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## Recent trends in vaccine coverage and confidence: A cause for concern

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### ABSTRACT

Declining trends in vaccine confidence come at a time when routine immunization coverage for children has slumped to a decades-long low. With some of the largest losses in confidence experienced among young adults, this is a concerning trend with the potential for long-term implications. This article reflects on recent research examining the levels and trends of vaccine confidence over time and across the globe, the drivers influencing confidence, and the role of the COVID-19 pandemic in shaping confidence today. Timely examination of the causes and consequences of waning vaccine confidence and critical evaluation of COVID-19 response measures will prove vital in mitigating additional losses in vaccine confidence and uptake while contributing to building resilience in the face of future health crises.

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Vaccine confidence; vaccine hesitancy; health equity

In July 2022, WHO and UNICEF sounded the alarm around the largest sustained decline in childhood vaccinations in three decades, with 25 million children missing out on one or more doses of the vaccine against diphtheria, tetanus, and pertussis. Coverage now stands at its lowest level since 2008.<sup>1</sup>

The strength of national immunization systems is often assessed using the percentage of children vaccinated with the third dose of the diphtheria, tetanus, and pertussis vaccine (DTP3), due to the requirement of three separate interactions with the healthcare system thus signaling sufficient levels of both supply-side infrastructure as well as demand for the vaccine.<sup>2</sup>

Pre-pandemic trends over the period 2010 to 2019 can be assessed using this metric. In 2019, 85 out of 195 countries' DTP3 coverage exceeded 95% – a key vaccination target<sup>3</sup> (Figure 1a). A total of 100 countries experienced a fall in DTP3 uptake in the period 2010 to 2019, while 74 countries experienced gains (Figure 1b). Falls were concentrated in Europe and Central and South America, as well as Philippines and Papua New Guinea: two countries with ongoing vaccine hesitancy challenges.<sup>5,6</sup> Gains in DTP3 uptake between 2010 and 2019 were prevalent in sub-Saharan Africa and the Indian sub-continent (Figure 1b).

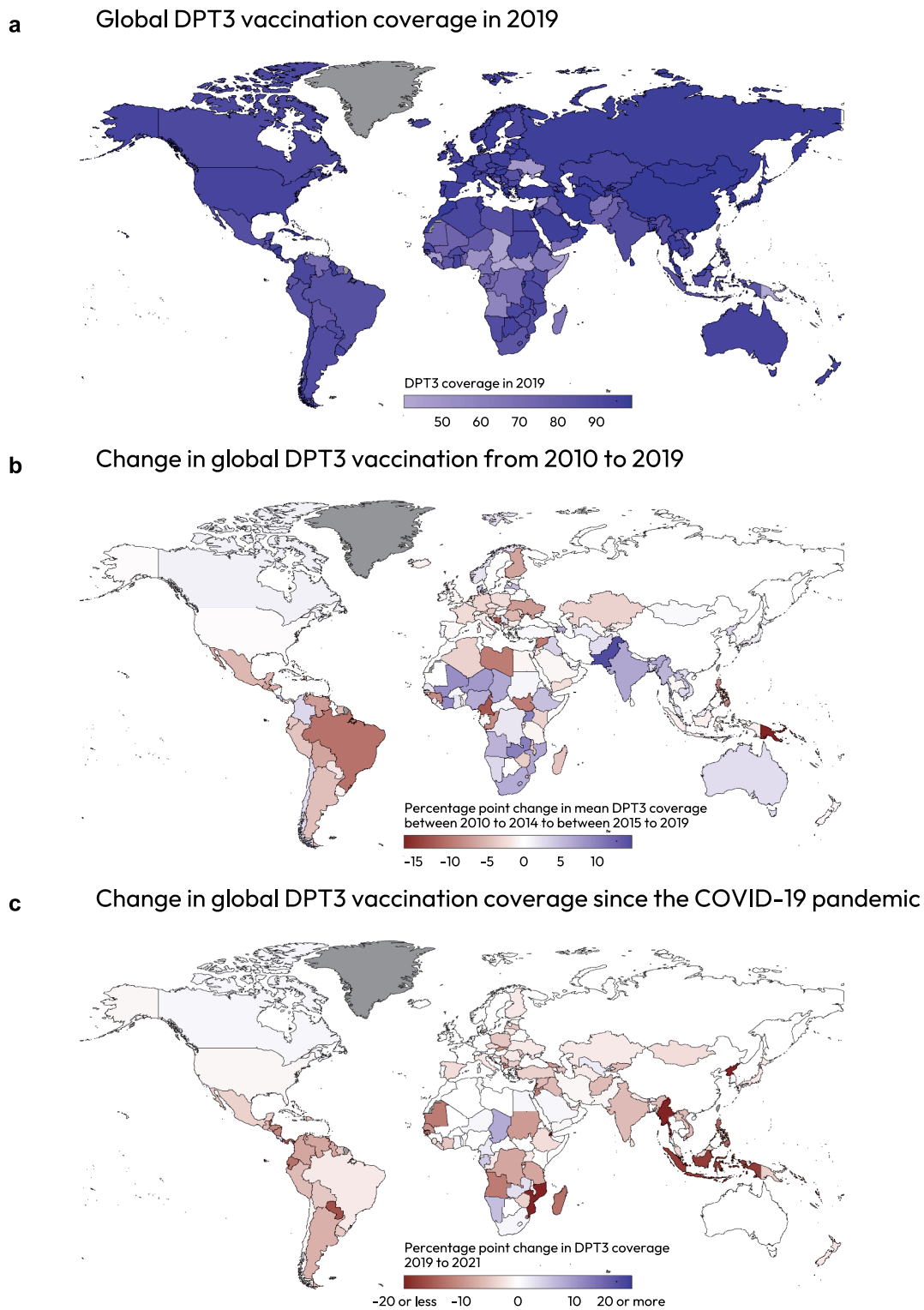
The global state of DTP3 coverage has worsened significantly since the COVID-19 pandemic with few countries emerging unscathed.<sup>7</sup> In 2021, only 63 countries' DTP3 coverage rates exceeded 95%, with 112 countries experiencing losses in DTP3 uptake in the period 2019 to 2021 (Figure 1c). Drops in coverage have been marked in sub-Saharan Africa, Eastern Europe, Central Asia, as well as the Indian sub-continent (Figure 1c). Low- and middle-income countries appear to have borne the brunt of pandemic-related disruptions in vaccine uptake.

While supply-side disruptions – such as lockdown measures and resource diversions, including of the availability of the health workforce<sup>8,9</sup> – have no doubt taken a significant toll on vaccine coverage, emerging evidence suggests that *demand*-side barriers, such as confidence in vaccines, have also been adversely impacted by the pandemic. Understanding if – and to what extent – vaccine confidence has been impacted by the pandemic is a pressing question, not least given the pandemic-induced losses in global vaccine uptake that have left many regions susceptible to vaccine-preventable disease outbreaks. In this piece, we comment on the recent state of vaccine confidence, and consider how pandemic-related factors may have worsened vaccine confidence, especially among young adults.

### Measuring vaccine confidence

To monitor trends in vaccine confidence, multiple indices and frameworks have been proposed to quantify public perceptions toward vaccines (see, for example, Shapiro 2021 *et al.* for a recent review).<sup>10</sup> Rooted at the center of these measures are concerns surrounding the vaccines themselves, such as in their safety, effectiveness, and importance, but also a broader set of social and political determinants, such as trust in institutions recommending vaccines and perceived motives.<sup>11</sup>

While a comprehensive literature base exists on COVID-19 vaccine confidence and acceptance,<sup>12–14</sup> there is less evidence on the impact of the COVID-19 pandemic, including associated restrictions and policies as well as misinformation, on confidence in other vaccines. As we exit the pandemic, it is becoming increasingly important to understand the impact of a major health crisis and the government handling of the response on public perceptions toward vaccination (and health systems more broadly) to inform preparedness for future crises.



**Figure 1.** Global trends in DPT3 coverage (a) DPT3 coverage in 2019. (b) Change in DPT3 coverage from 2010 to 2019. (c) Change in DPT3 coverage over the COVID-19 pandemic (2019 to 2021). All data from the WHO/UNICEF estimates of national immunization coverage<sup>4</sup>.

### Old and new issues

Vaccine confidence issues are not a recent phenomenon, although the scope and scale have changed. In Victorian Britain, anti-vaccination movements formed in opposition to the Compulsory Vaccination Act of 1853 which imposed fines or imprisonment for non-acceptance of the smallpox vaccine.<sup>15</sup> The legislation was met with large protests driven

by concerns centering on infringements to personal liberty, vaccine safety, and compatibility of the vaccine with religious beliefs.<sup>16,17</sup> Similar battles followed in the US and Germany, also giving rise to anti-vaccination movements, albeit to varying degrees.<sup>18</sup> While the UK introduced legislation in 1898 that included a conscientious objector clause, permitting smallpox vaccine exemptions, rates of smallpox

mortality continued to fall, albeit at a slower rate than in Germany, which did not introduce exemptions.<sup>19</sup> Countries around the world continue to enact varying degrees of mandatory policies for some childhood vaccines, particularly related to school entrance.<sup>20</sup> While the US and Germany both mandated some vaccinations for school entry (though the German mandate came into force in 2020), other countries – such as the UK (with its historical experience around compulsory smallpox vaccination) – issued recommendations rather than requirements for school entry.

Vaccine confidence issues have impacted different vaccine initiatives. Progress toward polio elimination in Afghanistan, Pakistan, and Nigeria, for instance, has been disrupted by anti-Western sentiments and rumors claiming that the vaccine causes sterilization.<sup>21–23</sup> In the Philippines, a rare vaccine risk of a newly introduced dengue vaccine came to light following a mass vaccination campaign, damaging public trust in the health authorities, and precipitating declines in the uptake of multiple vaccines.<sup>24,25</sup> Unaddressed parental fears and online misinformation were found to be strong mediating influences on declining vaccine confidence in Philippines.<sup>24</sup>

The dengue vaccine controversy is a prime example of how a confidence loss in one vaccine can quickly spread to drive losses in confidence in other vaccines, serving as a possible warning for how confidence losses in COVID-19 vaccines may translate into losses to other vaccines. While vaccines have long provided fertile ground for questions, anxieties, and concerns, the ease and speed by which vaccine concerns and or mis- and dis-information can be propagated has hastened. In the current hyperconnected, fast-changing digital environment, social media facilitates the rapid spread of information, rumors, and misinformation, and often results in the self-organization of like-minded individuals into groups.<sup>26</sup> The interactive nature of social media platforms presents both an opportunity and a threat – vulnerable to abuse and used to undermine trust as well as polarize and politicize public sentiments.<sup>27</sup>

The themes above resonate with the rollout of the COVID-19 vaccine over the past two years. Over the course of the pandemic, many studies have found links between misinformation with real-world outcomes and behaviors, such as compliance with public health guidance,<sup>28</sup> intention to receive a COVID-19 vaccine,<sup>28,29</sup> COVID-19 vaccination status,<sup>30</sup> and vaccine hesitancy.<sup>31</sup> In addition, vaccine mandates and other vaccine policies were implemented across many settings in the context of COVID-19 and while they may have driven COVID-19 vaccine acceptance in some settings,<sup>32</sup> there is evidence to suggest that they may have triggered psychological reactance – or backlash – among specific socio-demographic groups, including in younger people.<sup>33–35</sup> Concerns about state control have also featured strongly, ranging from those around vaccine passports and mandates and the corresponding electronic infrastructure that has been built<sup>36</sup> to rumors around vaccination and depopulation.<sup>37–39</sup> Vaccine safety anxieties and beliefs about the compatibility of vaccines with religious beliefs were also prominent, with the use of aborted fetal cell lines in vaccine development and production often cited as reasons for vaccine refusal.<sup>40</sup>

## Vaccine confidence and the pandemic

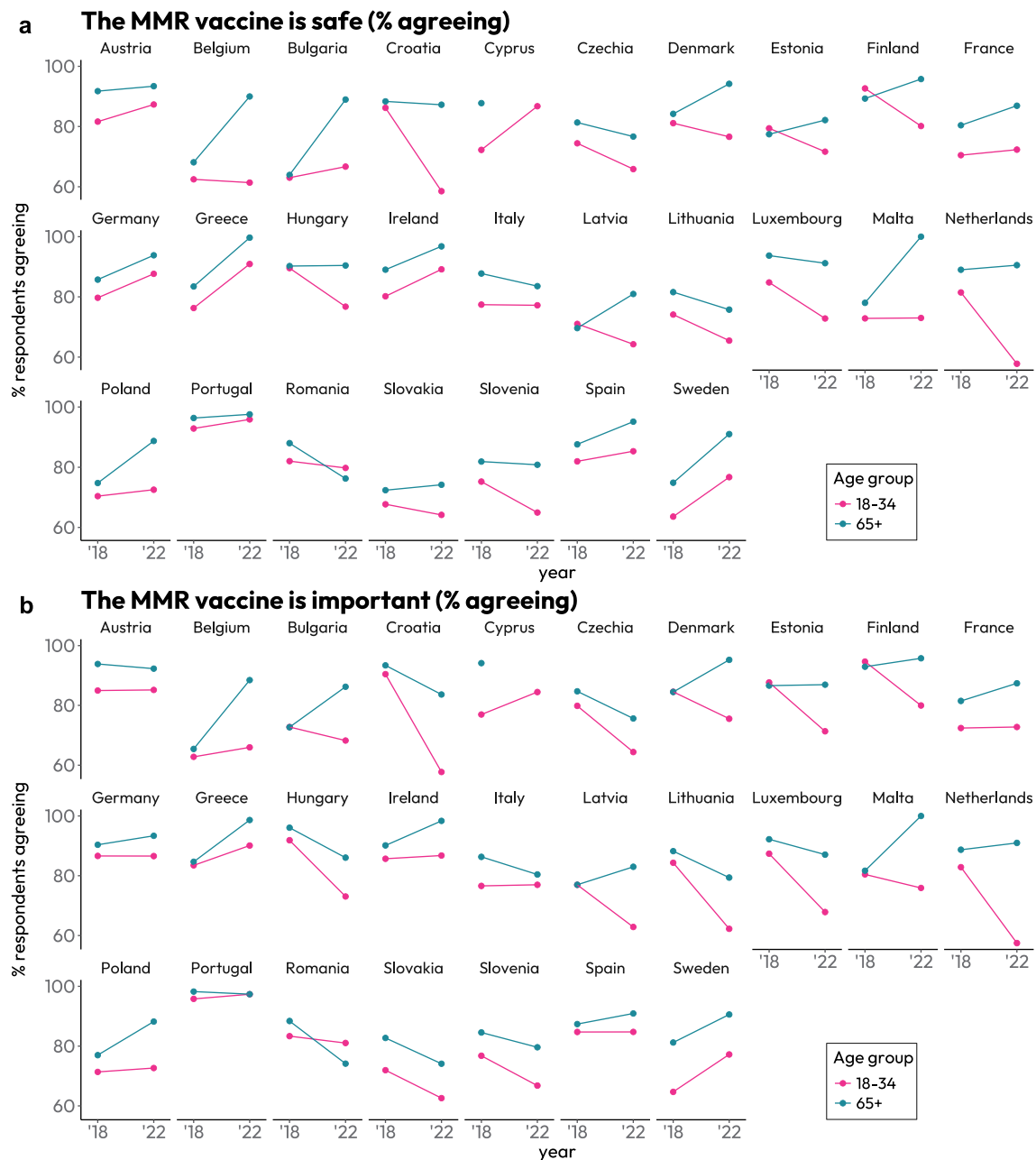
The recent *State of Vaccine Confidence in the European Union 2022* and UNICEF's *The State of World's Children 2023* reveal a mixed picture of vaccine confidence across the globe.<sup>41,42</sup> In the former, perceptions around the importance and safety of the MMR and HPV vaccines dropped over the pandemic period with notable backslides in specific countries and socio-demographic groups. For example, there has been a significant change since the start of the pandemic in the association between vaccine confidence and age, with younger adults becoming less confident since 2019, while older groups remain at high vaccine confidence levels. Although older groups tended to hold higher vaccine confidence levels than younger age cohorts before the pandemic,<sup>43,44</sup> the divergence in confidence between old and young over time appears to be new to Europe with emerging evidence suggesting that it may be a global phenomenon, as revealed by the 2023 *State of World's Children* report.<sup>42</sup>

This vaccine confidence age gap has increased across almost every EU member state between 2018 and 2022: for example, the gap among those agreeing that the MMR vaccine is safe between 18–34-year-olds and over 65s has increased in 21 of 27 EU member states (Figure 2, adapted from de Figueiredo 2020),<sup>41</sup> with most 18–34-year-olds surveyed becoming decreasingly confident in the safety and importance of the MMR vaccine since 2018.

Interestingly, two member states with among the highest levels of vaccine confidence before the pandemic – Portugal and Spain – avoided declines in confidence in either age group, while countries with lower levels of preexisting confidence – typically in Eastern Europe and the Baltics – experienced further backslides in 2022.<sup>41</sup> It is perhaps unsurprising then, that that Portugal and Spain have among the highest COVID-19 vaccine coverage rates in the EU—94.3% of the population over the age of 18 received the primary course in Portugal and 85.9% in Spain, according to the European Centre for Disease Prevention and Control COVID-19 vaccine tracker as of May 25, 2023 ([vaccinetracker.ecdc.europa.eu/public/extensions/COVID-19/](https://vaccinetracker.ecdc.europa.eu/public/extensions/COVID-19/)).

Similarly, countries with low – and declining – vaccine confidence such as Slovakia and Romania entered the pandemic with lower rates of routine pediatric vaccine coverage<sup>4</sup> and have among the lowest acceptance rates of the COVID-19 vaccine – only 60.2% of the Slovakian population received the primary course, while this value is 50.4% in Romania .

Portugal entered the pandemic with the highest rates of pediatric vaccine coverage in Europe, the result of a national immunization programme which ensures recommended vaccines are readily available, accessible, and affordable.<sup>45</sup> During the pandemic, military leadership was credited for the success of Portugal's COVID-19 vaccine roll out, signaling the population's trust in government to manage a crisis.<sup>46</sup> In Slovakia, widespread distrust of the state and misinformation were brewing prior to the pandemic, and it appears these sentiments thwarted government measures to control the spread of COVID-19.<sup>47</sup> Portugal and Slovakia stand as examples of how background coverage and confidence levels can serve as



**Figure 2.** Percentage of respondents agreeing that the MMR vaccine is safe and important between 2018 and 2022. The percentage of 18–34-year-olds and over 65s (65+) who agree that the MMR vaccine is safe (top) and important (bottom) in 2018 and 2022. Reproduced from state of vaccine confidence in the EU 2022<sup>41</sup>.

important predictors of how a programme will perform during a crisis.

A recent study by Siani and Tranter found significant falls in vaccine confidence in the UK over the course of the pandemic, with almost a quarter of respondents reporting that their confidence in vaccines had declined since the start of the pandemic.<sup>48</sup> The authors also find an increasing age gap in vaccine confidence, with younger groups becoming less confident over the pandemic and older groups moving in the opposite direction. Declining confidence among younger age groups is a significant cause for concern as they are the next cohort of parents making decisions around childhood vaccination.

Faltering confidence levels in vaccines following the COVID-19 pandemic are not unique to Europe. In a cross-

sectional modeling study in eight sub-Saharan African settings conducted between 2020 and 2022, declines in the perceived importance of vaccines for children were identified across all eight countries.<sup>49</sup> COVID-19 vaccines were also perceived to be less important in 2022 than in 2020 in six countries, with increases in confidence detected for only Ivory Coast (Côte d’Ivoire).

Like many countries during the rapid roll out of the COVID-19 vaccines, Ivory Coast’s efforts to vaccinate its population were stymied by a wave of misinformation and low-levels of public acceptance of the vaccines. However, a nationwide awareness-raising campaign—which included deploying mobile clinics and enlisting the support of influencers, as well as religious and community leaders—appears to have shifted the tide and Ivory Coast became a model for

managing vaccine hesitancy.<sup>50</sup> Four-weeks after the campaign was launched, Ivory Coast increased the number of people vaccinated from 2,000 per day to more than 20,000<sup>50</sup> and was one of the only countries where both COVID-19 vaccine confidence, and confidence in vaccines in general increased during the pandemic, reflecting built, rather than broken, trust. The success of Ivory Coast and Portugal stand out as examples of resiliency, but unfortunately these countries are exceptions to a global trend of waning confidence.

In a 55-country study monitoring global trends in vaccine confidence from 2015 to 2022, perceptions of the importance of vaccines for children decreased across 46-countries, with significant increases in India and Mexico. Gains in confidence were also detected in China, though given the spike in COVID-19 cases and deaths reported in early 2023 following the country's emergence from its "zero-COVID" policy, ongoing monitoring of vaccine confidence in China is necessary to understand the long-term impact of the pandemic. Countries experiencing the largest backslides include The Republic of Korea, Papua New Guinea, and Ghana.<sup>42</sup>

### What now?

Repercussions from the reported declines in vaccine uptake are still yet to be fully realized. Governments, public health authorities, and other policymakers and stakeholders will need to be proactive to mitigate potential losses in vaccine acceptance, especially among younger age groups stepping into parental roles and responsible for making decisions around routine immunization for their children.

Further research should seek to understand whether detected declines in confidence among young adults are transient or whether this trend represents a more long-lasting challenge to public health. In either case, research should investigate the determinants of falling confidence among younger age groups. Qualitative research should engage young adults to inform catered interventions and shape policy and systems change to reverse the trajectory of vaccine confidence among the next cohort of parents.

New research could also examine the impact of vaccine-specific misinformation (for example, COVID-19 vaccine misinformation) on other vaccines and develop strategies to build resilience to misinformation among the public. Inoculation theory – a psychological intervention that preemptively exposes individuals to weakened forms of misleading information with the goal of boosting resilience to misinformation – has shown some promise in building resilience against misinformation as well as purposely propagated fake news.<sup>51,52</sup>

We must also understand the impact of various COVID-19 response measures, including vaccination policies, on public confidence. Following the introduction of the COVID-19 vaccine in late 2020, many countries around the world moved to introduce vaccination requirements. The current literature suggests that some of these COVID-19 vaccination mandates may have triggered a backlash, inducing lower intentions to accept a COVID-19 vaccine, particularly among certain socio-economic groups such as young people and marginalized communities, as well as among some healthcare workers.<sup>33–35,53,54</sup> Critical evaluation of COVID-19 policies, measures,

and mandates put into place during the pandemic is required to understand the link between vaccination policies and observed confidence losses and to reform public health measures moving forward.

Assessing to what extent both COVID-19 policies and misinformation have impacted confidence in non-COVID-19 vaccines would provide an understanding of spill-over effects and help not only mitigate losses in other vaccines but build future pandemic preparedness.

While the COVID-19 pandemic and its impacts remain a lingering reality, a window of opportunity remains for timely, impactful research into the causes and consequences of declining vaccine confidence, especially among younger age groups, and to shape actionable responses to restore trust and confidence in vaccines as well as the people and systems who design, deliver, and mandate them.

### Disclosure statement

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