

# **Written evidence submitted by Dr Jason M. Nagata (NDC0017)**

## **Neuroscience and Digital Childhoods Inquiry**

**Contributor:** Jason M. Nagata, MD, MSc

Associate Professor of Pediatrics, University of California, San Francisco

### **Introduction**

I am a physician and researcher specializing in adolescent and young adult health, with a focus on digital media use, eating behaviors, and mental health. My research draws on large-scale longitudinal datasets, particularly the Adolescent Brain Cognitive Development (ABCD) Study, a US national cohort of children followed over time to examine brain, behavioral, and health development. Much of the evidence presented in this submission is based on analyses of ABCD data conducted by our research group.

I am submitting this evidence to inform the Committee's understanding of how digital devices and social media may influence behavior and health outcomes in children and adolescents. While digital technologies offer important opportunities for learning and connection, findings from longitudinal cohort studies, including the ABCD Study, suggest measurable risks. This is particularly true in early adolescence, a sensitive developmental period for socioemotional and cognitive development.

### **Section 1: Digital Device Use, Problematic Engagement, and Adolescent Mental Health**

#### **Problematic Social Media Use in Early Adolescence**

Early adolescence (ages 10–13 years) represents a critical window of brain development characterized by heightened sensitivity to reward, social feedback, and habit formation. Evidence from analyses of the Adolescent Brain Cognitive Development (ABCD) Study suggests that, during this period, digital platforms may interact with neurodevelopmental processes in ways that increase susceptibility to problematic or compulsive use.

Furthermore, analyses of ABCD data from early adolescents (ages 11–12 years) indicate that a substantial proportion report behaviors consistent with core components of behavioral addiction. These include loss of control, preoccupation, and continued use despite negative consequences. Specifically:

- 47.5% reported losing track of time while using their phone
- 30.6% reported interrupting other activities to check their phone
- 22.5% reported persistent thoughts about social media use
- 18.4% reported using social media to cope with negative emotions
- 15.5% reported unsuccessful attempts to reduce use

These patterns are concerning because they mirror mechanisms implicated in reinforcement learning and habit formation in the developing brain. Features of digital platforms, including variable rewards such as likes and notifications, as well as algorithm-driven content delivery, may amplify these processes by reinforcing repeated engagement.

## **Prospective Associations with Mental Health Outcomes**

Longitudinal evidence from large cohort studies of early adolescents, including analyses of the ABCD Study, indicates that screen use and social media engagement are associated with a range of mental health outcomes over time, even after accounting for baseline symptoms. Further findings from ABCD analyses show that greater screen time is prospectively associated with higher levels of depressive symptoms, anxiety, somatic complaints, and attention-deficit/hyperactivity symptoms over a two-year period. Although these associations are modest at the individual level, they may accumulate across multiple hours of daily exposure and across populations, making them meaningful from a public health perspective.

Several domains of mental health appear particularly sensitive to digital media exposure:

### Eating disorder symptoms:

Analyses of ABCD data indicate that higher screen time and social media use are associated with increased risk of disordered eating behaviors, including binge eating, fear of weight gain, and self-worth tied to appearance. Each additional hour of screen exposure is associated with higher odds of developing these symptoms over time. Social media platforms may increase exposure to idealized body standards, contributing to body dissatisfaction and maladaptive coping behaviors.

There is also evidence from longitudinal analyses that greater screen use is associated with higher likelihood of clinical-level eating disorders, including binge-eating disorder. Depressive symptoms may partially mediate this relationship, suggesting overlapping pathways involving mood regulation and self-perception.

### Depression and suicidal behaviors:

Higher total screen time has been associated with increased depressive symptoms and, in some studies, higher odds of suicidal behaviors. One potential mechanism is increased exposure to cyberbullying, which has been consistently linked to poorer mental health outcomes.

### Attention and behavioral disorders:

Screen time has also been associated with attention-related difficulties and externalizing behaviors. For example, higher social media use has been linked to increased prevalence of conduct-related problems. Exposure to certain types of content, including violent or highly stimulating material, may contribute to these associations.

### Compulsive and repetitive behaviors:

Increased screen exposure, particularly video-based platforms, has been associated with higher odds of obsessive-compulsive symptoms. Algorithm-driven content delivery may reinforce repetitive viewing patterns, potentially contributing to compulsive engagement.

## **Section 2: Digital Device Use and Substance Use**

Evidence from analyses of the ABCD Study indicates that screen use and social media engagement in early adolescence are associated with early substance use risk.

Analyses show that problematic social media use is associated with more favorable alcohol expectancies. Greater social media use has also been prospectively associated with higher risk of new-onset alcohol experimentation, with problematic use partially accounting for this relationship.

Higher total screen time has been associated with greater likelihood of early experimentation with alcohol, cannabis, and nicotine. Social media use and digital communication activities appear to be key contributors to these associations.

Given that substance use initiation in early adolescence is linked to increased risk of later substance use disorders, these findings highlight the potential importance of early patterns of digital media use.

### **Section 3: Digital Device Use and Physical Health**

Evidence from large, longitudinal cohort studies of early adolescents, including analyses of the ABCD Study, shows that screen use is associated with multiple domains of physical health, including sleep, physical activity, diet, and cardiometabolic risk.

#### Sleep:

Adequate sleep is essential for healthy brain and physical development. Data indicates that a majority of early adolescents have electronic devices in their bedrooms, and screen use near bedtime is associated with difficulty falling asleep, shorter sleep duration, and overall sleep disturbance. Prospective analyses demonstrate that these associations persist over time, even after accounting for baseline sleep problems. Proposed mechanisms include blue light exposure suppressing melatonin, increased cognitive and emotional arousal from screen content, nighttime notifications, and disruption of the association between the bedroom environment and sleep.

#### Physical activity and sedentary behaviour:

Screen time is a predominantly sedentary activity and may displace time spent in physical activity. Evidence shows that lower screen use and higher physical activity are associated with more favorable cardiovascular health markers, including lower blood pressure and healthier lipid profiles. The health impact of screen use appears to depend in part on what activities it replaces, such as exercise or sleep.

#### Weight and cardiometabolic health:

Higher screen time is associated with increased risk of overweight and obesity. Longitudinal findings indicate that each additional hour of daily screen time is associated with incremental increases in body mass index over time. Youth with higher levels of screen use are more likely to have elevated weight status compared to those with lower use.

#### Diet and nutrition:

Greater screen exposure is associated with poorer diet quality. Data suggests that this may reflect both behavioral patterns, such as eating while using screens, and environmental influences, including exposure to advertising for energy-dense, nutrient-poor foods.

#### Interpretation:

Although individual effect sizes are modest, these behaviors cluster and accumulate over time. Findings from the ABCD Study highlight adolescence as a critical developmental window during

which patterns of sleep, activity, and diet are established. Early habits related to screen use may persist into adulthood, with implications for long-term cardiovascular and metabolic health.

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