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Protecting the Developing Mind in a Digital Age: A Global Policy Imperative

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ABSTRACT

The global rise in smartphone and social media use has dramatically reshaped childhood and adolescence, with algorithmically engineered digital environments increasingly influencing young people's capabilities and functionings. This paper draws on data from the Global Mind Project to examine the population-level impacts of childhood smartphone ownership on mind health and wellbeing in young adulthood. Our analysis reveals that receiving a smartphone before age 13 is associated with poorer mind health outcomes in young adulthood, particularly among females, including suicidal thoughts, detachment from reality, poorer emotional regulation, and diminished self-worth. These correlations are mediated through several factors, including social media access, cyberbullying, disrupted sleep, and poor family relationships. This trend appears consistently across all global regions with the magnitude greatest in English-speaking nations. Based on these findings, we advocate for the adoption of a precautionary principle. We propose the implementation of a developmentally appropriate, society-wide policy approach, similar to those regulating access to alcohol and tobacco, that restricts smartphone and social media access for children under 13, mandates digital literacy education, and enforces corporate accountability. These measures aim to protect the foundational elements of mind health and wellbeing that underpin the capabilities and functionings for human flourishing in future generations.

Introduction

Since the early 2000s, smartphones, operating as gateways into artificial intelligence (AI)-powered digital environments, have rapidly become central to how children and adolescents socialise, learn and form their identities, offering new avenues to access friends, information and entertainment. However, alongside these opportunities, machine learning algorithms embedded within social

media platforms actively curate and amplify largely unregulated content to maximise user engagement. This can result in the displacement and disruption of key developmental activities such as in-person interaction and sleep, while exposing young users to a vast and often harmful digital landscape of developmentally inappropriate content including pornography, deepfakes, violent material, and extreme ideologies (e.g. Common Sense Media 2022). These AI-powered systems strategically exploit behavioural data and psychological vulnerabilities (Costello et al. 2023; Raffoul et al. 2023), potentially constraining children's agency by eroding autonomy, diminishing decision-making capacity, and encouraging social comparison. While platforms commonly set 13 as the minimum age of use in line with country-level standards, this requirement is not universally enforced, and many underage users access these platforms globally. At the same time, the age of first smartphone ownership is falling, with many children now owning a phone before they enter middle school, and spending many hours a day on their devices (Common Sense Media 2021; Ofcom 2023; Sapien Labs 2025b).

This algorithmically engineered digital environment that children inhabit, and which smartphones provide an often-unsupervised gateway into, is therefore reshaping the very nature and freedoms of childhood and adolescence, raising fundamental questions about its impact on the human mind and its consequent capabilities and functionings. Studies examining the effects of screen time, social media and smartphone use on various mental health outcomes in children have demonstrated negative effects in many cases (e.g. Santos et al. 2023; Twenge, Martin, and Campbell 2018), but also mixed and often contradictory results (e.g. Odgers 2018; Orben et al. 2022). These inconsistencies stem from a range of methodological limitations and variabilities, including challenges in accurately measuring screen time, imprecise definitions of what constitutes social media use, study populations that vary by gender, socio-economic status, age, and broader life context, and differences in how mental health outcomes are defined and assessed. Moreover, many studies are limited by short timeframes and a narrow focus on specific symptoms or behaviours, precluding a broader understanding of overall developmental effects. Collectively, this uncertainty has created a fragmented policy landscape, with some countries imposing age-based social media restrictions, grassroots movements advocating for delayed smartphone ownership, and schools adopting disparate in-house policies.

To support this debate, one central question that needs answered is: *at a population level*, what is the magnitude and nature of the developmental consequences of owning a smartphone in childhood on mental health outcomes as a young adult? Here we present results from the Global Mind Project that helps answer this question and propose a developmentally appropriate, precautionary policy response. We examine smartphone access in the context of mind health and well-being using a measure that encompasses the full complement of emotional, social

and cognitive capacities of mind that allow one the ability to navigate life's challenges and function productively (distinguishing from mental health in its traditional interpretations of depression and anxiety). Mind health is therefore a foundational condition for both capabilities and functionings.

About the Global Mind Project

The Global Mind Project is a large-scale, open-access, data acquisition initiative to systematically track and analyse the evolving landscape of mind health and wellbeing of the internet-enabled world in the context of multidimensional determinants that reflect the social, cultural, technological and environmental world in which we live and work. At its core is the Mind Health Quotient (MHQ), an online, self-report assessment tool that captures 47 social, emotional, cognitive and physical functions, representing a comprehensive set of positive functionings and negative symptoms, that draw from psychiatric and neuroscientific frameworks. The assessment generates a composite metric, the MHQ score, that reflects overall mind health, spans the spectrum from distressed (−100) to thriving (+200), and linearly relates to productive outcomes (Newson, Sukhoi, and Thiagarajan 2024). Since its launch in 2020, the Global Mind database includes profiles and extensive life context information from nearly 2 million individuals across 163 countries in 18 languages.

One striking finding from the project is the decrease in mind health and wellbeing of each successively younger age group (Sapien Labs 2025a), in stark contrast to the historically observed U-shaped wellbeing curve across the lifespan (Blanchflower 2021). Today, 41% of 18–34-year-olds struggle with symptoms or diminished functionings that significantly impair their daily life (Sapien Labs 2025a, 2025b). The timescale of this reversal aligns with the rise of smartphones and social media, prompting our exploration of how the age at which individuals first acquired a smartphone during childhood shapes mind health and wellbeing in young adulthood.

Population Impact of Younger Age of Smartphone Ownership on Mind Health and Wellbeing

Generation Z, born between 1997 and 2012, are the first cohort to grow up with smartphones and social media from early childhood. To provide a retrospective view of the impact, we examined the association between age of first smartphone ownership and current mind health status, as measured by the MHQ, summarising findings from previously published reports that draw upon data from over 100,000 18–24-year-olds across diverse cultures and language groups worldwide (Sapien Labs 2023; Thiagarajan, Newson, and Swaminathan 2025). While correlational in nature, this real-time, large-scale analysis provides critical insights into the cumulative developmental

consequences of a digital childhood without having to wait decades for longi-tudinal data to accumulate.

The most prominent finding is that for those who acquired their smartphone below the age of 13, their overall mind health and wellbeing is progressively lower with each younger age of first smartphone ownership. Specifically, the MHQ score drops from 30 for those who acquired a smartphone at age 13 to just 1 for those who acquired a smartphone at age five (Figure 1; $p < 0.001$ for age $14 +$ vs <10). Correspondingly, the percentage considered distressed or struggling (i.e. with negative MHQ scores indicating five or more severe symptoms), increases by 9.5% for females and 7.0% for males, a significantly higher percentage in females ($p < 0.001$). This general pattern is consistent across every region, culture and language highlighting a critical developmental window during which smartphone ownership appears to have the greatest impact. While shown for the entire 18–24 cohort, the same pattern persists for each individual age with steeper effects for those aged 18–20 versus 21–24,
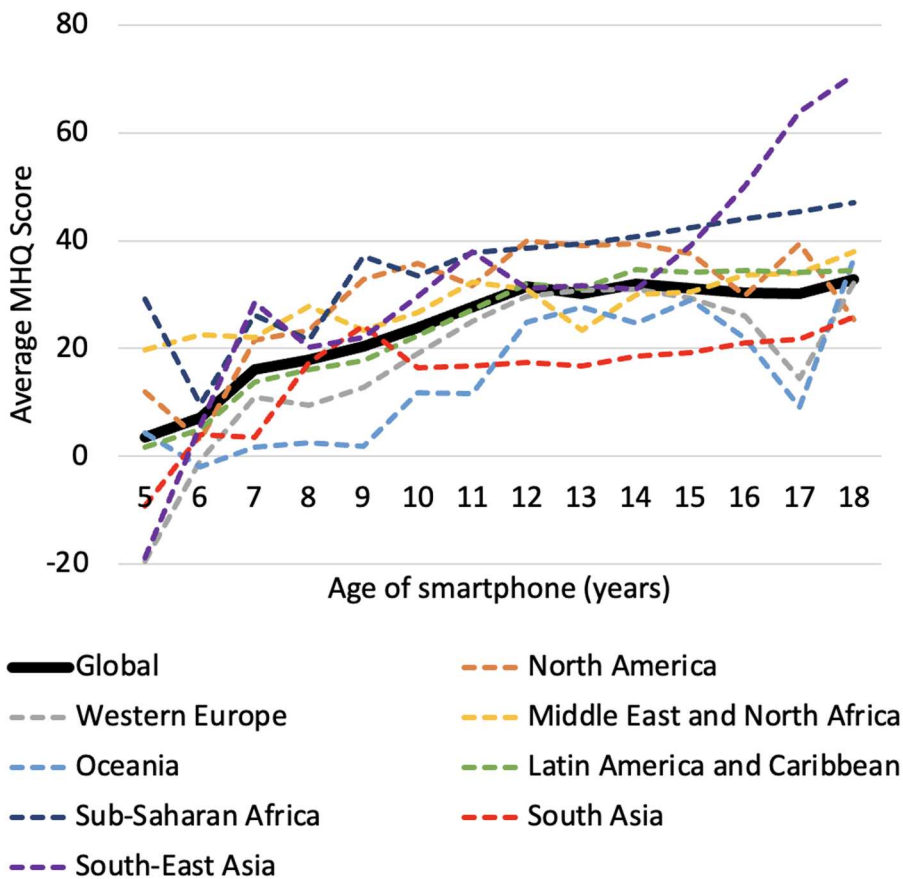

Figure 1. Average MHQ scores of 18–24-year-olds (males and females combined) by age of first smartphone ownership for the global population, as well as across different regions.

which may relate to their age during the COVID pandemic (see supplementary data in Thiagarajan, Newson, and Swaminathan 2025).

The specific symptoms that most strongly correlate with a younger age of smartphone ownership include suicidal thoughts, aggression, feelings of being detached from reality, and hallucinations (Table 1). Suicidal thoughts show the steepest change where 48% of females aged 18–24 who acquired a smartphone at age five or six report suicidal thoughts (ratings of ≥7 on a 9-point scale, where 9 is most severe life impact) compared to 28% who acquired a smartphone at age 13. Among males, the corresponding figures are 31% and 20%, respectively. Specific functionings that are significantly diminished in individuals who acquired a smartphone at a younger age include self-image, self-worth and confidence, and emotional resilience among females, and stability and calmness, self-image, self-worth, and empathy among males.

Taken together, these findings suggest that, at a global population-level and regardless of culture or language, having owned a smartphone before age 13 is associated with a profound shift in mind health and wellbeing in early adulthood. As the age at which children receive a smartphone continues to decrease, our data suggests a concerning trajectory toward a population with higher rates of aggression, suicidal thoughts, feelings of detachment from reality, and diminished self-worth, emotional control, and resilience. These findings also highlight an important methodological consideration: existing studies typically rely on tools focused on depression or anxiety symptoms, overlooking these emerging symptoms and potentially explaining some of the contradictions in the literature. We also note that while the COVID-19 pandemic, may have amplified this association, the consistency of these trends across global regions points to a broader developmental impact of early smartphone access.

Table 1. Difference in the percentage of 18–24-year-olds reporting (i) severe symptoms (ratings of ≥7 on a 9-point scale, where 9 is most severe life impact) and (ii) reduced functionings (ratings of ≤3 on a 9-point scale, where 9 indicates positive impact and 1 indicates negative life impact), between those who received their first smartphone at age 5–6 (average) versus age 13–18 (average).

	Females	Males
(i) Symptoms		
Suicidal thoughts or intentions	20%	11%
Hallucinations	14%	9%
Aggression towards others	14%	8%
Repetitive or compulsive actions	13%	5%
Sense of being detached from reality	13%	4%
(ii) Functionings		
Self-image	12%	10%
Self-worth & confidence	12%	10%
Emotional control	10%	8%
Emotional resilience	12%	5%
Empathy	8%	10%
Stability & calmness	6%	10%

Values represent the percentage point difference between the two groups, shown separately for females and males.

Pathways of Impact

What are the potential pathways through which earlier smartphone ownership is associated with poorer mind health and wellbeing outcomes? To explore this, we examined several potential factors including age of social media access, experiences of cyberbullying and sexual abuse, family relationships, friendships, sleep, and consumption of ultra-processed foods (Figure 2).

Using regression analysis, we found that, globally, the age of access to social media accounts for approximately 40% of the overall association between age of smartphone ownership and mind health (Figure 2, left). Other significant contributing factors include poor family relationships (13%), cyberbullying (10%), and disrupted sleep (12%). Notably, 68% of the negative impacts associated with poor family relationships and 63% of the negative impacts associated with cyberbullying are downstream of age of first social media account. This suggests that having access to AI-powered social media environments at a younger age puts individuals at greater risk for poorer family relationships and exposure to cyberbullying. In contrast, only 19% of the effects of disrupted sleep can be explained by age of access to social media. This suggests that sleep disruptions arising from smartphone ownership at a younger age arise from smartphone activity other than social media (e.g. watching movies, gaming). Other factors such as exposure to sexual abuse and consumption of ultra-processed foods, which are known to impact mind health and wellbeing, do not have a discernible role in explaining the association between earlier smartphone ownership and poorer mind health.

When separating out the Core Anglosphere, comprising developed, English-speaking countries, we found that young adults report access to both smartphones and social media earlier than their counterparts in Africa, South Asia
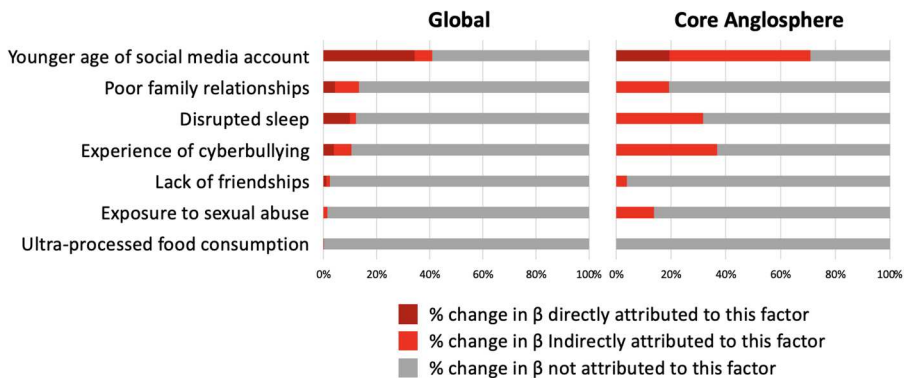

Figure 2. Results of a regression analysis showing how various factors reduce the beta-coefficient (i.e. strength) of the relationship between age of first smartphone ownership and adult mind health. The percentage change in the beta coefficient when each factor is added first reflects its total (direct and indirect) effect (dark red + light red), while the change when added last reflects its direct or independent effect (dark red only).

and the Middle East (average age of first smartphone is 11 compared to 14–16). Correspondingly, in this region (Figure 2, right), age of access to social media explains up to 70% of the observed effects associated with early smartphone ownership. Poor family relationships, cyberbullying and disrupted sleep account for 19%, 37%, and 32%, respectively, with 100% of these effects occurring downstream of age of access to social media. In addition, in contrast to the global results, sexual abuse explains 14% of the observed mind health association for females (but not males), which is again downstream of age of social media access. Thus, these findings suggest that age of access to AI-powered social media platforms has a much larger influence in the Core Anglosphere, increasing the likelihood of cyberbullying, sleep disruption, poor family relationships and sexual abuse. This heightened vulnerability may be driven not only by earlier access, but also by socio-cultural factors and the distinct nature of English-language online, where a greater volume of harmful, hyper-sexualised, or exploitative content compared to other languages and regions may be more readily available and therefore more algorithmically promoted. When such exposure occurs at an age when sense of self, sexual maturity and worldly understanding are still forming, young users are particularly susceptible to their damaging effects.

Altogether, this data suggests that owning a smartphone below age 13 results in earlier age of social media access (despite laws restricting use in this age group) and correspondingly greater probabilities of experiences of cyberbullying, sexual abuse (Core Anglosphere females), diminished family bonds and disrupted sleep. It is important to note that our analysis does not include variables such as screen time or specific social media activities. In addition, as it is not currently feasible to reliably estimate an individual's cumulative screen time or digital behaviour across childhood, this study does not take into consideration how much time individuals spent on screens in childhood or what content they specifically engaged with. Instead, our approach examines the cumulative probabilities of problems that arise across the population, based on the age that individuals acquire a smartphone in childhood. The findings should be interpreted as reflecting probabilistic population-level developmental patterns rather than individual behavioural trajectories.

A Developmentally Appropriate Digital Technology Policy for Under 13s

The relationship between earlier smartphone ownership in childhood and poor mind health outcomes in early adulthood, significantly mediated through earlier access to algorithmically curated social media platforms, presents a clear policy challenge, particularly in the context of rapidly evolving technology use. Our data show that for children under 13, smartphone ownership, and in turn access to social media, is associated with increased symptoms and

diminished functionings across multiple domains, with potential consequences extending beyond the psychological domain into education, civic participation, and economic opportunities. What's more, the magnitude is substantial: if current trends for increasingly younger smartphone ownership and social media access continue, projections from this data suggest that this factor alone could be responsible for mental distress such as suicidal thoughts, dissociation from reality, and diminished functionings such as emotional control and resilience in nearly a third of the next generation. It follows that based on these numbers, restricting smartphones during childhood, and in particular social media, has the potential to significantly strengthen capabilities and functionings by reducing clinical level mental distress in up to 8.5% of younger populations and suicidal thoughts in up to 20%, while improving emotional resilience and self-confidence in 12%.

This challenge cannot be effectively addressed through individual decision-making alone. Parents who restrict smartphone or social media access for children whose peers are using them face the dilemma between protecting their children and risking their social exclusion, exerting a powerful counterforce against even the most well-intentioned restrictions. Similarly, placing the burden of self-regulation on children themselves is unrealistic and ethically untenable. AI systems that drive social media platforms are engineered to exploit psychological vulnerabilities, manipulating and overriding developing cognitive defences, which imposes a considerable challenge when the prefrontal cortex is not yet mature. Moreover, children protected from smartphone and social media use at home remain vulnerable to downstream effects of aggression and dissociation in their peers, often manifested as bullying or violence in schools.

Altogether, given the profound consequence for human development and long-term flourishing, we urge a response that matches the gravity of the threat. Sceptics may argue that existing evidence does not yet meet the threshold for definitive causal claims and therefore should not drive policy. However, this fails to account for the pragmatic imperatives of public health. When children exhibit this magnitude and severity of mental distress and diminished functionings, intervention should not wait. While the risk of psychological reactance must be considered, the developmental harms of unregulated access remain too great to justify inaction. In this context, the precautionary principle is not only appropriate, it is necessary.

Given that the most damaging effects of early smartphone exposure are in those under age 13 and largely mediated by social media, we advocate for a systemic, society-wide policy approach that mirrors existing public health models for regulating access to harmful substances and activities at specific developmental stages. Just as we restrict alcohol, tobacco, and motor vehicle operation to older adolescents and adults based on risk to developing minds and bodies, so too should we restrict smartphones and social media during the critical formative years.

We therefore propose the following policy measures, presented in order of feasibility:

1. Require mandatory education on digital literacy and mental health (high feasibility, medium impact): This should cover ethical online engagement and strategies for managing algorithmic influence, catfishing, cyberbullying, and sexual predators. It should precede independent access to social media platforms, analogous to education requirements for a driver's licence and has relatively high feasibility as it builds on existing educational frameworks and has precedent in other domains. This approach not only informs safer digital engagement but enhances individual agency, enabling children to navigate digital environments in more informed and effective ways.

2. Strengthen the active identification of social media age violations and ensure meaningful consequences for technology companies (medium feasibility, high impact): Technology companies must be held accountable for enforcing age restrictions through improved age verification systems and meaningful penalties for non-compliance. While enforcement remains challenging, especially with respect to age verification, shifting responsibility toward technology providers to actively mitigate risk and protect users reduces the burden on families or individuals. Regulatory frameworks in other sectors (e.g. tobacco, alcohol) demonstrate that corporate accountability is achievable with sufficient political will.

3. Restrict access to social media platforms (medium feasibility, high impact): Social media platforms (i.e. platforms inviting posting of user-generated content and commenting) should be prohibited on all internet-connected devices for children under 13. This builds upon existing legal age restrictions but requires significantly enhanced enforcement mechanisms. Implementation challenges include technical difficulties with verifying users' age reliably, and monitoring across multiple devices and platforms.

4. Implement graduated access restrictions for smartphones (most challenging, highest potential impact): Access to smartphones (defined as personal devices with internet access and apps beyond calling and text messaging that are easily portable) should be restricted for children under 13, with alternatives offered, such as "kids" phones' that provide basic utility without social media or AI-powered content streams. By offering developmentally appropriate alternatives, this approach aims to minimise psychological reactance, offer access to developmentally appropriate opportunities afforded by digital devices (e.g. education apps), and avoid the counterproductive effects often associated with outright bans. This is the most challenging recommendation to implement due to socio-cultural norms around technology access, parental autonomy in decision-making, and practical enforcement challenges in private spaces.

While these recommendations focus on the under-13 age group, where the evidence is strongest, we note that there is growing evidence for extending appropriate protective measures to adolescents aged 14–18, with further studies required in this age group.

Altogether, these policy recommendations aim to safeguard mind health during critical developmental windows. Their implementation requires substantial political and societal will, effective enforcement, and a multi-stakeholder approach, but successful precedents do exist. For example, in the United States, underage alcohol access and consumption is regulated through a combination of parental, commercial, and corporate accountability. Parents may face fines when alcohol use is found in public spaces such as schools, restaurants, parks, and public transportation. In many jurisdictions, they can also be fined, criminally charged, or held civilly liable for providing alcohol to minors, especially if it results in harm. Sellers and establishments that distribute alcohol to underage individuals can face fines, licence revocation, or legal prosecution. Additionally, companies involved in the sale or marketing of alcohol are subject to strict advertising regulations and can be penalised for targeting minors or failing to enforce age restrictions.

In closing, this evidence suggests childhood smartphone ownership, an early gateway into AI-powered digital environments, is profoundly diminishing mind health and wellbeing in adulthood with deep consequences for individual agency and societal flourishing. Even as further research is needed to unpack causal mechanisms and individual variability, waiting for irrefutable proof in the face of these population-level findings risks losing the opportunity for timely, preventive intervention. By putting in place developmentally informed policies today, we have the opportunity to safeguard the mind health of future generations by expanding their real freedoms to learn, relate, and flourish in a digitally mediated world.

Disclosure Statement

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Notes on contributors

Tara C. Thiagarajan, Ph.D., is the Founder and Chief Scientist of Sapien Labs, where she brings a complex systems perspective to understanding the evolving human mind through global, interdisciplinary research.

Jennifer Jane Newson, Ph.D., is Lead Scientist for Cognitive and Mental Health at Sapien Labs, where she leads the development of the MHQ and the Global Mind Project.

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Data Availability Statement

The full dataset from the Global Mind Project, including the data used in this study, is freely available for not-for profit purposes from the Sapien Labs Researcher Hub. Access can be requested here: https://sapienlabs.org/global-mind-project/researcher-hub/

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