Executive Summary

The rapid adoption of digital technologies by adolescents has raised concerns about their impact on mental health while also providing new opportunities to support adolescents. This report highlights the need to reduce risks and amplify the benefits of digital technology engagement for adolescents, emphasizing the importance of a youth-centered approach to design, evaluation, and implementation of AI in adolescent mental health. It focuses on early adolescence (ages 10-14) as a critical period of development. Finally, this report identifies key challenges and opportunities for adolescent mental health in the context of AI, emphasizing the need for a holistic approach that considers developmental science and leverages AI to promote positive mental health outcomes for adolescents across eight main themes.

I.   Digital Mental Health
Adolescents often seek mental health information online, but they struggle to find culturally competent evidence-based support. Many are interested in using mental health apps but access is limited, and adoption is worse. To improve digital mental health services for adolescents, research must include their needs, interventions should be tailored to their preferences, and collaborations between academia and industry are necessary. AI can extend the reach of traditional therapies, but design features must be developmentally appropriate and youth-centered. Research gaps include understanding what drives adolescents to mental health platforms and developing inclusive user-centered methods to advantage of those drivers.

II.   Personalization
Personalized learning, therapies, and content curation can benefit adolescents due to the substantial variation in how digital technology impacts their mental health. A one-size-fits-all approach is ineffective, and machine learning models can optimize interventions for individual adolescents by predicting their specific needs and targeted outcomes. Furthermore, tailoring interventions to diverse subgroups of adolescents is crucial for addressing emerging inequalities caused by the introduction of new technologies. Machine learning models can be used to actively monitor gaps in learning and health, target resources, and evaluate the impact of specific policies and design features in reducing inequalities. However, several key issues and questions remain related to personalizing digital and media engagement plans, tailoring online experiences and content consumption, and personalizing digital mental health interventions, micro-interventions, and nudges. Design features that facilitate personalization include using adolescent data, minimizing biases, delivering low-cost infrastructure, ensuring accessibility, using sensor fusion to monitor diverse activities, incorporating gamification, integrating with existing mental health resources, and developing child-specific algorithms. To advance personalization efforts, research must explore differential impacts across populations, develop child-specific algorithms, understand the utilization of child-specific impacts by parents and adolescents, recruit diverse populations for testing differential impacts, and carefully consider the opportunities and risks associated with personalization algorithms in children's spaces.

III.   Supporting Adolescent Sleep
Research shows that increased screen and media exposure is linked to poor sleep outcomes in young people, such as shorter sleep duration, later bedtimes, and lower sleep quality. While biological changes during adolescence make it difficult for teens to fall asleep earlier, the rise in

digital technologies is considered a leading explanation for the worsening sleep outcomes in recent years. However, there are opportunities for digital tools to protect and promote healthy sleep patterns among adolescents. AI-powered applications and services can be used to promote behavioral modification, alter sleep environments, address pre-bedtime rumination, and develop personalized sleep education and interventions. Design features that would help include automatic adjustment of lighting, whole house automation of temperature and noise, and monitoring of academic performance and mood in relation to sleep. Research gaps exist in exploring the connection between AI services and physical computing, validating consumer sleep sensors, studying the effects of smart alarms, addressing privacy concerns, and understanding the mechanisms through which digital technologies interfere with sleep.

IV.   Just-In-Time Interventions and Early Screening and Diagnosis

Going forward, it will be important to incorporate techniques from education and entertainment into mental health support, such as the use of AI, intelligent learning environments, adaptive coaching, and modeling of affect and internal states. In particular, these approaches can be used to augment early detection and screening, parent training, JIT parent interventions, and real-time monitoring of adolescent mental health. Design features to enhance these interventions include enhancing platform accessibility, leveraging mobile and wearable technology, data sharing for research, context-aware interventions, global peer support networks, and digital platforms for pre-screening and diagnosis. Research gaps include the need for more data from children, innovation in adolescent health research, culturally relevant interventions, investment in virtual and augmented reality, and understanding how children and adolescents interpret their own data in behavioral change and mental health technologies.

V.   Combatting Loneliness and Building Online Communities

Loneliness has been recognized as posing a significant public health risk with detrimental health consequences. Adolescence, in particular, is a period when loneliness both peaks and is predictive of negative long-term health and social consequences. The impact of technology use on loneliness is complex, with both positive and negative effects depending on the purpose and patterns of usage. Online communities can provide valuable support for minoritized youth, but they also present challenges related to privacy and elevated risk for harassment. Expanding considerations for social inclusion in platform ecologies is crucial to understanding and supporting diverse forms of communication. To address these issues, AI can help identify loneliness and mental health risks, provide social safety structures, and enforce community-based norms. However, research gaps exist in leveraging intelligent computing, exploring the role of AI in strengthening social connections, addressing legal and ethical concerns, and understanding the risks and benefits of identifying youth with mental health challenges online. Overall, a comprehensive approach involving technology, policy, and research is needed to mitigate the impact of loneliness and promote positive online experiences for adolescents.

VI.   Content Moderation, Social Tech, and Adolescent Mental Health

Adolescents' extensive online presence has raised concerns about the negative impact of digital technology and social media content on their social and emotional development. However, empirical evidence linking social media consumption to mental health problems is limited. Most reviews have found weak associations between social media use and mental well-being, with self-reported data being the primary basis for these claims. Instead, research suggests that

adolescents who already have mental health issues tend to use social media differently. It is crucial to shift focus towards designing research studies that can determine causality and explore how offline risk factors influence adolescents' online behaviors. Rather than demonizing online spaces, efforts should be directed towards creating safe and supportive environments for young people. Design features such as personalized content, developmental-focused content moderation, algorithmic transparency, and modeling civility can contribute to positive experiences. Key research gaps include conducting experimental studies targeting young adolescents, moving away from purely observational research, exploring content moderation strategies, fostering partnerships between technology companies and researchers, and studying how mental health symptoms influence online behavior. Additionally, efforts should be made to align online spaces with adolescents' developmental stages and mental health needs.

VII.   Adolescent-AI Interactions

Rapid advancements in AI are changing how children interact with the digital world, with conversational agents playing a prominent role. These agents have shown effectiveness in supporting health, well-being, and even delivering therapeutic interventions. Questions remain, however, such as how and how much to use AI in developing personalized treatment plans, whether conversational agents can fulfill adolescents' social needs, the responsibility of AI systems as mandated reporters, and the scalability of support to underserved communities. Design features supportive of positive adolescent-AI interactions include enabling agent recognition, supporting user interaction with AI, and training AI to understand and interact with children. The research gaps include understanding adolescent engagement with AI, investigating the effectiveness of AI in mental health interventions, exploring AI's role in screening and treatment planning, and conducting descriptive studies on adolescent interactions with AI systems. By addressing these aspects, we can harness the benefits of AI while ensuring responsible and effective use in promoting adolescent well-being.

VIII. Building Better AI for Adolescents

Fundamental advances in AI may come about as a result of better understanding of how children's brains learn and modeling AI based on insights from developmental psychology and neuroscience to create more effective systems. AI can address gaps in health and learning, but it will require a focus on minimizing disparities and targeting resources to communities in need. More specifically, building AI that can support adolescent development will require approaches that are evidence-based, developmentally sensitive, and ethical, while also considering factors like mental health, physical activity, and the settings where adolescents spend their time. The integration of markers of chronological and social age into AI systems will be critical, as well as the need to collaborate with adolescents and their families in the design process. Consent and data ownership issues are rampant, but they also open up new opportunities with innovative approaches to obtaining consent, age verification, brief mental health interventions, and data management, particularly in diverse non-Western settings.