influenza vaccination during pregnancy: a systematic review of fetal death, spontaneous abortion, and congenital malformation safety outcomes. *Vaccine* 2015;33:2108–17.
- 21 Goldfarb I, Panda B, Wylie B, *et al.* Uptake of influenza vaccine in pregnant women during the 2009 H1N1 influenza pandemic. *Am J Obstet Gynecol* 2011;204:S112–5.
- 22 Conlin AMS, *et al.*, Crum-Cianflone NFJO, Gynecology. Safety of the pandemic H1N1 influenza vaccine among pregnant US military women and their newborns 2013;121:511–8.
- 23 WHO. Zika virus. Available: <https://www.who.int/news-room/fact-sheets/detail/zika-virus> [Accessed 28th Dec 2020].
- 24 Moore CA, Staples JE, Dobyns WB, *et al.* Characterizing the pattern of anomalies in congenital Zika syndrome for pediatric clinicians. *JAMA Pediatr* 2017;171:288–95.
- 25 Mansuy JM, Dutertre M, Mengelle C. Zika virus: high infectious viral load in semen. *a new sexually transmitted pathogen?* 2016;16:405.
- 26 Musso D, Roche C, Robin E, *et al.* Potential sexual transmission of Zika virus. *Emerg Infect Dis* 2015;21:359–61.
- 27 CJMM B. Report MW. Preliminary findings from an investigation of Zika virus infection in a patient with no known risk factors—Utah 2016. 2016;65.
- 28 Jamali Moghadam SR, Bayrami S, Jamali Moghadam S, *et al.* Zika virus: a review of literature. *Asian Pac J Trop Biomed* 2016;6:989–94.
- 29 Katz LM, Rossmann SN, SNJAop R. Zika and the blood supply: a work in progress. *Arch Pathol Lab Med* 2017;141:85–92.
- 30 Qureshi AI, ed. *Chapter 6 - Comparing the Zika Virus Disease Pandemic to Other Disease Pandemics*. Zika Virus Disease: Academic Press, 2018.
- 31 Sedgh G, Singh S, Hussain R. Intended and unintended pregnancies worldwide in 2012 and recent trends. *Stud Fam Plann* 2014;45:301–14.
- 32 MJTL R. Zika virus outbreak: reproductive health and rights in Latin America 2016;387:843.
- 33 Viterna J, JSGJH B, Rights H. Pregnancy and the 40-year prison sentence: how “abortion is murder” became institutionalized in the Salvadoran judicial system. *Health Hum Rights* 2017;19:81–93.
- 34 Machado-Alba JE, Machado-Duque ME, Gaviria-Mendoza A. Hormonal contraceptive prescriptions in Colombia and Zika virus 1993;387.
- 35 Coltart CEM, Lindsey B, Ghinai I, *et al.* The Ebola outbreak, 2013–2016: old lessons for new epidemics. *Philos Trans R Soc Lond B Biol Sci* 2017;372:20160297.
- 36 Ebola haemorrhagic fever. Available: <https://www.msf.org/who-fact-sheet-ebola-haemorrhagic-fever> [Accessed 29th Dec 2020].
- 37 Nkangu MN, Olatunde OA, Yaya S, SJldop Y. The perspective of gender on the Ebola virus using a risk management and population health framework: a scoping review. *Infect Dis Poverty* 2017;6:135.
- 38 Medina-Rivera M, Centeno-Tablante E, Finkelstein JL. Presence of Ebola virus in breast milk and risk of mother-to-child transmission: synthesis of evidence 2020.
- 39 Nordenstedt H, Bah EI, de la Vega M-A. Ebola virus in breast milk in an Ebola virus-positive mother with twin babies. *Guinea* 2015. 2016;22:759.
- 40 Sissoko D, Keita M, Diallo B. Ebola virus persistence in breast milk after no reported illness: a likely source of virus transmission from mother to child 2017;64:513–6.
- 41 Ifediora OF, KJGGARoM A, Organizations I. West Africa's Ebola Pandemic: Toward Effective Multilateral Responses to Health Crises 2017;23:225–44.
- 42 Zhong Y, Xu J, Li T, *et al.* Potential clinical treatment for Ebola pandemic. *Sci China Life Sci* 2014;57:982–4.
- 43 Ebola virus WHO. Available: <https://www.who.int/news-room/fact-sheets/detail/ebola-virus-disease> [Accessed 29 DEC 2020].
- 44 Racine T, Kobinger GP. Viral pathogenesis: unlocking Ebola persistence. *Nat Microbiol* 2017;2:17124.
- 45 Chughtai AA, Barnes M, MACINTYRE CR. Persistence of Ebola virus in various body fluids during convalescence: evidence and implications for disease transmission and control. *Epidemiol Infect* 2016;144:1652–60.
- 46 Bausch DG, Townner JS, Dowell SF, *et al.* Assessment of the risk of Ebola virus transmission from bodily fluids and fomites. *J Infect Dis* 2007;196:S142–7.
- 47 Baggi F, Taybi A, Kurth A. Management of pregnant women infected with Ebola virus in a treatment centre in guinea June 2014;19:20983.
- 48 Caluwaerts S, Fautsch T, Lagrou D, *et al.* Dilemmas in managing pregnant women with Ebola: 2 case reports: table 1. *Clin Infect Dis* 2016;62:903–5.
- 49 Oduyebo T, Pineda D, Lamin M, *et al.* A pregnant patient with Ebola virus disease. 2015;126:1273–5.
- 50 Muehlenbachs A, de la Rosa Vázquez O, Bausch DG, *et al.* Ebola virus disease in pregnancy: clinical, histopathologic, and immunohistochemical findings. *J Infect Dis* 2017;215:64–9.
- 51 Denney L, Gordon R, AJLODI I. Teenage pregnancy after Ebola in Sierra Leone 2015.
- 52 Hynes M, Ward J, Robertson K. A determination of the prevalence of gender-based violence among conflict-affected populations in East Timor 2004;28:294–321.
- 53 Kofman YB, Garfin DR, Research P. Home is not always a Haven: the domestic violence crisis amid the COVID-19 pandemic. *Psychological Trauma: Theory, Research, Practice, and Policy* 2020;12:S199–201.
- 54 PAHO. Adolescent pregnancy in Latin America and the Caribbean. Available: [https://pancap.org/pc/pcc/media/pancap\\_event/Technical-brief-Adolescent-Pregnancy-in-Latin-America-and-the-Caribbean.pdf](https://pancap.org/pc/pcc/media/pancap_event/Technical-brief-Adolescent-Pregnancy-in-Latin-America-and-the-Caribbean.pdf) [Accessed 30 Dec 2020].
- 55 Elston J, Moosa A, Moses F. Impact of the Ebola outbreak on health systems and population health in Sierra Leone 2016;38:673–8.
- 56 CJQA W. How Ebola led to more teenage pregnancy in West Africa 2015.
- 57 OMJAiA M. Ebola and accusation: Gender dimensions of stigma in Sierra Leone's Ebola response 2017;24:25–35.
- 58 Walsh S, Mulhern E. *A Step in the Rights' Direction: Advocacy, Negotiation, and Money as Tools for Realising the Right to Education for Pregnant Girls in Sierra Leone During the Ebola Epidemic*. Pregnant in the Time of Ebola: Springer, 2019: 399–416.
- 59 Sochas L, Channon AA, Nam S. Counting indirect crisis-related deaths in the context of a low-resilience health system: the case of maternal and neonatal health during the Ebola epidemic in Sierra Leone. *Health Policy Plan* 2017;32:iii32–9.
- 60 Camara BS, Delamou A, Diro E, *et al.* Effect of the 2014/2015 Ebola outbreak on reproductive health services in a rural district of guinea: an ecological study. *Trans R Soc Trop Med Hyg* 2017;111:22–9.
- 61 Bietsch K, Williamson J, Reeves M. Family planning during and after the West African Ebola crisis. *Stud Fam Plann* 2020;51:71–86.
- 62 Yang Z, Liu Y, YJAJop L. Vertical transmission of severe acute respiratory syndrome coronavirus 2: a systematic review. *Am J Perinatol* 2020;37:1055–60.
- 63 Riley T, Sully E, Ahmed Z, *et al.* Estimates of the potential impact of the COVID-19 pandemic on sexual and reproductive health in low- and middle-income countries. *Int Perspect Sex Reprod Health* 2020;46:73.
- 64 UNFPA. Impact of the COVID-19 pandemic on family planning and ending gender-based violence, female genital mutilation and child marriage. Available: <https://www.unfpa.org/resources/impact-covid-19-pandemic-family-planning-and-ending-gender-based-violence-female-genital> [Accessed 30 Dec 2020].
- 65 Cousins SJTL. COVID-19 has “devastating” effect on women and girls 2020;396:301–2.
- 66 COVID-19 School Closures Around the World Will Hit Girls Hardest. Available: <https://plan-international.org/blog/2020/03/covid-19-school-closures-hit-girls-hardest> [Accessed 30 DEC 2020].
- 67 Nanda P, Tandon S, Khanna A. Virtual and essential - adolescent SRHR in the time of COVID-19. *Sex Reprod Health Matters* 2020;28:1831136.
- 68 JTTLC L, Health A. Mental health effects of school closures during COVID-19 2020;4:421.
- 69 Mayurasakorn K, Pinsawas B, Mongkolsucharitkul P. School closure, COVID-19 and lunch programme: unprecedented undernutrition crisis in low-middle income countries 2020;56:1013–7.
- 70 Marie Stopes International. Methodology for calculating impact of COVID-19, 2020. Available: <https://www.mariestopes.org/resources/methodology-for-calculating-impact-of-covid-19> [Accessed 30 Dec 2020].
- 71 Vaccine Rates Drop Dangerously as Parents Avoid Doctor's Visits. Available: <https://www.nytimes.com/2020/04/23/health/coronavirus-measles-vaccines.html> [Accessed 30 Dec 2020].
- 72 Tricco AC, Lillie E, Zarin W, *et al.* PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
- 73 International Conference on population and development programme of action, 2014. Available: <https://www.unfpa.org/publications/international-conference-population-and-development-programme-action> [Accessed 9 March 2021].
- 74 Barot S, Cohen S, Darroch J. *Sexual and reproductive health and rights indicators for the SDGs*. New York: Guttmacher Institute, 2015.
- 75 World Bank. Low and middle income countries. Available: <https://data.worldbank.org/country/XO> [Accessed 28 Dec 2020].
- 76 Ouzzani M, Hammady H, Fedorowicz Z, *et al.* Rayyan—a web and mobile APP for systematic reviews. *Syst Rev* 2016;5:1–10.



- 77 Askarian M, Khakpour M, Taghrir MH. Investigating the epidemiology of the methanol poisoning outbreaks in the third millennium: a

scoping review protocol 2020.