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EXHIBIT A

EXPERT REPORT, ANNA LEMBKE, M.D.

July 11, 2025

RELATING TO:

State of New Mexico, Ex Rel., Raul Torrez, Attorney General v. Meta Platforms, Inc.; Instagram, LLC; Meta Payments, Inc.; and Meta Platforms Technologies, LLC.

First Judicial District Court, Santa Fe County

No. D-101-CV-2023-02838

- f. The DSM-5, which was issued in 2013 by the same organization, the APA, does not include a statement recognizing a diagnosis of social media addiction.
 - i. In my opinion, social media addiction should be recognized by the DSM for the reasons stated in this Report and by the sources cited herein. The fact that social media addiction has not yet been included in the DSM means little.
 - ii. Any new mental health disorder that arises in the population will take time before it is recognized by and incorporated into the DSM.
 - iii. The DSM is an imperfect compendium of mental diseases²⁹ and not the end all and be all of psychiatric diagnosis.
 - iv. A great deal of evidence has accumulated since 2013 on the subject of social media addiction, including but not limited to the sources cited above (van den Eijnden; Boer; WHO/HBSC), which document the validity of such a diagnosis.
 - v. The DSM-5, the International Classification of Diseases (ICD-11), and the American Psychiatric Association (APA) have all recognized the addictive nature of Internet gaming, which speaks to a consensus on the addictive potential of certain kinds of digital media. At the current time, gambling disorder is formally recognized in the DSM-5,³⁰ and Internet gaming disorder is in the appendix (section 3, potential disorders requiring further research).³¹
 - vi. The 2024 APA statement acknowledging the validity of, and defining the conditions for, “social media addiction,” is an accurate representation of the state of scientific evidence in 2025. It is reasonable to anticipate that the more current view espoused by the APA in 2024 will be incorporated into the next edition of the DSM, when the lengthy process of review of the evidence developed since 2013 is completed.
 - vii. Active discussion is underway on the inclusion of social media use disorder in the DSM.

3. Addictive social media exploit our innate need for human connection by increasing access, quantity, potency, novelty, and uncertainty of social rewards, leading

²⁹ Davis, L. C., Diianni, A. T., Drumheller, S. R., Elansary, N. N., D'Ambrozio, G. N., Herrawi, F., Piper, B. J., & Cosgrove, L. (2024). Undisclosed financial conflicts of interest in DSM-5-TR: cross sectional analysis. *BMJ* (Clinical research ed.), 384, e076902. <https://doi.org/10.1136/bmj-2023-076902>

³⁰ American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.), at p. 585.

³¹ American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.), at p. 795.

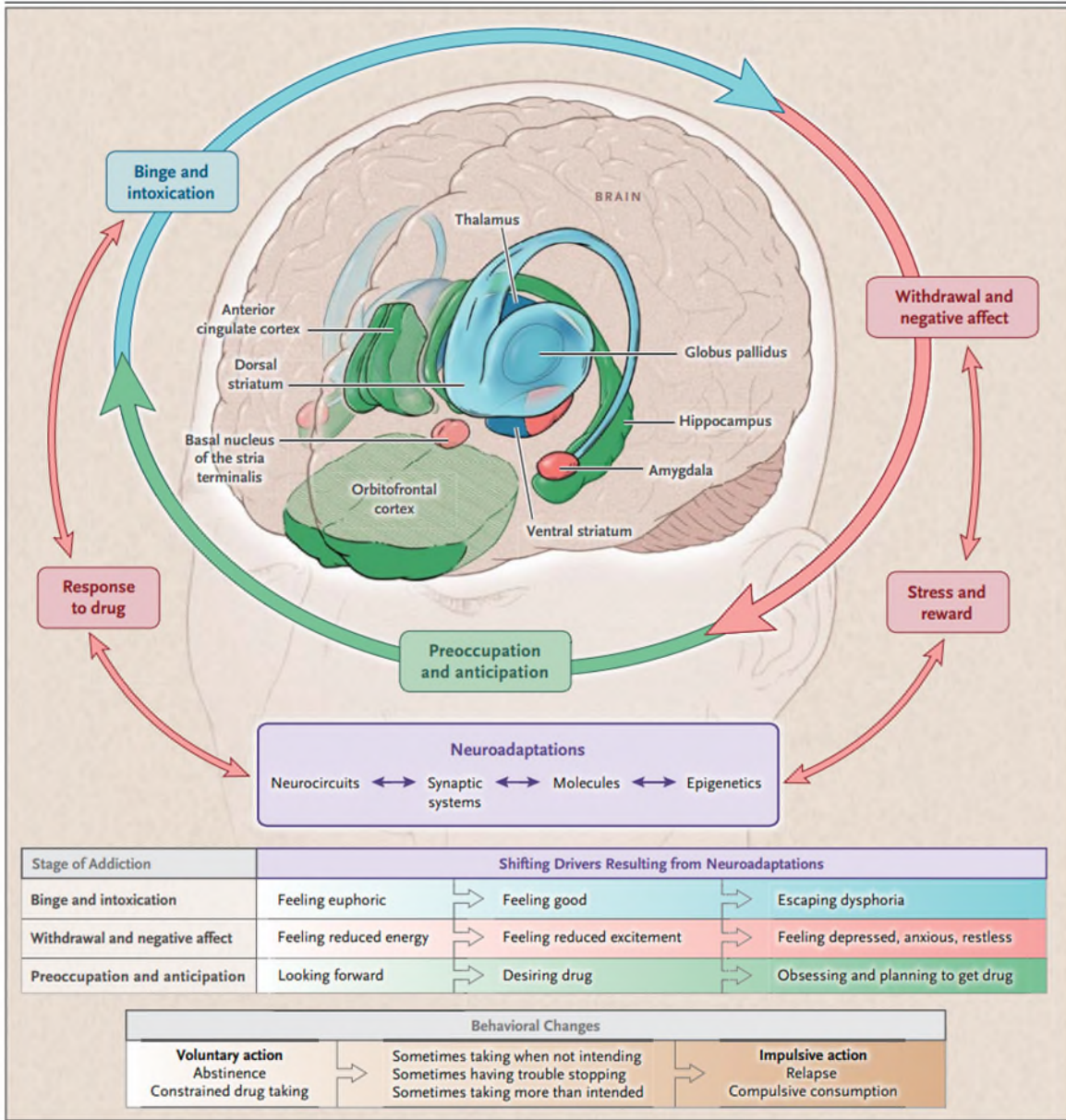
to brain and behavioral changes consistent with addiction. Young people are especially vulnerable to these harms.

- a. From a neuroscience perspective, addiction is a disorder of the brain's reward circuitry.³²
 - i. All addictive substances and behaviors mimic a reinforcing chemical or neural network that already exists in the brain, but in an ultra-potent, super-normal form, triggering the chemical cascade that activates the brain's reward pathway. Nicotine mimics endogenous acetylcholine and binds nicotinic receptors. Cannabis mimics endogenous cannabinoids and binds anandamide receptors. Opioids mimic endogenous endorphins and bind opioid receptors. And so on. Our brains did not evolve for these super-normal reinforcers in abundance, thereby setting up the cycle of intoxication, withdrawal, and neuroadaptation that leads to the disease of addiction.
 - ii. Reinforcing substances and behaviors temporarily increase dopamine firing in the brain's reward pathway. In order to accommodate the higher levels of dopamine release, the brain adapts by downregulating its own endogenous dopamine and its own endogenous dopamine receptors. This process is called neuroadaptation. With the repeated use of the substance or behavior, vulnerable individuals can enter a chronic dopamine deficit state, wherein the threshold for experiencing pleasure goes up, and the threshold for experiencing pain goes down. Addicted individuals then need the substance or behavior not to feel good, but simply to escape the pain of withdrawal.
 - iii. In severe forms of addiction, individuals commit all available resources to obtaining more of the substance or behavior, even forgoing natural rewards like food and social interaction.³³ By hijacking the brain's reward and motivational centers, addiction leads to compulsive, self-destructive consumption that overcomes the limits of voluntary choice. The cycle of neuroadaptation is illustrated below³⁴:

³² Koob, G. F., & Volkow, N. D. (2010). Neurocircuitry of addiction. *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology*, 35(1), 217–238. <https://doi.org/10.1038/npp.2009.110>

³³ Schultz W. Potential vulnerabilities of neuronal reward, risk, and decision mechanisms to addictive drugs. *Neuron*. 2011;69(4):603-617. doi:10.1016/j.neuron.2011.02.014.

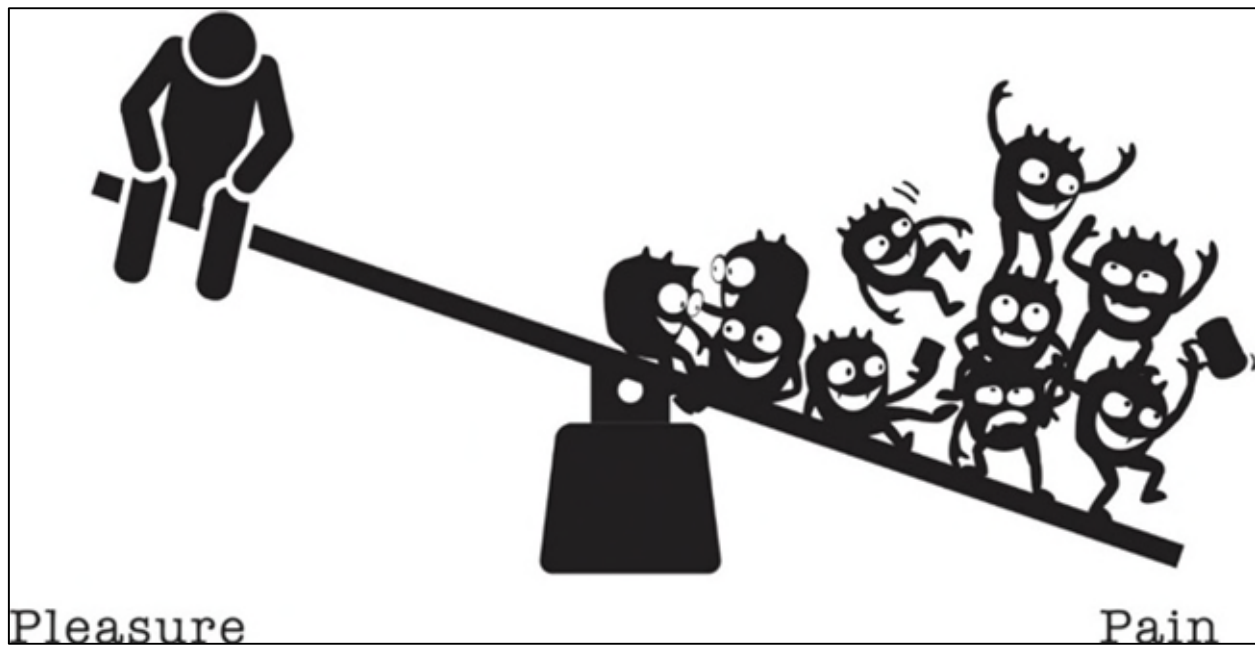
³⁴ Volkow, N. D., Koob, G. F., & McLellan, A. T. (2016). Neurobiologic Advances from the Brain Disease Model of Addiction. *The New England journal of medicine*, 374(4), 363–371. <https://doi.org/10.1056/NEJMra1511480>, Figure 1.



- b. Another way to understand this process of neuroadaptation to high-dopamine rewards that can lead to addiction is to use the metaphor of a pleasure-pain balance, like a teeter-totter in a kid's playground.
- i. When the beam is level with the ground, the individual is at baseline levels of dopamine firing, or what neuroscientists call *homeostasis*.
 - ii. When the individual experiences pleasure, the beam tips one way. When they experience pain, the beam tips in the opposite direction.
 - iii. One of the overarching rules governing the balance is that it wants to remain level, and the brain will work hard to restore a level balance with any deviation from neutrality. The way the brain restores

homeostasis after a pleasurable stimulus is first by tilting an equal and opposite amount to the side of pain. You might imagine that as gremlins, representing neuroadaptation, hopping on the pain side of the teeter totter to bring it level again. But the gremlins like it on the teeter totter, so they don't get off as soon as it's level, they stay on until it has tipped an equal and opposite amount to the side of pain.

- iv. With repeated exposure over time to the same or similar reinforcing stimulus, the gremlins multiply and are eventually camped out on the pain side of the balance. Now the brain has changed its hedonic or joy set-point and needs more of the substance or behavior in more potent forms over time to get the same effect (tolerance). The process of the brain adapting to a chronic external stimulus is called *allostasis*. Eventually the individual is using the substance or behavior not to feel good (positive reinforcement), but just to stop feeling bad (negative reinforcement). This is the addicted brain.



- c. Human beings are social creatures. Our sociability has allowed us to survive and thrive over millions of years of evolution, enhancing our ability to find mates, shepherd scarce resources, and protect ourselves against enemies.
- d. Social media provide social validation and group affiliation at scale. Crowd-sourced social validation, or the promise thereof, combined with a quick turnaround for engagement and little up-front work, translates into a powerfully addictive reward.
- e. *Wanting but not liking* is a common aphorism to describe addiction, which captures the phenomenon of compulsively using a drug even after it has stopped being pleasurable or adaptive. A Harris Poll (2024), which surveyed a

representative group of 1,006 U.S. adults aged 18–27, showed that 40% of participants agreed (11% strongly) with the statement that they “wish social media had never been invented.”³⁵

- f. Our innate desire for social connection is mediated by a cascade of brain chemicals that makes social connection feel good. A growing body of evidence demonstrates that social media activates the same reward pathway as drugs and alcohol, and people who develop social media addiction demonstrate similar brain changes as seen in individuals with other forms of addiction.
 - i. Oxytocin, our so-called *love hormone*, binds to dopamine releasing neurons in the brain’s reward pathway leading to an increase in dopamine release, which is why falling in love and other forms of social bonding activate the pleasure centers of the brain.³⁶
 - ii. Social validation and reputation enhancement light up the same reward pathway as drugs and alcohol. A study by Izuma et al. examined whether stimuli that communicate “acquiring a good reputation” activate the same reward circuitry as monetary rewards.³⁷ Nineteen (19) subjects participated in functional magnetic resonance imaging (fMRI) experiments involving monetary and social rewards. The authors found that acquiring a good reputation robustly activated reward-related brain areas and overlapped with the areas activated by monetary rewards.³⁸ The authors concluded, “Our findings support the idea of a ‘common neural currency’ for rewards and represent an important first step toward a neural explanation for complex human social behaviors.”³⁹
 - iii. Sherman and colleagues found that adolescents are more inclined to like Instagram-style photos that have been liked by others, and viewing these photos compared with photos that have been less-liked, is “associated with greater activity in neural regions implicated in reward processing, social cognition, imitation, and attention.”⁴⁰ This study highlights that the crowd-sourced, interactive, reciprocal nature of

³⁵ The Harris Poll. (2024, October 9). What Gen Z thinks about its social media and smartphone usage - Harris Poll. Harris Poll. <https://theharrispoll.com/briefs/gen-z-social-media-smart-phones/>

³⁶ Hung, L. W., Neuner, S., Polepalli, J. S., Beier, K. T., Wright, M., Walsh, J. J., Lewis, E. M., Luo, L., Deisseroth, K., Dölen, G., & Malenka, R. C. (2017). Gating of social reward by oxytocin in the ventral tegmental area. *Science* (New York, N.Y.), 357(6358), 1406–1411. <https://doi.org/10.1126/science.aan4994>.

³⁷ Izuma, K., Saito, D. N., & Sadato, N. (2008). Processing of social and monetary rewards in the human striatum. *Neuron*, 58(2), 284–294. <https://doi.org/10.1016/j.neuron.2008.03.020>.

³⁸ Izuma, K., Saito, D. N., & Sadato, N. (2008). Processing of social and monetary rewards in the human striatum. *Neuron*, 58(2), 284–294. <https://doi.org/10.1016/j.neuron.2008.03.020>.

³⁹ Izuma, K., Saito, D. N., & Sadato, N. (2008). Processing of social and monetary rewards in the human striatum. *Neuron*, 58(2), 284–294. <https://doi.org/10.1016/j.neuron.2008.03.020>, at p. 284.

⁴⁰ Sherman, L. E., Payton, A. A., Hernandez, L. M., Greenfield, P. M., & Dapretto, M. (2016). The Power of the Like in Adolescence: Effects of Peer Influence on Neural and Behavioral Responses to Social Media. *Psychological science*, 27(7), 1027–1035. <https://doi.org/10.1177/0956797616645673>, at p. 1027.

social media through *likes* and other similar design features increases the potency of the medium.

- iv. Davey and colleagues found that being “liked” in a mode akin to social media activates the brain’s reward pathway.⁴¹
- v. In 2011, Kim et al., published a brain imaging study showing similar effects on the dopamine brain reward system with digital media addiction as seen with other forms of addiction, specifically down-regulation of D2 dopamine receptors in the ventral striatum (reward circuitry). In their study “Reduced Striatal D2 Dopamine receptors in People with Internet Addiction,”⁴² the authors’ state, “An increasing amount of research has suggested that Internet addiction is associated with abnormalities in the dopaminergic brain system. We hypothesized that Internet addiction would be associated with reduced levels of dopaminergic receptor availability in the striatum compared with controls. To test this hypothesis, a radiolabeled ligand [11C]raclopride and positron emission tomography was used to assess dopamine D2 receptor binding potential in men with and without Internet addiction. Consistent with our prediction, individuals with Internet addiction showed reduced levels of dopamine D2 receptor availability in subdivisions of the striatum including the bilateral dorsal caudate and right putamen. This finding contributes to the understanding of neurobiological mechanism of Internet addiction.”⁴³
- vi. Eva Telzer and colleagues have shown that addiction-like social media use (ASMU) at baseline in adolescents is associated with decreased sensitivity to positive social media cues two years later, consistent with the development of tolerance, the result of neuroadaptation as described.⁴⁴ Like with other addictive substances and behaviors, the more we expose our brains to a reinforcing stimulus, the more likely we are to develop tolerance to that stimulus, needing more of it in more potent forms to get the same effect. “Within a longitudinal design, 103 adolescents completed a social incentive delay task during 1–3 fMRI scans (6–9th grade), and a 4th self-report assessment of ASMU and

⁴¹ Davey, C. G., Allen, N. B., Harrison, B. J., Dwyer, D. B., & Yücel, M. (2010). Being liked activates primary reward and midline self-related brain regions. *Human brain mapping*, 31(4), 660–668. <https://doi.org/10.1002/hbm.20895>

⁴² Kim, S. H., Baik, S. H., Park, C. S., Kim, S. J., Choi, S. W., & Kim, S. E. (2011). Reduced striatal dopamine D2 receptors in people with Internet addiction. *Neuroreport*, 22(8), 407–411. <https://doi.org/10.1097/WNR.0b013e328346e16e>

⁴³ Kim, S. H., Baik, S. H., Park, C. S., Kim, S. J., Choi, S. W., & Kim, S. E. (2011). Reduced striatal dopamine D2 receptors in people with Internet addiction. *Neuroreport*, 22(8), 407–411. <https://doi.org/10.1097/WNR.0b013e328346e16e>, at p. 407.

⁴⁴ Flannery, J. S., Burnell, K., Kwon, S. J., Jorgensen, N. A., Prinstein, M. J., Lindquist, K. A., & Telzer, E. H. (2024). Developmental changes in brain function linked with addiction-like social media use two years later. *Social cognitive and affective neuroscience*, 19(1), nsae008. <https://doi.org/10.1093/scan/nsae008>

depressive symptoms ~2 years later (10–11th grade). We assessed ASMU effects on brain responsivity to positive social feedback across puberty and relationships between brain responsivity development, ASMU symptoms, and depressive symptoms while considering gender effects. Findings demonstrate decreasing responsivity, across puberty, in the ventral media prefrontal cortex, medial prefrontal cortex, posterior cingulate cortex, and right inferior frontal gyrus associated with higher ASMU symptoms over 2 years later.”⁴⁵

- g. The risk of addiction, including to social media, increases with easier access, a larger quantity, higher potency, more novelty, and an element of uncertainty (gamblification).
 - i. Access (How Easy): Decades of addiction research have shown that when an addictive substance or behavior is more readily available, more people use it and more people get addicted to it.⁴⁶ Not everyone who is exposed to an addictive substance or behavior will develop addiction, but a consistent subset of the population will. Some individuals, including youth, are more vulnerable than others. Defendants have made it easy for kids and teens to access their social media products with few or no guardrails, thereby increasing the risk of social media addiction in youth.
 - ii. Quantity (How Much): The more the brain is exposed to an addictive substance or behavior, the higher the risk of addiction to that substance or behavior. Defendants’ social media products are inherently designed to maximize quantity through design features like *endless scroll/infinite scroll* and *autoplay*, increasing the risk of addiction and other mental health harms. The inventor of infinite scroll, Aza Raskin, stated infinite scroll is one of the “behavioral design loops that create some totality of, you know, digital cocaine.”⁴⁷ A report from Amnesty International on young people ages 13-24 found “a staggering 74% of respondents report checking their social media accounts more than they would like to. Respondents bemoaned the ‘addictive’ lure of the constant stream of notifications and targeted recommendations, often feeling ‘overstimulated’ and ‘distracted.’”⁴⁸

⁴⁵ Flannery, J. S., Burnell, K., Kwon, S. J., Jorgensen, N. A., Prinstein, M. J., Lindquist, K. A., & Telzer, E. H. (2024). Developmental changes in brain function linked with addiction-like social media use two years later. *Social cognitive and affective neuroscience*, 19(1), nsae008. <https://doi.org/10.1093/scan/nsae008>, at p. 1.

⁴⁶ The North American opioid epidemic is a prime example of this phenomenon, and there are many others.

⁴⁷ Deposition of Aza Raskin, March 17, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 71;17-75:-7.

⁴⁸ Amnesty International. (2023, February 13). “We are totally exposed”: Young people share concerns about social media’s impact on privacy and mental health in global survey. <https://www.amnesty.org/en/latest/news/2023/02/children-young-people-social-media-survey-2/>

- iii. Potency (How Strong): The more potent a drug or behavior, the more likely it is to be addictive.⁴⁹ Defendants' social media exploit the inherently rewarding human need for social reciprocity, social validation, and group affiliation through a rapid feedback loop of *posts*, *likes*, *shares*, and *comments*, enumerated at scale. The *algorithmic feed* optimizes for engagement, including time spent on the platform. Time spent, especially to the exclusion of other activities the individual could or should be doing, is one measure of the potency of social media. Just as people can develop tolerance to social media, they can also experience withdrawal, often in the form of *FOMO*, *fear of missing out*, another common reason young users give for staying on social media platforms longer than they want to.⁵⁰ FOMO is a dysphoric (negative) mental state consistent with negative reinforcement, i.e. engaging in a behavior to stop feeling bad, in contrast to positive reinforcement, i.e. engaging in a behavior to feel good.⁵¹ Addiction often begins with positive reinforcement but progresses over time to negative reinforcement as the brain needs more of the substance or behavior in more potent forms and larger quantities to get the same response.
- iv. Novelty (How New): The brain's reward pathway is highly sensitive to new information and experiences.⁵² Through features like *notifications*, Defendants' social media products alert the user to new posts, thereby promoting ongoing engagement or re-engagement with the product, even when the user has directed their attention elsewhere. Notifications function as Pavlovian cues (conditioned stimulus) that perpetuate the addiction cycle by creating the anticipation of reward (unconditioned stimulus) that drives the motivation to get the drug or engage in the behavior.⁵³ Conditioned cues release dopamine in the brain's reward pathway in anticipation of future reward, setting up the cycle of anticipation, withdrawal, and craving that leads to addiction.⁵⁴

⁴⁹ NIDA. 2020, July 6. Drug Misuse and Addiction. Retrieved from <https://nida.nih.gov/publications/drugs-brains-behavior-science-addiction/drug-misuse-addiction> on 2025, March 29

⁵⁰ Alutaybi A, Al-Thani D, McAlaney J, Ali R. Combating Fear of Missing Out (FoMO) on Social Media: The FoMO-R Method. *Int J Environ Res Public Health*. 2020 Aug 23;17(17):6128. doi: 10.3390/ijerph17176128. PMID: 32842553; PMCID: PMC7504117.

⁵¹ Wise RA, Koob GF. The development and maintenance of drug addiction. *Neuropsychopharmacology*. 2014 Jan;39(2):254-62. doi: 10.1038/npp.2013.261. Epub 2013 Oct 11. PMID: 24121188; PMCID: PMC3870778.

⁵² Costa, V. D., Tran, V. L., Turchi, J., & Averbeck, B. B. (2014). Dopamine modulates novelty seeking behavior during decision making. *Behavioral Neuroscience*, 128(5), 556–566. <https://doi.org/10.1037/a0037128>

⁵³ Robinson, M. J., Anselme, P., Fischer, A. M., & Berridge, K. C. (2014). Initial uncertainty in Pavlovian reward prediction persistently elevates incentive salience and extends sign-tracking to normally unattractive cues. *Behavioural brain research*, 266, 119–130. <https://doi.org/10.1016/j.bbr.2014.03.004>;

⁵⁴ Schultz, W., Dayan, P., & Montague, P. R. (1997). A neural substrate of prediction and reward. *Science (New York, N.Y.)*, 275(5306), 1593–1599. <https://doi.org/10.1126/science.275.5306.1593>;
See Haugen_00010114 at Haugen_00010127.

- v. Uncertainty (How Likely): Studies indicate that uncertain rewards are more reinforcing than certain rewards.⁵⁵ By definition, gambling relies on uncertain rewards.⁵⁶ Defendants' social media products create uncertain rewards through design features such as the *mystery of the algorithm*, *ephemeral content*, and unpredictable awards, thereby gamblifying social media and contributing to the increased risk of social media addiction.
- h. Children and adolescents are especially vulnerable to the addictive nature of social media because of their sensitivity to social cues and their preference for short term, risky rewards.
 - i. Adolescents are sensitive to social cues. From an evolutionary perspective this makes sense: Adolescence is the time to search for and find reproductive partners. In experimental paradigms, adolescents show heightened responses to positive and negative social feedback.⁵⁷ After experiencing negative social feedback, teens report a greater drop in mood and more anxiety than adults.⁵⁸
 - ii. Social evaluation situations in adolescents cause a greater stress response (heightened response in the autonomic nervous systems as indexed by skin conductance) than in adults, and more feelings of self-consciousness.⁵⁹ While ostensibly being viewed by a peer in a live video feed, adolescents self-reported rapidly rising embarrassment which was correlated with distinct changes in brain imaging in key structures for integrating emotional and social information.⁶⁰ This response "drastically" increased during adolescence and subsided into adulthood.⁶¹
 - iii. At the same time that teenagers have a fine-tuned sensitivity for social cues, the prefrontal cortex, essential for regulating and tempering appetites and impulses, is still not fully connected to the subcortical

⁵⁵ Shen, L., Fishbach, A., & Hsee, C. K. (2015). The motivating-uncertainty effect: Uncertainty increases resource investment in the process of reward pursuit. *Journal of Consumer Research*, 41(5), 1301–1315. <https://doi.org/10.1086/679418>

⁵⁶ Linnet, J., Thomsen, K. R., Møller, A., & Callesen, M. B. (2010). Event frequency, excitement and desire to gamble, among pathological gamblers. *International Gambling Studies*, 10(2), 177–188. <https://doi.org/10.1080/14459795.2010.502181>

⁵⁷ Somerville, L. H. (2013). The Teenage Brain: Sensitivity to Social Evaluation. *Current Directions in Psychological Science*, 22(2), 121–127. <https://doi.org/10.1177/0963721413476512>

⁵⁸ Somerville, L. H. (2013). The Teenage Brain: Sensitivity to Social Evaluation. *Current Directions in Psychological Science*, 22(2), 121–127. <https://doi.org/10.1177/0963721413476512>

⁵⁹ Somerville, L. H. (2013). The Teenage Brain: Sensitivity to Social Evaluation. *Current Directions in Psychological Science*, 22(2), 121–127. <https://doi.org/10.1177/0963721413476512>, at p. 124.

⁶⁰ Somerville, L. H. (2013). The Teenage Brain: Sensitivity to Social Evaluation. *Current Directions in Psychological Science*, 22(2), 121–127. <https://doi.org/10.1177/0963721413476512>, at p. 124.

⁶¹ Somerville, L. H. (2013). The Teenage Brain: Sensitivity to Social Evaluation. *Current Directions in Psychological Science*, 22(2), 121–127. <https://doi.org/10.1177/0963721413476512>, at p. 124.

emotion processing centers of the brain that drive appetite and impulses. Hence, teenagers are less able to exert cognitive or emotional control, especially in socially salient situations. Teens are more inclined to engage in risky behaviors, which has been linked to the mesolimbic system, including the ventral striatum, a key nucleus in the brain's reward circuitry.⁶² Teens experience an influx of pubertal hormones which themselves have an impact on neurotransmitters and circuits, especially those involved in socio-affective response and regulation.⁶³

- iv. Evidence shows that just like with drugs and alcohol, the earlier a child is exposed to social media, the more likely they are to develop social media addiction.⁶⁴
- i. I am familiar with the National Academies of Sciences, Engineering, and Medicine (NASEM) 2024 report, entitled, "Social Media and Adolescent Health."⁶⁵ NASEM reports contribute to scientific knowledge, and each NASEM Report is the result of a particular committee at a particular point in time and must be considered on its own merits. Certain aspects of the NASEM 2024 Report are pertinent to my opinions in this case, as set forth below.
- i. The NASEM Report includes an important summary that supports my opinion that Defendants' social media products are designed to be addictive, and that such product designs are part of the revenue-generating business model: "Social media include a broad range of features that facilitate social interaction online; platforms vary widely in their target audiences, purposes, and design. For this reason, it is important to understand platform features, often called affordances, and how they interact with different developmental stages. Some affordances are powered by computational algorithms, a set of instructions that a program follows to solve a problem or perform a task. Algorithms are used for generating recommendations and determining the rank in which content is displayed, for targeting ads,

⁶² Bjork, J. M., Knutson, B., Fong, G. W., Caggiano, D. M., Bennett, S. M., & Hommer, D. W. (2004). Incentive-elicited brain activation in adolescents: similarities and differences from young adults. *The Journal of neuroscience : the official journal of the Society for Neuroscience*, 24(8), 1793–1802. <https://doi.org/10.1523/JNEUROSCI.4862-03.2004>

⁶³ Shaw, P., Kabani, N. J., Lerch, J. P., Eckstrand, K., Lenroot, R., Gogtay, N., Greenstein, D., Clasen, L., Evans, A., Rapoport, J. L., Giedd, J. N., & Wise, S. P. (2008). Neurodevelopmental trajectories of the human cerebral cortex. *The Journal of neuroscience : the official journal of the Society for Neuroscience*, 28(14), 3586–3594. <https://doi.org/10.1523/JNEUROSCI.5309-07.2008>; Somerville, L. H., Hare, T., & Casey, B. J. (2011). Frontostriatal maturation predicts cognitive control failure to appetitive cues in adolescents. *Journal of cognitive neuroscience*, 23(9), 2123–2134. <https://doi.org/10.1162/jocn.2010.21572>

⁶⁴ Schou Andreassen, C., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of addictive behaviors : journal of the Society of Psychologists in Addictive Behaviors*, 30(2), 252–262. <https://doi.org/10.1037/adb0000160>

⁶⁵ National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27396>.

and for content moderation. *In a larger sense, algorithms, which are generally proprietary, serve the end goals of keeping users engaged for as long as possible and generating revenue.*”⁶⁶

- ii. The 2024 NASEM Report also highlights that Defendants’ efforts to attribute harmful effects to “content,” as opposed to product design, are unpersuasive, in that the addictive design is a significant reason why the platforms are harmful: “There are several ways in which platform algorithms can influence health. *While an algorithm may be innocuous, the way it presents content can be harmful, with more sensational and provocative posts given higher priority in users’ feeds, especially if the user has responded to a similar type of post in the past. This practice has the potential to create distortions and give rise to recursive feedback loops.* Recursive feedback can, in turn, exacerbate problems with harmful content and misinformation. Recursive feedback can also promote any number of fringe views from unscientific health treatments to conspiracy theories.”⁶⁷
- iii. The NASEM Report appears to recognize the existence of the condition of Social Media Use Disorder, as either an independent diagnosis or part of the same condition as Internet gaming disorder: “Heavy users of online video games can develop a dysfunctional behavior related to games, characterized by a persistent pattern of impaired control over the need to play, to the point where gaming takes precedence over all other life activities. Given that gaming disorder is defined by dysfunction, it is not surprising that many studies find evidence that the disorder predicts depression, anxiety, social phobia, poor school performance, sleep disruption, and poor relationships with parents and peers. Although less well studied, a dysfunctional use of social media appears to be a similar problem. *It is currently unclear whether problematic social media use and gaming disorder are distinct disorders or are simply different manifestations of a similar disordered use of technology.*”⁶⁸
- iv. The NASEM report states that the literature does not support the conclusion that social media are harmful “at the population level.”⁶⁹

⁶⁶ National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27396>, at p. 2. (emphasis added)

⁶⁷ National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27396>, at pp. 2-3. (emphasis added)

⁶⁸ National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27396>, at p. 6. (emphasis added)

⁶⁹ National Academies of Sciences, Engineering, and Medicine. 2024. Social media and adolescent health. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27396>, at p. 5.

However, that conclusion is undermined by the other statements excerpted above, which do support that conclusion.

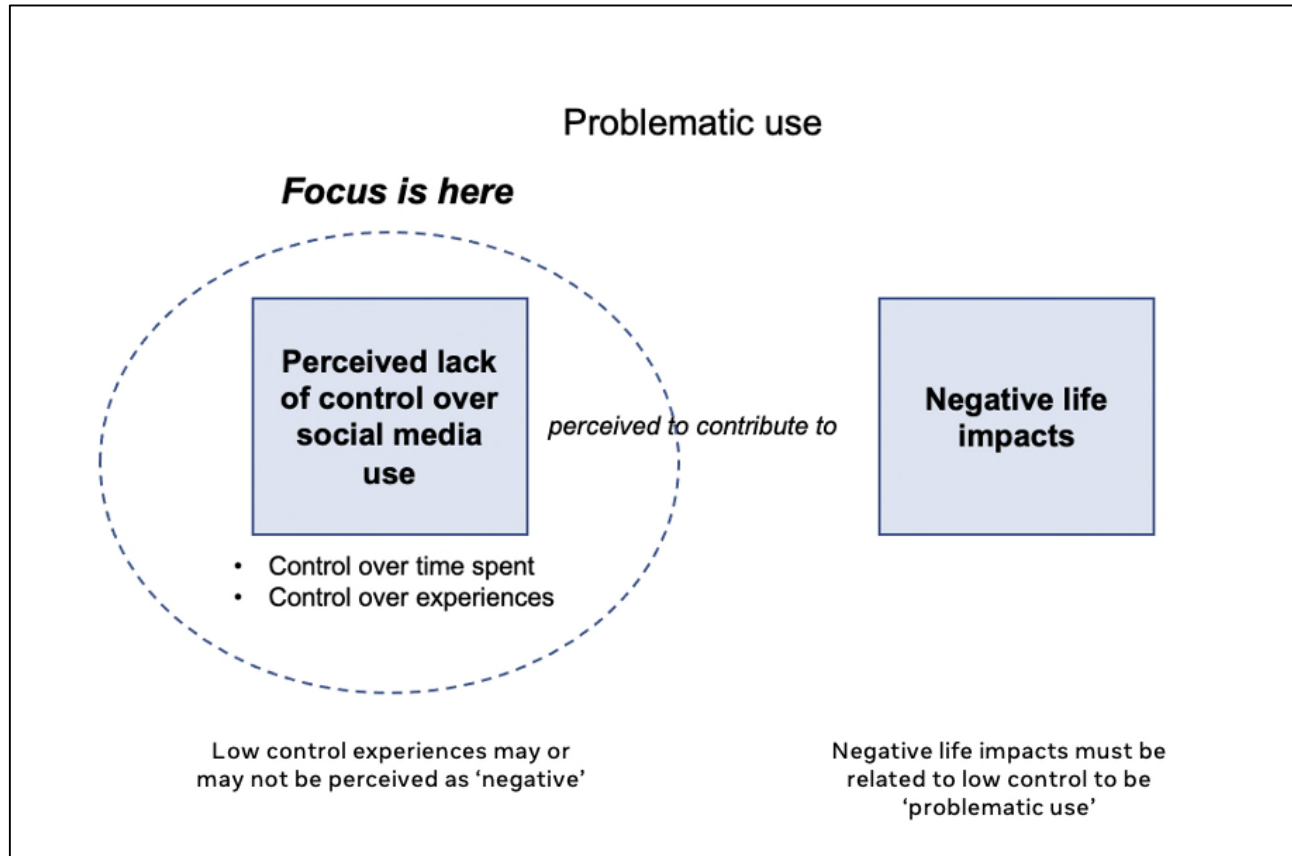
- v. Finally, the 2024 NASEM Report has been criticized for its inadequate public health presentation on the Committee, as well as its inclusion of members with financial ties to industry: “What was equally surprising was that NASEM appointed two experts to this committee who had received funding from industry. [Citations omitted]. These conflicts of interest reduce the integrity of the committee and the report it was charged with writing. Those trained in public health, especially those in tobacco control, alcohol prevention, nutrition, and gun violence prevention, are familiar with the importance of qualifying research from industry-funded scientists. The conclusions and recommendations found in the report should be considered with these committee members’ conflicts of interest in mind. For decades, industry-funded research has muddied the waters of the scientific literature, casting doubt on the harms to society caused by tobacco, guns, and alcohol. Those trained in schools of public health are often taught about the lengths the tobacco, firearm, and alcohol industries have gone to discredit public health research. To accomplish this, each industry has funded research and researchers to produce studies that contradict (i.e., sow doubt about) the prevailing evidence on a topic area. The ability to sow doubt has cascading effects on public opinion and agenda setting at the legislative level. Therefore, NASEM committees charged with understanding and summarizing issues of public concern, and with providing recommendations for (in)action by the government, should be free of members with conflicts of interest.”⁷⁰

4. Defendants exploit behavioral reward mechanisms with their addictive and unsafe social media products targeted at kids. Defendants’ own documents provide evidence that their social media products are addictive.

- a. **Meta** exploits behavioral reward mechanisms with its addictive and unsafe social media products targeted at kids.
 - i. Meta’s internal definition of “Problematic Use (PU)” aligns closely with accepted definitions of social media addiction. A Meta presentation from 2023 elaborates on Meta’s definition of “Problematic Use” as follows: “A perceived lack of control over usage of a technology or social media platform *and* this lack of control is perceived to lead to negative life impacts (e.g., in domains such as

⁷⁰ Allem J. P. (2024). Social Media and Adolescent Health. American journal of public health, 114(10), 980–982. <https://doi.org/10.2105/AJPH.2024.307784>, at p. 980.

relationships, work/school, sleep, etc).”⁷¹ See figure⁷² below for a graphic of Meta’s definition of Problematic Use:



- A. Meta’s definition includes room for lack of awareness of addictive symptoms: “Low control experiences may or may not be perceived as ‘negative.’”⁷³ Similarly, ASAM states addiction is characterized by “diminished recognition of significant problems with one’s behaviors and interpersonal relationships.”⁷⁴
- B. Meta’s definition of Problematic Use also acknowledges multiple adverse life impacts as “related to low control,”⁷⁵ drawing a causal connection between problematic, addictive use, and negative life consequences.

⁷¹ METANMAG-007-00214892 at *17 (produced natively).

⁷² METANMAG-007-00214892 at *17 (produced natively).

⁷³ METANMAG-007-00214892 at *17 (produced natively).

⁷⁴ American Society of Addiction Medicine. (2011. August 15). Public Policy Statement: Short Definition of Addiction. https://web.archive.org/web/20181007192411/https://www.asam.org/docs/default-source/public-policy-statements/1definition_of_addiction_short_4-11.pdf?sfvrsn=6e36cc2_0

⁷⁵ METANMAG-007-00214892 at *17 (produced natively).

- C. An Internal Meta study of problematic Facebook use, entitled, “Understanding Perceptions of Problematic Facebook Use,” used the “Bergen Social Media Addiction Scale,”⁷⁶ lending further credibility to the idea that Meta’s “Problematic Use” is synonymous with social media addiction. Specifically, the Bergen Scale “was developed on the basis of the addiction theory, which measures addiction through six core components: salience, tolerance, mood modification, relapse, withdrawal, and conflict....”⁷⁷
- D. Further, Meta’s internal researchers and reviewers of Cheng et al’s Problematic Use study called out the false distinction the authors make between problematic use and addictive use (see below), highlighting that Meta’s own thought-leaders understood problematic use and addiction to be the same thing or so closely related as to make distinction difficult. (Note the lines through the text are as in the document itself)

Difference between “problematic use” and “addiction” (point of confusion to clarify):

- IAC: “R3 also asks how for clarification around how the problematic use of Facebook is different from Internet addictions. R1 also expressed concern on equating problematic internet use and internet addiction. If this is the case then R1 questions why not frame the paper around internet addiction and discuss the literature present on that aspect. I encourage the authors to clarify in the rebuttal how they differentiate between these two terms in the paper and to address this point.”
- 2AC: “I wonder how is the problematic use of Facebook different from Internet addictions?”
- R1: “why does this study frame itself around problematic use rather than around internet addiction, which is a term that might resonate with more lay readers and can also be tied to literature on addiction more closely?”

- A. In response to the question, “How common is problematic use?”, Meta’s own research found that 13% of people report two or more instances of problematic use, and “the single most important variable correlating with problematic use is age.”⁷⁸
- B. In sum, in my opinion, Meta’s definition and usage of “Problematic Use” is closely akin, if not equivalent, to social media addiction.

⁷⁶ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>

⁷⁷ Danish Competition and Consumer Authority. (2025). Young consumers and social media. <https://www.em.dk/Media/638744252848589136/KFST%20analyse%20-%20Young-consumers-and-social-media.pdf>, at p. 23.

⁷⁸ METANMAG-002-00678376 at METANMAG-002-00678377.

ii. Access (How Easy):

- A. Meta has made it easy for young users to access their social media content. Anyone at any age, including kids under the age of 13, can create a Facebook or Instagram account by providing an incorrect birthdate as there is no age verification process.⁷⁹
- B. Facebook's own internal documents attest to the easy accessibility of its rewards as follows: "Facebook's rewards are easily accessible, available all the time, limitless, and don't include built-in controls. For people who tend to have difficulty regulating their consumption of rewards, it may be easy to use Facebook too much."⁸⁰
- C. Instagram's internal documents describe teens as "an IG [Instagram] priority audience" and state "16% of creators in the total addressable market ... are teens."⁸¹
- D. Facebook's internal study of problematic Facebook use found that "Being younger, as well as being more constantly active on Facebook throughout the day ... are most indicative of increased problematic use."⁸²

iii. Quantity (How Much):

- A. Meta's social media products include numerous design features that increase quantity, for example endless scroll and autoplay.
- B. A Meta internal document describes why consumers "spend more time than [they'd] like on Instagram/FB/Oculus," noting the "Infinite scroll, auto-play videos, losing track of time." With autoplay, one video rolls directly into the next, such that the user has to do work to *stop* using, rather than the other way around.⁸³
- C. As one Facebook user reported, "I lose track of time. Especially with the videos. Wow, I spend a lot of time on the videos

⁷⁹ Gold, A. (2023, March 6). Tech platforms struggle to verify their users' age. Axios. <https://www.axios.com/2023/03/06/age-checks-online-children-social-media-privacy>; See METANMAG-002-02003448 at METANMAG-002-02003469.

⁸⁰ METANMAG-002-01338514 at METANMAG-002-01338537

⁸¹ METANMAG-028-00118695 at METANMAG-028-00118731.

⁸² METANMAG-003-00405477 at METANMAG-003-00405484.

⁸³ METANMAG-015-00030753 at METANMAG-015-00030777.

because they start automatically and when I realize it, I'm already watching.”⁸⁴

- D. An internal Instagram document on targeting addictive use of social media cites “Overall amount of time spent,” as a key feature of problematic use.⁸⁵ An email to Head of Instagram Adam Mosseri stated that Instagram’s “overall goal remains total teen time spent.”⁸⁶ Meta CEO Mark Zuckerberg admitted that Meta set specific goals for time spent on their platforms, contrary to his statements to Congress denying this fact.⁸⁷
- E. A study by Shakya and Christakis found a clear link between time spent on Facebook use and worsened mental health, based on objective measures of Facebook engagement, i.e. “the number of Facebook friends they had (‘friend count’), the number of times in their history of Facebook use that they had clicked ‘like’ on someone else’s content (‘lifetime like count’), the number of links they had clicked in the past 30 days (‘30-day link count’), and the number of times they had updated their status in the past 30 days (‘status count’).”⁸⁸ The authors concluded that it is not the content per se but the sheer amount of time spent on Facebook that creates the harm, including opportunity costs, that is, decreased engagement in healthy activities due to time spent on Facebook: “... our models cannot identify the mechanisms by which Facebook use may lead to reduced well-being. Although ‘liking’ other people’s content could be reflective of attention to other’s positive posts, which could lead to negative self-comparison, updating one’s own status and clicking links would seem to suggest that the relationships we found are simply a matter of quantity of use. If this is the case, our results are in contrast to those from previous research asserting that the quantity of social media interaction is irrelevant and that only the quality of those interactions matter. *Large quantities of social media*

⁸⁴ METANMAG-015-00030753 at METANMAG-015-00030777.

⁸⁵ METANMAG-028-00118695 at METANMAG-028-00118712.

⁸⁶ METANMAG-002-00534915.

⁸⁷ Deposition of Mark Zuckerberg, Volume I, March 27, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 171:12-194:8.

⁸⁸ Shakya, H. B., & Christakis, N. A. (2017). Association of Facebook Use With Compromised Well-Being: A Longitudinal Study. *American journal of epidemiology*, 185(3), 203–211. <https://doi.org/10.1093/aje/kww189>, at p. 205.

interaction may indeed detract from more meaningful real life experiences.”⁸⁹

- F. Meta’s own researchers found that “measures of time spent also correlate positively with increased problematic use. People reporting problematic use are on Facebook at a wider variety of times in the day (even after controlling for time spent), and also open Facebook more frequently (i.e. having a greater number of sessions or periods of continuous use.)”⁹⁰
- G. Is problematic use a function of using Facebook and Instagram for too long? Meta’s researchers conclude, “Overall yes.” “People with problematic use (those who report two or more problematic use cases) do spend more time on Facebook ~42 hours in the past 28 days vs. ~35 hours).” And “On average, people spent 28% more time on Instagram as well. Notably, people who report that their use of Facebook is problematic tend to spend a larger fraction of time using Instagram (if they are also on Instagram).”⁹¹
- H. But in response to the question, “Is problematic use simply a factor of using Facebook too long?”, Meta researchers responded, “Not quite.... People who spend the least amount of time on Facebook (< 9 hours per month) also report problematic use at a substantial rate,” noting that it’s *how* they use Meta’s platforms that matters.⁹²
- I. In relation to Instagram, Meta’s researchers note the dangers of ‘spiraling,’ which they describe as, “the general (negative) experience from continuously browsing similar content (and so would manifest on app as similar content chaining, browsing similar content on explore/profiles/etc.)”⁹³

iv. Potency (How Strong):

- A. Meta’s social media products include many features that contribute to its interactive potency, such as *posts*, *likes*, *shares*, and *comments*, enumerated at scale.

⁸⁹ Shakya, H. B., & Christakis, N. A. (2017). Association of Facebook Use With Compromised Well-Being: A Longitudinal Study. *American journal of epidemiology*, 185(3), 203–211. <https://doi.org/10.1093/aje/kww189>, at p. 210 (emphasis added).

⁹⁰ METANMAG-003-00405477 at METANMAG-003-00405480-81.

⁹¹ METANMAG-002-00678376 at METANMAG-002-00678377.

⁹² METANMAG-002-00678376 at METANMAG-002-00678377.

⁹³ METANMAG-002-00080155 at METANMAG-002-00080156.

- B. Meta’s own researchers, Justin Cheng, Moira Burke, and Elena Goetz Davis, performed an internal Facebook Study, “Understanding Perceptions of Problematic Facebook Use,” in which they paired “a survey of 20,000 Facebook users in the U.S. measuring perceived problematic Facebook use with server logs of aggregated behavioral data for the previous four weeks, such as the amount of time respondents spent on the site and counts of interactions with close friends.”⁹⁴ They found that 3.1% of U.S. Facebook users developed severe social media addiction,⁹⁵ while an internal document reported an additional finding that 55% of Facebook users developed mild social media addiction.⁹⁶
- C. The survey consisted of the following questions “adapted from existing literature and questions from academia on Internet addiction and problematic use,” lending further credence to the idea that Meta’s definition of problematic use is synonymous with addictive use. Each question below was measured on a 4 or 5-point Likert scale, with cut-offs at 4 or 5 to signal “problematic use.” For example, reporting losing sleep “very often” or “always” was considered problematic. Less than that was not. For each person, they counted the number of questions where participants reported a problem.⁹⁷
- I. “How do you feel about how much time you spend on Facebook?” This question gets at the *C= out-of-control* use diagnostic criterion for an addictive use disorder, with those reporting feeling dismayed about time spent on Facebook more likely to have an addiction.
- II. “How much control do you feel you have over the amount of time you spend on Facebook?” This question addresses the *C=out-of-control use* directly, eliminating any ambiguity about what might be meant by feeling badly about time spent.
- III. “Overall, do you feel like Facebook has had a positive or negative impact in your life?” This question gets right to

⁹⁴ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>.

⁹⁵ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>.

⁹⁶ METANMAG-007-00396731.

⁹⁷ METANMAG-003-00405477.

the heart of *C=consequences* related to Facebook use, another diagnostic criterion for an addictive use disorder.

- IV. “How often, if ever, do you try to reduce use of Facebook?” This question gets at the *C=compulsions* diagnostic criterion, that is the loss of agency in addiction, where the individual is using more than they want to.
 - V. “How often do you get less sleep than you want because you're using Facebook?” This question gets at the *C=consequences* criterion for diagnosing an addictive use disorder.
 - VI. “Overall, how much does your use of Facebook hurt your relationships with others?” This question gets at the *C=consequences* criterion for diagnosing an addictive use disorder.
 - VII. “To what extent does Facebook help or hurt your work or school performance?” This question gets at the *C=consequences* criterion for diagnosing an addictive use disorder.
 - VIII. “How concerned are you about missing important posts on Facebook if you don't log in frequently enough?” This question gets at the *C=craving* diagnostic criterion, describing states of wanting the drug when not using.
- D. Cheng and colleagues found that 36% of respondents report one or more problematic use case, and 13% of respondents report two or more problematic use cases. They then “divided participants into two groups: (1) Those reporting 2 or more problematic use cases, and (2) those who don't [report two or more problematic use cases], and compare their demographics and activities on Facebook.” This tells us up front that the internal Meta study left out Facebook users who experience high level problematic use in one area, representing the larger share of problematic users, such that their findings of problematic users do not include the full spectrum of problematic use, but only the more severe cases. Therefore, when in this memo the authors write, “Prevalence of problematic use is low (13% of respondents),” it should be noted that 13% prevalence is not considered low when citing to the medical literature and further that by their own definition of problematic use, they are leaving out 36% of

respondents who reported one or more problematic use cases.⁹⁸

- E. Cheng and colleagues found that “People reporting problematic use spend more time on the site (42 vs. 36 hours in a month); receive more notifications and respond to them more quickly; have more sessions and log in to FB at a wider variety of times of day; are more likely to deactivate (and reactivate).”⁹⁹ These findings provide further evidence of the addictive features of the platform beyond content. The authors found that, “Teens and people in their 20s are the most likely to report problematic use, even though they spend a little less time on the site than other adults (people in their mid~30s or above).”¹⁰⁰
- F. Further, the authors found that, “[c]ontrary to stereotypes of people scrolling through endless content, people who experience problematic use spend proportionally less time in Their News Feeds and more time browsing profiles, and message others more frequently.”¹⁰¹ This illustrates the interactive nature of Facebook as central to its reinforcing properties.
- G. Highlighting the reward expectation loop of Meta’s addictive products, the authors describe that “people experiencing problematic use...sent 62.7% more messages than those who are not experiencing problematic use ($d = 0.20$, $p < 0.001$) (Figure 3d), despite spending only 21.6% more time overall on Facebook. Normalizing by the amount of time spent on the site, they sent 38.7% more messages per hour ($d = 0.19$, $p < 0.001$). They were also 36.7% more likely to have sent more messages than they received ($d = 0.19$, $p < 0.01$).”¹⁰²
- H. The Cheng et al “Understanding Perceptions of Problematic Facebook Use” study was peer reviewed by Meta’s internal experts and the authors provided with extensive commentary

⁹⁸ METANMAG-003-00405477 at METANMAG-003-00405478.

⁹⁹ METANMAG-003-00405477 at METANMAG-003-00405478.

¹⁰⁰ METANMAG-003-00405477 at METANMAG-003-00405478.

¹⁰¹ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>.

¹⁰² Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>.

and feedback.¹⁰³ Some of the feedback from internal reviewers included the following:

- I. "The interpretation of people viewing friends' profiles as seeking connection seems overly positive to me. My interpretation of this would be related to social comparison, or colloquially ('Facebook stalking') which both seem more likely to be associated with problematic behaviors than seeking connection. I'd like to see a more multi-faceted and balanced interpretation of these kinds of data." In other words, this Meta reviewer directly calls out the overly rosy interpretation of these data and identifies the time spent viewing profiles as part of a potentially harmful feedback loop.
- II. "This paper misses some opportunity to use multiple waves of data and/or make causal claims about behavior. One might expect a sequence of causal relationships between posting a photo, receiving notifications, and time on site, and an increase in reports of problematic use at that time. Or perhaps the increased report of problematic use would trigger the post-notifications pair (i.e., people posting to feel better about themselves)." This reviewer's comments make clear that these data are sufficient to make causal claims about the platform's design features and the harms they can cause, bringing attention to Meta's failure of corporate responsibility, as well as the need for releasing these data to the research community to pursue this important line of research.
- I. The Cheng et al "Understanding Perceptions of Problematic Facebook Use" study was presented in *CHI Conference on Human Factors in Computing Systems Proceedings* (CHI 2019), May 4-9, 2019, Glasgow, Scotland UK. ACM, New York, NY, USA, 13 pages.
<https://doi.org/10.1145/3290605.3300429>.
- J. The Cheng et al "Understanding Perceptions of Problematic Facebook Use" study and other related findings were shared company-wide. A document written by Justin Cheng and Moira Burke, dated June 7, 2016, entitled *Problematic Facebook Use* discusses the data from this study and attests

¹⁰³ METANMAG-003-00406531.

“Our well-being findings have been presented at the H2 2017 Company All-Hands, earning calls, and before Congress.”¹⁰⁴

- K. Meta internal documents (see below for partial list) further show that the Cheng et al study is part of a larger body of research conducted by Facebook (Meta) on the impact of their products on well-being, including extensive reviews of the medical literature and consultation with experts in the field. In other words, this study is not a casual commentary by non-experts.¹⁰⁵ The authors summarize their study methodology as follows: “We have a survey to detect problematic use that is deeply rooted in external academic as well as internal quantitative and qualitative user experience research;” and “We have broken down problematic use sub-areas into time-related and content-related issues, thus making it easier to move these issues, which likely have different product solutions separately.”¹⁰⁶

Additional Notes

[1] Core Data Science has a long history of well-being research and product design in collaboration with teams across the company.

Some of our past studies include:

- Longitudinal studies showing how well-being changes with Facebook use
 - Hard Questions: Is Spending Time on Social Media Bad for Us? (2018)
 - The History behind MSI (with Eden Litt, Compassion, and Feed)
 - 2017-2018 Longitudinal well-being study (with Ryan Ritter and Matt Killingsworth)
 - Meaningful interactions as a leading indicator for well-being (2018, with Ryan and Matt)
 - The Relationship Between Facebook Use and Well-Being Depends on Communication Type and Tie Strength (2017 JCMC)
 - Online or offline: Connecting with close friends improves well-being (2016 blog post)
 - Internet Use and Psychological Well-Being: Effects of Activity and Audience (2015 CACM)
 - Growing closer on Facebook: Changes in tie strength through site use (CHI 2014)
 - Reading, Writing, Relationships: The Impact of Social Network Sites on Relationships and Well-Being (Moir's 2011 dissertation)
 - Social capital on Facebook: Differentiating uses and users (CHI 2011)
 - Social network activity and social well-being (CHI 2010)

- L. In a follow-up document on Meta's further research on problematic use, including an international sample, Meta researchers expand the list of behavioral manifestation of problematic use (PU), independent of content, writing, “Those higher in PU have more sessions than those low in PU,

¹⁰⁴ METANMAG-003-00405477.

¹⁰⁵ METANMAG-003-00405477 at METANMAG-003-00405485.

¹⁰⁶ METANMAG-005-01047531.

particularly low engagement sessions. Those higher in PU spend more time on Facebook than those low in PU, particularly at night. Those higher in PU respond to more notifications than those low in PU. More repetitive behaviors such as frequent app checks or checking newsfeed several times a session. More feed inventory coming from groups and pages"¹⁰⁷

- M. Meta's internal documents provide evidence that the Cheng et al "Understanding Perceptions of Problematic Facebook Use" study is founded on meaningful data, captures the phenomenology of addiction, separates out content from the addictive design features, and finds that the addictive design features substantially contribute to harm in youth.
- N. Meta's framing of problematic use was applied to Instagram as well, and Meta's researchers exchanged and cross-pollinated research on Facebook to similar researcher conducted on Instagram. For example, this exchange between Facebook and Instagram Meta employees illustrates how Cheng et al's work was used to inform studies of Instagram users: [REDACTED] (10/26/2021 11:55:07 PDT): ">btw, do we have a specific definition for problematic social media use?" Jus-Tin Cheng (10/26/2021 13:33:53 PDT): ">We defined one in a paper: <https://research.fb.com/publications/understanding-perceptions-of-problematic-facebook-use/> (for FB)"; Shruti Bhutada (10/26/2021 14:48:50 PDT): ">Central has a paper too. I can pull these for you"¹⁰⁸
- O. In response to the question, "Do Synchronous Interactions Correlate With Problematic Use?" Meta's internal research found the following: "Internal research suggests that sending and receiving messages are very meaningful interactions that should be encouraged. Online communication can also increase feelings of social support and help develop and grow relationships. On the other hand, prior work has also shown how synchronous, 1-to-1 communication is positively associated with depression. Here, we find that people reporting problematic use spend more time sending and receiving messages per unit time spent on Facebook. So on one hand, while this sending and receiving of messages may be meaningful, its use can also be problematic." These findings by Meta's own internal researchers demonstrate how

¹⁰⁷ METANMAG-005-01047531 at METANMAG-005-01047535.

¹⁰⁸ METANMAG-002-00080155 at METANMAG-002-00080156.

the synchronous interactive design features of the platform are key to its reward potential, and also what contribute to the harm. Importantly, these interactive design features are independent of content. Further in analyzing the impact on topic content, Meta researchers conclude, “... when the topic differences with respect to what someone writes also trends in a similar direction, many differences here are not significant,” again highlighting the harmful effects of design over content.¹⁰⁹

v. Novelty (How New):

- A. Meta’s social media products rely on features like *notifications* to draw the user back into using the social media product when their attention is elsewhere.
- B. Meta’s own researchers describe the impact of notifications as follows: “Notifications may prompt people to use Facebook at times when they wouldn’t have otherwise, thus reducing feelings of control by interrupting other tasks or in-person social interactions. In prior work, interruptions slow task completion [25], inhibit performance on complex tasks [85], and make it difficult to return to a previously interrupted task [70]. Previous research also found that notifications can cause inattention and hyperactivity, which in turn decreases productivity and subjective well-being [58].”¹¹⁰
- C. Facebook’s internal researchers noted that “Problematic Users found it incredibly difficult avoiding notifications compared to those without PU [problematic use]”;¹¹¹ and “The majority intended to have a quick look, but would get hooked by something on FB, losing all track of time.”¹¹²
- D. One Facebook user surveyed by FB said, “Red dots are toxic on the home screen.”¹¹³ Red dots are a form of notification.
- E. Instagram internal documents described “frequent checking,” including “clearing of notifications,” as a key aspect of

¹⁰⁹ METANMAG-002-00678376 at METANMAG-002-00678378.

¹¹⁰ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>.

¹¹¹ METANMAG-015-00030753 at METAMAG-015-00030778.

¹¹² METANMAG-015-00030753 at METAMAG-015-00030779.

¹¹³ METANMAG-015-00030753 at METAMAG-015-00030777.

Instagram Problematic Use (PU).¹¹⁴ The document further described that 42% (74 million) global teens struggle with frequent checking and clearing of notification,¹¹⁵ and “21% of US teen WAU [Weekly Active Users] say notifications make it harder for them to manage the amount of time they spend on the app, and 32% say the number of notifications they receive can be overwhelming.”¹¹⁶

- F. “People reporting problematic use [of Facebook] received 27.4% more notifications than people who did not report problematic use ($d = 0.15$, $p < 0.05$), and responded to a greater fraction of these notifications ($d = 0.18$, $p < 0.01$, Figure 3e, Research Question 4). In particular, they were more likely to respond to notifications when they were about replies to comments they had made ($d = 0.18$, $p < 0.05$).”¹¹⁷ This again highlights the role of notifications in social media addiction.
- G. Facebook users who deactivate their Facebook accounts, a potential proxy for those struggling with addictive, problematic use, both receive more notifications than the average user, and also respond to them faster.¹¹⁸ The fact that some users may deactivate their Facebook accounts does not negate the fact that a substantial population of users is incapable of doing so, due to the addictive nature and design of the platform. Teens are more likely to deactivate their Facebook accounts than adults.¹¹⁹

vi. Uncertainty (How Likely):

- A. Meta’s social media algorithm provides just enough uncertainty, also known as intermittent positive reinforcement, to encourage ongoing engagement in the hope of future reward.¹²⁰ Meta has called the unpredictable nature of social media products the *mystery of the algorithm*.¹²¹ Unpredictable

¹¹⁴ METANMAG-028-00118695 at METANMAG-028-00118744.

¹¹⁵ METANMAG-028-00118695 at METANMAG-028-00118744.

¹¹⁶ METANMAG-028-00118695 at METANMAG-028-00118744.

¹¹⁷ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>.

¹¹⁸ METANMAG-007-00387258 at METANMAG-007-00387265.

¹¹⁹ METANMAG-003-00405477 at METANMAG-003-00405481.

¹²⁰ Robinson, M. J., Anselme, P., Fischer, A. M., & Berridge, K. C. (2014). Initial uncertainty in Pavlovian reward prediction persistently elevates incentive salience and extends sign-tracking to normally unattractive cues. Behavioural brain research, 266, 119–130. <https://doi.org/10.1016/j.bbr.2014.03.004>

¹²¹ METANMAG-015-00030753 at METANMAG-015-00030777.

rewards are more rewarding than predictable ones, which is why social media products can be likened to slot machines in a casino.

- B. Instagram internal documents specifically use the language of slot machines, noting their “pull to refresh” feature wherein, like pulling on a slot machine, users refresh the entire app to see what images and videos are newly suggested. Meta describes this as “Slot machine effect pull down to refresh.”¹²²
- C. Meta employee Albert Hamood commented on a post by Meta’s Tom Cunningham on “reasons why increasing user-engagement might not increase user value,”¹²³ which noted, “(3) Self Control Problems...Finally there are sometimes discrepancies between what people choose and what gives them the most value...There are reasons to worry about self-control and use of our products. I think the biggest problems people have are: (1) compulsive use, to fill gaps in their time, and they end up spending more time than they’d like, instead of spending time with their families, or studying; (2) unhealthy fixating on other people – most prototypically, compulsively looking up the profile of your ex-partner.”¹²⁴ Hamood commented “A lot of (3) sounds like addiction. Addiction (as I was taught!) is characterized by a dissociation between ‘liking’ and ‘wanting.’ The addict self-reports that they do drugs because they like it, but generally it can be revealed that addicts don’t like the drug as much as they used to, before they were addicted. However they want it more, and compulsively seek it, despite suffering harm. Mapping to Tom’s thinking here, wanting can be proxied by engagement, but liking is more like the value we’re after. These dissociate all the time, [sic] and it can happen to anyone. Addiction is challenging to define, and usually refers to behavior that persists despite adverse consequences. It seems clear from what’s presented here that some of our users are addicted to our products. And I worry that driving sessions incentivizes us to make our product more addictive, without providing much more value. How to keep someone returning over and over to the same behavior each day? Intermittent rewards are most effective (think slot machines), reinforcing behaviors that

¹²² METANMAG-005-01853253 at METANMAG-005-01853281, METANMAG-005-01853366.

¹²³ METANMAG-055-00062512

¹²⁴ METANMAG-055-00062512 at METANMAG-055-00062517

become especially hard to extinguish – even when they provide little reward, or cease providing reward at all.”¹²⁵

- vii. Meta’s internal documents attest to the addictive nature of these and other interactive design features as depicted in the figure below:¹²⁶

Current PU Experience

We heard about 10+ triggers contributing to PU habits.

- **Notifications** – Getting too many minor/irrelevant notifications. Try to only look at important ones but get sucked into longer sessions.
- **Entertaining content** – Many said they’d open FB with a clear intent (like checking the news, a specific group, or work-related posts), then get distracted by something entertaining
- **Videos** – Easy to get immersed (especially before bedtime). Auto-play exacerbates the issue.
- **Groups** – Get exponentially more notifications, engaged in chat threads
- **Fear of missing out (FOMO)** – Worry about missing important world news or updates in their social circles.
- **Mystery of the algorithm** – Uncertainty over if they will see posts from those they want; if they can find a post again later.
- **Marketplace / Ads** – Vigilance of buyers/sellers, sales, lower resistance to purchasing at night
- **Recently post/comment** – Higher curiosity to see responses
- **Ephemeral content** (e.g. Stories, birthdays) – Catch it before it’s gone
- **Boredom/free time** – Desire to fill downtime or “time pass”

Red dots are toxic on the home screen.
P4, 25-34 (m) US

People liking things can be addictive. I feel compelled to see who liked it. I think it’s a bad habit because [I’m] always checking.
P2, 45-54 (m) US

The algorithm doesn’t always know what I want to see. I have to do the work to find what I want to see.
P7, 35-44 (f) US

What bothers me the most is getting so entertained; I lose track of time. Especially with the videos. Wow, I spend a lot of time on the videos because they start automatically and when I realize it, I’m already watching.
P1, 29 (f) Brazil

Facebook App Research

- viii. Meta’s internal slide presentation, “Facebook ‘Addiction’: A response to the public narrative based on clinical and neuroscience research,” by Elena Davis, dated June 2018,¹²⁷ tries to make an unpersuasive distinction between habits and addiction to minimize the harms of problematic Facebook use.

- A. Davis identifies design features that contribute to addictive use, such as “notifications with little or no relevance” (novelty/cue-induced cravings), “continuous content without breaks” (quantity/forced abundance), “constant updates including Like counts” (potency through quantified social validation), “lack of feedback about amount of use” (quantity/no natural stopping point), and “signals of

¹²⁵ METANMAG-055-00062512 at METANMAG-055-00062525.

¹²⁶ METANMAG-015-00030753 at METANMAG-015-00030777.

¹²⁷ METANMAG-002-01338514

availability that lead to expectations of quick responses (immediate gratification and expectancy of reward).”¹²⁸

- B. Davis acknowledges that “Facebook may be rewarding and habit-forming. Therefore some people may experience genuine problems related to their Facebook use. We should reduce cases where rewards are unpredictable or lacking value, and reduce unintentional behavior, for example.”¹²⁹ The document then lists these features: “notifications with little or no relevance, continuous content without breaks, constant updates including Like counts, lack of feedback about amount of use, signals of availability that lead to expectations of quick responses.”¹³⁰
- C. Simply replacing the word ‘addictive’ with the word ‘habit-forming,’ however, does not change the phenomenon. The core definitional feature of addiction is repetitive, ‘habitual’ behaviors that cross over to harmful behaviors. As stated in this “Facebook ‘Addiction’” presentation, “some people may experience genuine problems related to their Facebook use,”¹³¹ and that includes the problem of addictive use.
- D. Davis goes on to say, “Facebook’s rewards are easily accessible, available all the time, limitless, and don’t include built-in controls. For people who tend to have difficulty regulating their consumption of rewards, it may be easy to use Facebook too much.”¹³² I agree, which is exactly how Facebook designed it, a frictionless interface where it’s ‘easy to use too much,’ creating the problem of Facebook addiction. Whether you call it ‘habit-forming,’ which tends to minimize harms, or ‘addictive,’ which acknowledges the extent of those harms in some cases, this “Facebook ‘Addiction’” document should have been a call to action to change the design features which contribute to those harms.
- E. Davis’ “Facebook ‘Addiction’” presentation relies on a similar definition of addiction, attributed to similar sources, as I do in this Report, stating for example that, “Addiction involves a broad set of long-lasting changes to brain circuitry underlying reward, stress, and self-control. The major brain change is that

¹²⁸ METANMAG-002-01338514 at METANMAG-002-01338517.

¹²⁹ METANMAG-002-01338514 at METANMAG-002-01338517.

¹³⁰ METANMAG-002-01338514 at METANMAG-002-01338517.

¹³¹ METANMAG-002-01338514 at METANMAG-002-01338517.

¹³² METANMAG-002-01338514 at METANMAG-002-01338537.

the dopamine system becomes less sensitive,”¹³³ and noting that “Impairment can be in social, occupational, or other life domains.”¹³⁴ On a slide entitled “If Facebook ‘addiction’ were a diagnosis, criteria might include: Multiple symptoms...Examples: Preoccupying thoughts: thoughts about Facebook use are excessive, absorbing, and irresistible[.] Overwhelming behavior: drive to use Facebook is extremely strong, despite desire and/or attempts to stop[.] ‘Tolerance’: more and more use is needed to achieve desired feelings...Persistence over time[:] Use continues despite significant negative life impacts[.] Problematic symptoms are not limited to unique or temporary circumstances...Negative life impacts[:] Facebook use has caused significant negative impacts on important areas of life functioning, e.g., loss of job or relationships[.] Other important interests are neglected in favor of Facebook use[.]”¹³⁵ Meta’s own documents are rife with examples of “Facebook addiction.”

- F. Davis makes the unsupported claim that “Facebook is not a substance that acts directly on the brain. It does not create brain changes at the level of intoxication or impairment. The rewards that Facebook produces are naturalistic (i.e. social), not chemical.”¹³⁶ As detailed in this Report, people can get addicted to behaviors as well as substances, which means that behaviors too can ‘create brain changes at the level of intoxication or impairment.’ Indeed, the brain is *the* bodily organ on which Facebook and Instagram act.
- G. Davis also makes the unsupported claim, “There is no evidence of dopamine system abnormalities related to Facebook use.”¹³⁷ As described above, social rewards trigger the same reward pathway as drugs and alcohol and social media addiction leads to similar brain changes as drug and alcohol addiction. Flannery et al.¹³⁸ have shown tolerance to social media. The Kim et al. (2011) study supports changes to the dopaminergic system with “internet addiction.” While it is not

¹³³ METANMAG-002-01338514 at METANMAG-002-01338522.

¹³⁴ METANMAG-002-01338514 at METANMAG-002-01338523.

¹³⁵ METANMAG-002-01338514 at METANMAG-002-01338524.

¹³⁶ METANMAG-002-01338514 at METANMAG-002-01338525.

¹³⁷ METANMAG-002-01338514 at METANMAG-002-01338525.

¹³⁸ Flannery, J. S., Burnell, K., Kwon, S. J., Jorgensen, N. A., Prinstein, M. J., Lindquist, K. A., & Telzer, E. H. (2024). Developmental changes in brain function linked with addiction-like social media use two years later. *Social cognitive and affective neuroscience*, 19(1), nsae008. <https://doi.org/10.1093/scan/nsae008>

specific to Facebook, there is no valid reason to exclude Facebook use from the umbrella term of “internet addiction.”

- H. Davis makes the unsubstantiated claim, “Facebook does likely activate dopamine,” but “The degree of dopamine release from behaviors is not as extreme as from substances.”¹³⁹ To my knowledge there is no evidence showing how much dopamine Facebook releases relative to substances or other behaviors. It might be less, but it also might be more. While the diagnosis of addiction is not based on how much dopamine is released (but rather on the manifestation of harmful behaviors caused by compulsive overuse), this very presentation cites to studies showing changes in the brain’s reward pathway in response to social media, changes that are known to be mediated by dopamine: “1. Instagram pictures with more vs. fewer ‘Likes’ activate the ventral striatum (VS) to a greater extent[.] This means Like counts provide meaningful information for whether something is important and potentially rewarding. 2. Images of Facebook symbols (e.g., the “F”) activate the VS more for frequent users[.] If you use Facebook often, common symbols produce reward system activation; also those symbols will be more familiar to you and therefore more salient. 3. People who have stronger VS responses to reputation gains as compared to monetary gains are more likely to use Facebook more[.] People who are particularly sensitive to social rewards might find Facebook use more rewarding and therefore use it more.”¹⁴⁰ This slide cites to Sherman et al., 2016; 2018,¹⁴¹ Turel et al., 2014,¹⁴² and Meshi et al., 2013.¹⁴³
- I. Davis asserts “A Facebook addiction diagnosis would require a fairly high threshold of severity and inability to control use despite serious negative life impacts. It is unlikely that most people would meet this threshold when it comes to Facebook.”¹⁴⁴ I would agree that making a diagnosis of

¹³⁹ METANMAG-002-01338514 at METANMAG-002-01338525.

¹⁴⁰ METANMAG-002-01338514 at METANMAG-002-01338532.

¹⁴¹ Sherman, L. E., Greenfield, P. M., Hernandez, L. M., & Dapretto, M. (2018). Peer influence via Instagram: Effects on brain and behavior in adolescence and young adulthood. *Child Development*, 89, 37-47; Sherman, L. E., Payton, A. A., Hernandez, L. M., Greenfield, P. M., & Dapretto, M. (2016). The power of the like in adolescence: effects of peer influence on neural and behavioral responses to social media. *Psychological Science*, 27, 1027-1035.

¹⁴² Turel, O., He, Q., Xue, G., Xiao, L., & Bechara, A. (2014). Examination of neural systems sub-serving Facebook “addiction”. *Psychological Reports*, 115, 675-695.

¹⁴³ Meshi, D., Morawetz, C., & Heekeren, H. R. (2013). Nucleus accumbens response to gains in reputation for the self relative to gains for others predicts social media use. *Frontiers in Human Neuroscience*, 7, 439.

¹⁴⁴ METANMAG-002-01338514 at METANMAG-002-01338527

addiction requires a threshold of severity, which has been described based on validated measures like the Social Media Disorder Scale. I also agree that “it is unlikely that *most* people would meet this threshold.”¹⁴⁵ But most people who drink alcohol, use drugs, or gamble, also do not meet threshold criteria for addiction. Lifetime prevalence of addiction to drugs is approximately 17%.¹⁴⁶ According to Facebook’s own research, 3.1% of Facebook users are severely addicted to Facebook,¹⁴⁷ amounting to 93 million¹⁴⁸ Facebook users seriously harmed. As noted above, Meta’s own documents acknowledge a much higher proportion of 55% of users with “mild” addiction.

- J. Davis describes how “The negative emotion itself could become a trigger for use - so there would be constant real life (non-Facebook) cues that could drive someone to use too much.”¹⁴⁹ I agree. People experiencing negative emotions are more vulnerable to addiction, and internal triggers are as powerful as external ones. That Facebook use might be triggered by emotional distress does not change the fact that its addictive potential is contributing to emotional distress, especially among its most vulnerable users, including children and teens, and that the emotional distress caused by Facebook is contributing to ongoing engagement with Facebook.
- K. Davis states, “Having a habit does not mean you have no agency. It does mean that effortful control is needed to inhibit your automatic behavior, and this can be difficult.”¹⁵⁰ This statement seems to be making the claim that distinguishing between a habit and addiction is the difference between having agency and having no agency. I disagree. Having addiction does not mean you have *no* agency. It means you have *limited* agency. If people with addiction had no agency they would never get into recovery, and yet we know

¹⁴⁵ METANMAG-002-01338514 at METANMAG-002-01338527

¹⁴⁶ Substance Abuse and Mental Health Services Administration. (2024). 2023 Companion infographic report: Results from the 2021, 2022, and 2023 National Surveys on Drug Use and Health (SAMHSA Publication No. PEP24-07-020). Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. <https://www.samhsa.gov/data/report/2021-2022-2023-nsduh-infographic>, at p.9.

¹⁴⁷ Cheng, J., Burke, M., & Davis, E. G. (2019). Understanding Perceptions of Problematic Facebook Use. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. <https://doi.org/10.1145/3290605.3300429>; METANMAG-002-01006161 at METANMAG-002-01006162.

¹⁴⁸ Barinka, A. (2022, October 26) Meta’s Instagram Users Reach 2 Billion, Closing In on Facebook, Bloomberg. <https://www.bloomberg.com/news/articles/2022-10-26/meta-s-instagram-usersreach-2-billion-closing-in-on-facebook>

¹⁴⁹ METANMAG-002-01338514 at METANMAG-002-01338539

¹⁵⁰ METANMAG-002-01338514 at METANMAG-002-01338544.

addiction is a treatable disease. Their agency is constrained by their disease corresponding to the severity. Those with mild addiction have more agency than those with severe addiction. Further, there are “powerful neurological and psychological forces”¹⁵¹ driving both habit and addiction. In sum, the difference she attempts to draw between habit and addiction is largely semantic.

- L. Davis acknowledges that Facebook’s design makes it difficult to break habitual behaviors.¹⁵² “Habits can be changed by behavior regulation, but aspects of Facebook can make regulation difficult: [1]) Low awareness[;] People don't realize how often or for how long they are using Facebook[,] [2]) Low intentionality[:] Default options are kept in place Choices are not deliberate[.] [3]) Low attentiveness[:] Use of Facebook feels mindless Logging on is unconscious or automatic[.] [4]) Low control[:] It is difficult to limit one's use It is easy to keep scrolling and go on frequently.”¹⁵³ Indeed.
- b. Other **Meta** internal documents also provide evidence that its social media products, Facebook and Instagram, lead to out-of-control use, compulsive use, continued use despite consequences, and withdrawal.
 - i. Facebook conducted a qualitative study on Facebook “Problematic Use,” stating “‘problematic use sometimes called ‘social media addiction’ externally,”¹⁵⁴ is characterized by “Loss of Control over Time Spent (LCOTS).”¹⁵⁵ The study was conducted in 2019 and included 24 in-person one on one interviews with “problematic Facebook users in the US, Brazil, and India to determine which opportunities the team should pursue around excessive, problematic use.”¹⁵⁶ As previously stated, Facebook’s internal definition of problematic use mirrors definitions of social media addiction.
 - ii. Out of Control Use:
 - A. The Facebook Qualitative Study identifies out of control use as a feature of Problematic Use, quoting one participant, “I’m on Facebook every day, every moment. Literally, every moment;

¹⁵¹ METANMAG-002-01338514 at METANMAG-002-01338544.

¹⁵² METANMAG-002-01338514 at METANMAG-002-01338548

¹⁵³ METANMAG-002-01338514 at METANMAG-002-01338548.

¹⁵⁴ METANMAG-015-00030753 at METANMAG-015-00030767 (See also METANMAG-007-00387938)

¹⁵⁵ METANMAG-015-00030753 at METANMAG-015-00030754.

¹⁵⁶ METANMAG-015-00030753; See also METANMAG-007-00387938.

just not when I'm in the shower. It's a habit, I just have been doing this for a few years... I lose the notion of time."¹⁵⁷

- B. Facebook researchers acknowledge Facebook's addictive potential by citing external research in their internal presentations, such as "The best external research indicates that Facebook's impact on people's well-being is negative. FB can have a negative effect when people feel a lack of control over the experience or when use undermines other aspects of life."¹⁵⁸
- C. In a slide presentation, Elena Davis and Josh Latshaw of X-Meta Well-being described Meta's survey of users' perceived control of their use of Facebook and Instagram conducted between December 2022 and January 2023, in which they surveyed ~30K youth and ~30K adult users in 12 countries.¹⁵⁹ They found that "Users' perceived control can be validly measured across age cohorts with questions assessing **low attentiveness** around platform use (i.e., spending more time, checking, and consuming content without realizing it) and **low capability** to change platform use (i.e., low confidence in ability to reduce time, checking, or interactions)."¹⁶⁰ They documented that ~31-34% of youth spend more time, checking, and consuming Facebook content without realizing it and 19-20% of youth have low confidence in ability to reduce time, checking, or interactions on Facebook.¹⁶¹ Their results link "low perceived control on FB" to specific product features, including *Stories*, *Notifications*, *News Feed*, *Reels*, and *Comments*.¹⁶²
- D. Similar to the Facebook platform, Meta's survey of Instagram users' documented that 38-39% of youth spend more time, checking, and consuming Instagram content without realizing it and 18-19% of youth have low confidence in their ability to reduce time, checking, or interactions on Instagram.¹⁶³ Davis and Latshaw found specific Instagram design features "associated with low perceived control of IG," including

¹⁵⁷ METANMAG-015-00030753 at METANMAG-015-00030779.

¹⁵⁸ METANMAG-015-00030753 at METANMAG-015-00030758.

¹⁵⁹ METANMAG-011-01610327 at *2 (produced natively).

¹⁶⁰ METANMAG-011-01610327 at *2 (produced natively). (emphasis in original)

¹⁶¹ METANMAG-011-01610327 at *27 (produced natively).

¹⁶² METANMAG-011-01610327 at *31 (produced natively). (emphasis added)

¹⁶³ METANMAG-011-01610327 at *10 (produced natively).

*Explore tab, Stories creation, Reels tab, Direct, Notifications, Home, and Profile.*¹⁶⁴

- E. Davis and Latshaw concluded, “Stories usage is the strongest and most consistent predictor of low control. This may be due to content consumption affordances (like autoplay) but also about ephemerality, which may contribute to not wanting to miss updates and desire to respond to others in a timely way (consistent with social pressures, FOMO; expert input supports these hypotheses...”¹⁶⁵
- F. An Instagram internal slide presentation entitled, “E[Instagram] Mental Well-being” dated November 17, 2022, by “WB [Well-being] Leads Review,” notes that “56% of IG teens surveyed say it’s difficult to manage how much time they spend on social media and 14% say IG makes it worse,”¹⁶⁶ attesting to the addictive nature of the platform.
- G. The same presentation acknowledges that “Teens and young adults are more likely to report experiencing problematic use consistent with developmental differences in self-control.”¹⁶⁷ Further, “41% of weekly teen users say they try to limit their IG use and 22% say they want help controlling their usage,”¹⁶⁸ showing how addictive social media platforms like Instagram can increase the risk of out-of-control use.

iii. Compulsive Use:

- A. A core feature of addiction is behaviors that are so automatic that we’re engaging in them without realizing it and contrary to our desire to do so. The Facebook Qualitative Study corroborates the compulsive nature of Facebook, quoting one participant, “People liking things can be addictive. I feel compelled to see who liked it. I think it’s a bad habit because [I’m] always checking.”¹⁶⁹
- B. And another participant, “I check right away when I get a notification, like a compulsion.”¹⁷⁰

¹⁶⁴ METANMAG-011-01610327 at *14 (produced natively).

¹⁶⁵ METANMAG-011-01610327 at *40 (produced natively).

¹⁶⁶ METANMAG-028-00118695 at METANMAG-028-00118703.

¹⁶⁷ METANMAG-028-00118695 at METANMAG-028-00118703.

¹⁶⁸ METANMAG-028-00118695 at METANMAG-028-00118703.

¹⁶⁹ METANMAG-015-00030753 at METANMAG-015-00030777.

¹⁷⁰ METANMAG-015-00030753 at METANMAG-015-00030778.

- C. On February 3, 2019, a Facebook user emailed CEO Mark Zuckerberg directly asking for help for her Facebook addiction: “Please help Hello. My name is Tamika. I joined facebook awhile ago. But I have deleted my account. I was too addicted to Facebook.”¹⁷¹
- D. “IG [Instagram] Mental Well-being” (2022) reporting on Instagram’s own internal data describes how “23% of US teen WAU [Weekly Active Users] say they open Instagram without realizing it at least once a day (Hanko, PU foundational survey).”¹⁷²
- E. “27% of teen WAU across 6 countries (UK, US, NG, SK, BR, IN) report ‘often’ or ‘very often’ checking IG automatically without realizing it (Davis, PU pilot survey).”¹⁷³

iv. Consequential use:

- A. The Facebook Qualitative Study acknowledges many different adverse consequences as a result of Facebook addiction, stating “All problematic users were experiencing multiple life impacts,” listed as “loss of productivity,” “sleep disruption,” “relationship impacts,” “parents neglecting their kids,” “safety risks,” and “regretful purchases.”¹⁷⁴ See image below.¹⁷⁵

¹⁷¹ METANMAG-003-00355263.

¹⁷² METANMAG-028-00118695 at METANMAG-028-00118744.

¹⁷³ METANMAG-028-00118695 at METANMAG-028-00118744.

¹⁷⁴ METANMAG-015-00030753 at METANMAG-015-00030780.

¹⁷⁵ METANMAG-015-00030753 at METANMAG-015-00030780.

Current PU Experience



All problematic users were experiencing multiple life impacts.

- **Loss of productivity** - (1) Giving up. The person won't do the task/activity outside FB. (2) Postponing the beginning. The person will take more time to start the task/activity off FB. (3) Extending the duration. The person will take more time to complete the task because will stop to check FB.
- **Sleep disruption** - (1) Delaying/reducing sleep hours due to loss of time control; (2) Waking up and checking FB prolonging a return to sleep; and (3) Sleep loss due to disturbing content, like politics or violence.
- **Relationship impacts** - People together but separately on their phones. And a false sense of closeness created by seeing updates on FB, but fewer offline visits.
- **Parents neglecting their kids** - Parents focused more on FB than caring for or bonding with their children. Or refrained from reprimanding kids for risk of later "retaliation" on their own use.
- **Safety risks** - Loss of situational awareness around environmental dangers (moving vehicles, pickpockets).
- **Regretful purchases** - Spending money on things they didn't need.



I was late to my cousin's wedding because I was watching a video. He's my godfather so it was a shame. Why were you late? I was on Facebook; I forgot the time.

P3, 22 (f) Brazil



Sometimes I don't pay the attention I should to my son. I love to play with him, and the phone sometimes distracts me".

P7, 32 (m) Brazil



One day I was stepping out of the train. I should've been in the middle, but I was on the edge only. I was on my phone. A person kind of pushed me inside. I got saved! After that, I just sit and do it.

P4, 30 (m) India



Sometimes I lose sleep. If I have to wake up at 6am and I'm on FB at night, I look at the phone and it's 2am. Sometimes I'm so involved that I go on and it's hard to wake up the next morning.

P5, 20 (f) Brazil

Facebook App Research

- B. The Facebook Qualitative Study notes how difficult it is to perceive addictive behaviors in ourselves, even when others can see there is a problem. "Many mentioned parents, partners and friends complaining about their use, but it didn't always sink in. Feelings of guilt were an indicator of higher awareness."¹⁷⁶
- C. Facebook researchers also found significant *opportunity costs* with Facebook use,¹⁷⁷ quoting one participant as saying, "I spend too much time on social networks and Facebook. I could study more, I could read a book, I could exercise. Because I spend too much time on Facebook, I waste my time and I don't do useful things...;"¹⁷⁸
- D. Another participant said, "The time I spend is not healthy, it's like an addiction. Opening the app every half hour, it's not healthy."¹⁷⁹
- E. To be sure, some participants in the Facebook Qualitative Study acknowledged the good and the bad of social media: As one

¹⁷⁶ METANMAG-015-00030753 at METANMAG-015-00030778.

¹⁷⁷ METANMAG-015-00030753 at METANMAG-015-00030772.

¹⁷⁸ METANMAG-015-00030753 at METANMAG-015-00030772.

¹⁷⁹ METANMAG-015-00030753 at METANMAG-015-00030772.

respondent says, “I’ve got some good things on FB so that’s the reason why I’ve devoted so much time on it... This is something that I’m confessing to myself I want to devote time to my loved ones; FB is helping me to take care of my social obligations.”¹⁸⁰ Another says about Facebook, “60% useful and 40% useless because you can’t control what is there and so you see everything.”¹⁸¹ These positive uses notwithstanding, the beneficial effects of social media use do not negate the harms caused to those who are addicted, especially where addictiveness is a feature of the product. Further, Meta’s own ‘well-being’ researchers acknowledge that people can value things that are harmful to them, which happens all the time to people with addiction.¹⁸²

- F. Meta internal documents describe “Perceived life interference from app use is highest for younger users,” relating to a graph showing that teens (13-17) are most adversely affected by problematic/addictive use.¹⁸³
- G. See figure below:¹⁸⁴

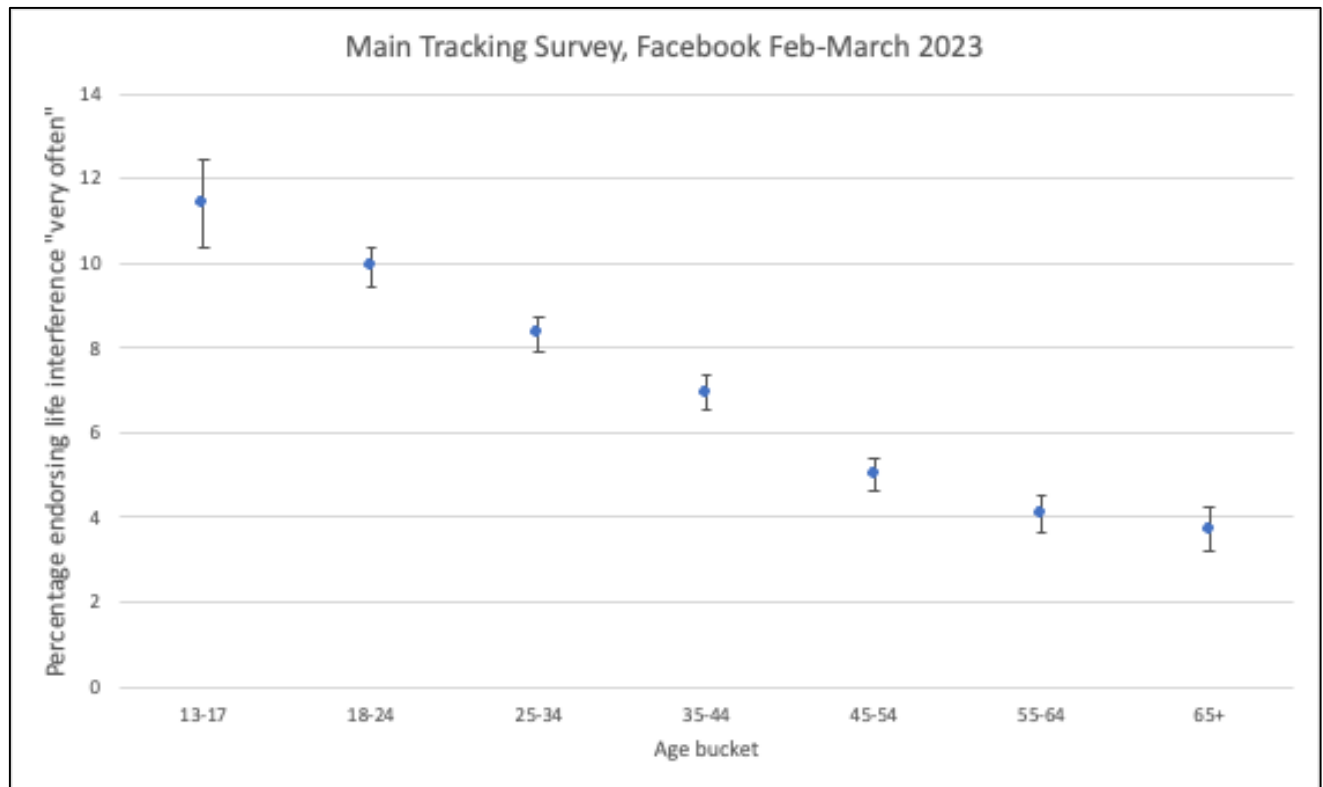
¹⁸⁰ METANMAG-015-00030753 at METANMAG-015-00030774.

¹⁸¹ METANMAG-015-00030753 at METANMAG-015-00030774.

¹⁸² METANMAG-014-00000222 at METANMAG-014-00000243.

¹⁸³ METANMAG-007-00214892 at *18 (produced natively).

¹⁸⁴ METANMAG-007-00214892 at *18 (produced natively).



H. In the same global survey presented by Davis and Latshaw referenced above, Instagram users reported that Instagram interfered with their lives, in particular fulfilling other responsibilities, a consequence of addiction referred to as opportunity costs. “Users reporting low control also report higher ‘life interference’ from their app use (i.e., perceiving that use of Instagram prevents the fulfillment of other responsibilities). Low attentiveness: 20-25% higher life interference; low capability 17-23% higher life interference.”¹⁸⁵

v. Tolerance/Withdrawal:

- A. As discussed previously in this Report, continued engagement with an addictive medium is driven in part by neuroadaptation to the stimulus which contributes to tolerance and withdrawal, also known as ‘wanting but not liking.’
- B. Meta’s own Shayli Jimenez said, “IG [Instagram] is a drug,”¹⁸⁶ and her colleague █████ responded, “LOL, I mean, all social

¹⁸⁵ METANMAG-011-01610327 at *10 (produced natively).

¹⁸⁶ Deposition of Shayli Jimenez, Volume I, February 11, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), METANMAG-002-01117553.

media. We're basically pushers,” to which Jimenez responded, “Seriously it is! We are causing reward deficit disorder because people are bingeing on IG so much they can’t feel reward anymore, like their reward tolerance is so high.”¹⁸⁷ Jimenez later claimed that this was said “sarcastically in a Chat.”¹⁸⁸ In the same chat, Jimenez also shared images of the addiction cycle and Nayir Eyal’s “The Hook Model.”¹⁸⁹

- C. Fear of missing out (FOMO) is common sign of withdrawal from social media and a dysphoric feeling that drives re-use contrary to intention or desire. Instagram internal data show that “42% of US teen WAU with self-reported low control over their IG usage experience FOMO if they don’t check IG often (Hanko 2022, report forthcoming),” and “42% are concerned about offending friends if they don’t immediately respond to messages.”¹⁹⁰
- D. A recent study led by the University of Chicago economist Leonardo Bursztyn surveyed 1,000 college students and asked them how much they would need to be paid to deactivate their accounts on either Instagram or TikTok for four weeks.¹⁹¹ On average, students said they’d need to be paid roughly \$59 to deactivate TikTok and \$47 to deactivate Instagram.¹⁹² But when asked how much to deactivate if most others do too, most students were willing to deactivate for no money and pay others to do the same.¹⁹³

vi. Wellbeing:

- A. Facebook’s own researchers identify ways to intervene or reduce “problematic use (PU)” and “loss of control over time spent (LCOTS),” namely by increasing “situational

¹⁸⁷ Deposition of Shayli Jimenez, Volume I, February 11, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047); METANMAG-002-01117553.

¹⁸⁸ Deposition of Shayli Jimenez, Volume I, February 11, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), at 263:25-264:10.

¹⁸⁹ Deposition of Shayli Jimenez, Volume I, February 11, 2025, In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation (MDL 3047), Exhibit 17;

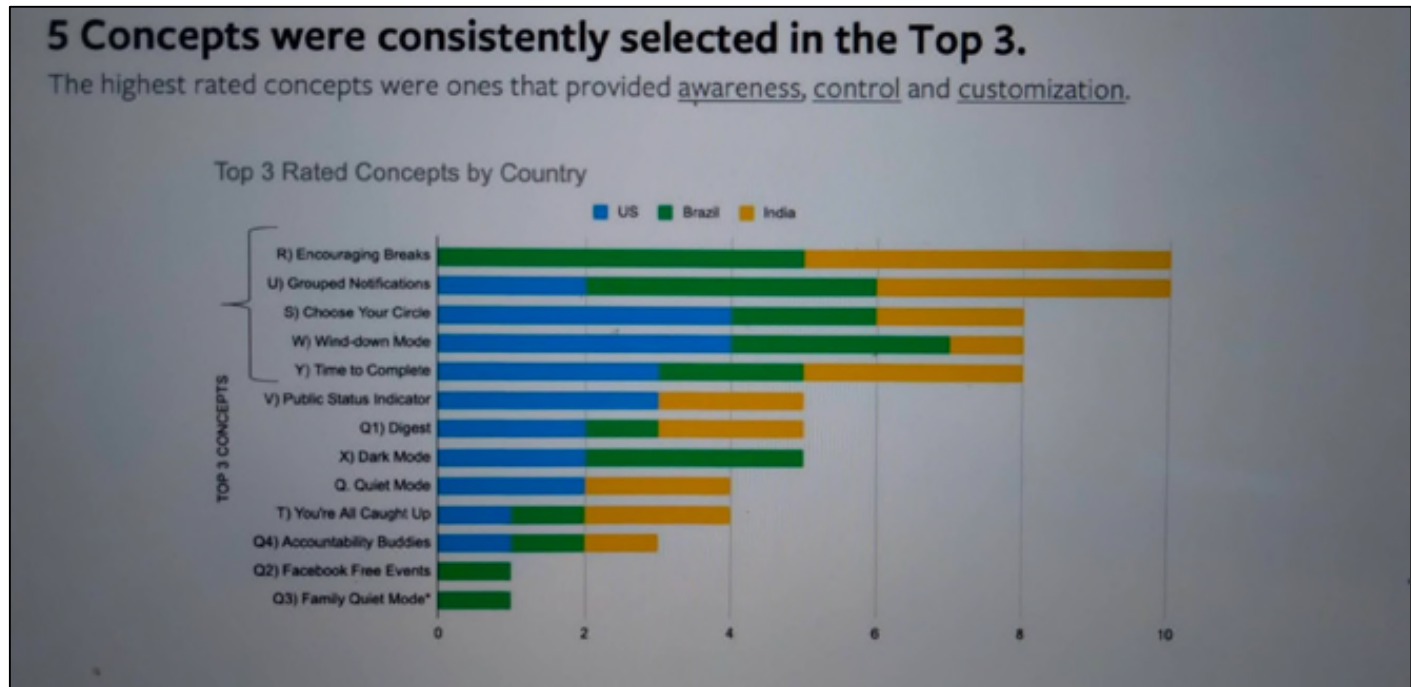
¹⁹⁰ METANMAG-028-00118695 at METANMAG-028-00118721.

¹⁹¹ Bursztyn, L., Handel, B., Jimenez, R., & Roth, C. (2023). When product markets become collective traps: the case of social media. <https://doi.org/10.3386/w31771>

¹⁹² Bursztyn, L., Handel, B., Jimenez, R., & Roth, C. (2023). When product markets become collective traps: the case of social media. <https://doi.org/10.3386/w31771>

¹⁹³ Bursztyn, L., Handel, B., Jimenez, R., & Roth, C. (2023). When product markets become collective traps: the case of social media. <https://doi.org/10.3386/w31771>

awareness, sense of control, customization, transparency and a sense of completion” and “removing time sensitivity.” This suggests that reducing the impact of the addictive design elements, like hidden algorithms driving engagement, tracking user data covertly to drive the algorithms, and features like autoplay, endless scroll, and notifications, detract from a sense of completion and create time urgency.¹⁹⁴ The researchers ask Facebook users to rate suggested design features that might help.¹⁹⁵ See image below for full list.¹⁹⁶



- B. Facebook Wellbeing researchers note that participants in the study tried to reduce their own addictive use and failed: “I turn off notifications. I don’t want them to be poppin’ up on me. If I commented on your picture, then I get a notification from people commenting who aren’t even my friends;” “Apple tells you how much time you’re on so I’m trying to track that to minimize it;” “I tried to set up a certain time to spend on FB, but it was impossible.”¹⁹⁷
- C. Facebook researchers concluded, “Only a few had attempted remediation tactics, and none had found a full solution. Most

¹⁹⁴ METANMAG-015-00030753 at METANMAG-015-00030754; METANMAG-015-00030841.

¹⁹⁵ METANMAG-015-00030753 at METANMAG-015-00030793.

¹⁹⁶ METANMAG-007-00387938 at METANMAG-007-00387996. See also METANMAG-015-00030753 at METANMAG-015-00030793.

¹⁹⁷ METANMAG-015-00030753 at METANMAG-015-00030781.

flailed with fruitless tactics or resorted to extreme measures.”¹⁹⁸

- D. As per Instagram’s own internal documents, “IG has a comprehensive list of well-being features but they hard [sic] to find and use cases are not explicitly clear.”¹⁹⁹
- E. Even after Instagram introduced its Well-being features, whether daily usage limits, Take a Break, or Quiet Mode, they were are all opt-in features, and any default mode could be opted-out, including for teens.²⁰⁰
- F. Per internal documents, “Overall awareness of some mental well-being products is low, demonstrating there is an opportunity to reach teens more consistently.”²⁰¹ Less than 3% of Weekly Active Users of Instagram have enabled Take a Break and 0.2% honor it. Less that 1% of WAU have enabled a daily limit of Instagram, and 0.08% honor it.²⁰²
- G. Instagram advises using ‘Creators’ to ‘upsell’ measures to limit Instagram use, like “Selena Gomez x Take a Break upsell, Megan thee Stallion x Quiet mode.”²⁰³ This is an example of the fox guarding the hen house. Creators rely on large audiences and number of views to promote their brand. They are not well-positioned to encourage young people to get off of Instagram. Instagram’s own documents attest that “Creators say they feel constant pressure to create to sustain engagement and growth and believe that they will be ‘punished’ by low distribution if they take a break from creating (Data suggests [sic] that at least a portion of this is perception vs. reality).”²⁰⁴
- H. In response to the suggestion to “Expand Take a Break to support app-opens,” the decisions was to “not recommend Especially since direct messaging is a major reason for app opens.”²⁰⁵ This document shows Instagram prioritizing opening their app over user wellness.
- I. In response to the question, “How will we know if we’ve solved this problem [problematic use] for people,” an internal Meta

¹⁹⁸ METANMAG-015-00030753 at METANMAG-015-00030781. (emphasis in original)

¹⁹⁹ METANMAG-028-00118695 at METANMAG-028-00118705.

²⁰⁰ METANMAG-033-00111259 at METANMAG-033-00111266.

²⁰¹ METANMAG-028-00118695 at METANMAG-028-00118706.

²⁰² METANMAG-028-00118695 at METANMAG-028-00118741.

²⁰³ METANMAG-028-00118695 at METANMAG-028-00118729.

²⁰⁴ METANMAG-028-00118695 at METANMAG-028-00118731.

²⁰⁵ METANMAG-028-00118695 at METANMAG-028-00118745.

document states, “Success metric: increase in the average amount of time users spend with others in a world.”²⁰⁶

- J. The “Alternate Topic Nudge” is described as “We’re interrupting people from dwelling on a topic and empowering them to make informed choices so they feel their time on Instagram is intentional.”²⁰⁷ The measure of its effectiveness is described as follows: “12% of teens who see a topic nudge, tap in [sic] on one or more new topics. This leads to less time spent scrolling endlessly on one type of content that may have been making them feel worse.”²⁰⁸ But importantly, Instagram is not calling for measuring whether they’re spending less time scrolling overall.
- vii. As summarized by Meta’s own internal documents, Meta’s awareness of “Problematic Use” (aka social media addiction) is “High,” while their “Product investment” is “Mid-Low.”²⁰⁹ Or, again in Meta’s own words, “The stance we have historically taken is to give people control, but not in a way that hurts metrics.”²¹⁰
- viii. Meta’s own Empathy Team, charged with safeguarding the well-being of its users, concluded that “Product features that are designed to exploit insecurity, or provide a dopamine rush (likes, notifications, the pull-down-to-see, the infinite scroll, etc), to increase time spent, are inherently at odds with well-being and take away from people’s ability to consciously focusing on activities that add value to their lives.”²¹¹ I agree.
- ix. Meta should warn adolescents and their parents about the addictive nature of its platforms and the mental health risks to adolescents from use of the platforms.

5. Addiction to social media can adversely affect youth mental health, particularly among those with co-occurring psychiatric disorders. Conversely, limiting social media use can improve youth mental health. While some users may benefit from social media, such benefit does not negate the harm caused to a substantial population of users.

- a. Experimental studies show that reducing or stopping social media improves mental and emotional well-being. These experimental designs are consistent

²⁰⁶ METANMAG-005-01853253 at METANMAG-005-01853257.

²⁰⁷ METANMAG-033-00111259 at METANMAG-033-00111271

²⁰⁸ METANMAG-033-00111259 at METANMAG-033-00111271.

²⁰⁹ METANMAG-007-00214892 at *13 (produced natively).

²¹⁰ METANMAG-005-01853253 at METANMAG-005-01853268.

²¹¹ METANMAG-007-00183811 at METANMAG-007-00183815.

with a causal mechanism whereby social media use causes mental health harms.

- i. Davis and Goldfield experimentally examined the effects of reducing social media use on symptoms of depression, anxiety, fear of missing out (FOMO), and sleep, specifically in youth *with emotional distress*, an important distinction because of this subgroup’s vulnerability to the harms of social media compared with the general population.²¹² In a randomized controlled trial of 220 youth aged 17–25 years to either an intervention or control group, the intervention group was asked to reduce smartphone-based social media use to 1 hour per day for 3 weeks while the control group had no social media restrictions. Social media was tracked via objective measures.²¹³ The researchers found that “Compared to the control group, the intervention group showed significantly greater reductions in symptoms of depression, anxiety, and FOMO, and greater increases in sleep. No effects of gender were detected. Reducing SMU on smartphones to approximately 1 hr/day may be a feasible, inexpensive, and effective method of increasing sleep and reducing symptoms of depression, anxiety, and FOMO among distressed youth.”²¹⁴
- ii. A study of 143 University of Pennsylvania undergraduates who were randomly assigned to reduce their use of social media (Facebook, Instagram and Snapchat) to 10 minutes, per platform, per day, or to use social media as usual for three weeks, found that the group that limited their social media use showed significant reductions in loneliness and depression compared to the control group.²¹⁵
- iii. Alcott and colleagues (2020) randomly assigned 2,743 adults to deactivate their Facebook accounts for one month or not.²¹⁶ Those who deactivated Facebook experienced significantly improved well-being.²¹⁷ The researchers relied on surveys, emails, text messages, and

²¹² Davis, C. G., & Goldfield, G. S. (2025). Limiting social media use decreases depression, anxiety, and fear of missing out in youth with emotional distress: A randomized controlled trial. *Psychology of Popular Media*, 14(1), 1–11. <https://doi.org/10.1037/ppm0000536>

²¹³ Davis, C. G., & Goldfield, G. S. (2025). Limiting social media use decreases depression, anxiety, and fear of missing out in youth with emotional distress: A randomized controlled trial. *Psychology of Popular Media*, 14(1), 1–11. <https://doi.org/10.1037/ppm0000536>

²¹⁴ Davis, C. G., & Goldfield, G. S. (2025). Limiting social media use decreases depression, anxiety, and fear of missing out in youth with emotional distress: A randomized controlled trial. *Psychology of Popular Media*, 14(1), 1–11. <https://doi.org/10.1037/ppm0000536>

²¹⁵ Hunt, M. G., Marx, R., Lipson, C., & Young, J. (2018). No more FOMO: Limiting social media decreases loneliness and depression. *Journal of Social and Clinical Psychology*, 37(10), 751–768. <https://doi.org/10.1521/jscp.2018.37.10.751>

²¹⁶ Allcott, H., Braghieri, L., Eichmeyer, S., & Gentzkow, M. (2020). The welfare effects of social media. *The American Economic Review*, 110(3), 629–676. <https://doi.org/10.1257/aer.20190658>

²¹⁷ Allcott, H., Braghieri, L., Eichmeyer, S., & Gentzkow, M. (2020). The welfare effects of social media. *The American Economic Review*, 110(3), 629–676. <https://doi.org/10.1257/aer.20190658>

monitoring software to measure both subjective accounts and objective behavior of both groups, both during and after the experiment.²¹⁸ The authors concluded, “We find that four weeks without Facebook improves subjective well-being and substantially reduces post-experiment demand, suggesting that forces such as addiction and projection bias may cause people to use Facebook more than they otherwise would.”²¹⁹

- iv. A study by Abrahamsson (2024) conducted in Norway shows that banning smartphones in schools leads to reduced seeking for mental health care and an improvement in grade point average in girls.²²⁰ The author concludes, “My results show that banning smartphones leads to a significant decline at the intensive margin for the number of consultations related to diagnosis and treatment for psychological symptoms and diseases.”²²¹
- v. A study by Pawlowski (2021) and colleagues in Denmark explored the impact of banning smartphones in schools on kids’ level of physical activity.²²² From August to October 2020, children from grades 4–7 (10–14 years) at six Danish schools were banned from using their smartphones during recess for a four-week period.²²³ The authors found “a significant increase in PA [physical activity] during recess—both in intensity and frequency—when a ban on smartphone usage was implemented for four weeks.”²²⁴
- vi. A meta-analysis by Ferguson claims that reductions in social media use have no impact on mental health, “meta-analytic evidence for causal effects was statistically no different than zero.” This study, however, fails to separate out studies which were too short in duration to

²¹⁸ Allcott, H., Braghieri, L., Eichmeyer, S., & Gentzkow, M. (2020). The welfare effects of social media. *The American Economic Review*, 110(3), 629–676. <https://doi.org/10.1257/aer.20190658>

²¹⁹ Allcott, H., Braghieri, L., Eichmeyer, S., & Gentzkow, M. (2020). The welfare effects of social media. *The American Economic Review*, 110(3), 629–676. <https://doi.org/10.1257/aer.20190658>

²²⁰ Abrahamsson, S. (2024). Smartphone bans, student outcomes and mental health. In SAM (Discussion Paper No. 0804–6824; Vols. 01–24). <https://openaccess.nhh.no/nhh-xmlui/bitstream/handle/11250/3119200/DP%2001.pdf?sequence=1&isAllowed=y>

²²¹ Abrahamsson, S. (2024). Smartphone bans, student outcomes and mental health. In SAM (Discussion Paper No. 0804–6824; Vols. 01–24). <https://openaccess.nhh.no/nhh-xmlui/bitstream/handle/11250/3119200/DP%2001.pdf?sequence=1&isAllowed=y>

²²² Pawlowski, C. S., Nielsen, J. V., & Schmidt, T. (2021). A Ban on Smartphone Usage during Recess Increased Children's Physical Activity. *International journal of environmental research and public health*, 18(4), 1907. <https://doi.org/10.3390/ijerph18041907>.

²²³ Pawlowski, C. S., Nielsen, J. V., & Schmidt, T. (2021). A Ban on Smartphone Usage during Recess Increased Children's Physical Activity. *International journal of environmental research and public health*, 18(4), 1907. <https://doi.org/10.3390/ijerph18041907>.

²²⁴ Pawlowski, C. S., Nielsen, J. V., & Schmidt, T. (2021). A Ban on Smartphone Usage during Recess Increased Children's Physical Activity. *International journal of environmental research and public health*, 18(4), 1907. <https://doi.org/10.3390/ijerph18041907>

meaningfully account for the acute withdrawal after abrupt cessation of social media use, in which mental health symptoms would be expected to be worse.²²⁵ A re-analysis of the same data by Thrul et al, separating out studies based on duration of cessation of social media use, found “that interventions of less than 1 week resulted in significantly worse mental health outcomes ($d=-0.168$, $SE=0.058$, $p=.004$), while interventions of 1 week or longer resulted in significant improvements ($d=0.169$, $SE=0.065$, $p=.01$). Analyses of intervention length as continuous moderator included $k=19$ studies and showed significant quadratic effects for number of weeks ($b=-0.022$; $SE=0.008$; $z=-2.6$; $p<.01$), as well as number of days ($b=-0.001$; $SE=0.000$; $z=-2.5$; $p<.05$). These findings suggest that social media use reduction / abstinence interventions should have a minimum length of 1 week or longer to confer mental health benefits.”²²⁶ In my clinical experience, 3-4 weeks of abstinence is necessary for patients to note psychiatric improvements after stopping social media use.

- b. A study by Primack and colleagues (2021) used a longitudinal prospective design to examine a cohort of individuals who were and were not initially depressed, to see whether and how social media use related to their depression status. It showed a dose dependent impact of baseline social media use on the development of depression ($p<0.001$).²²⁷ “Among 990 participants who were not depressed at baseline, 95 (9.6%) developed depression by follow-up.”²²⁸ The authors write, “Compared with those in the lowest quartile, participants in the highest quartile of baseline social media use had significantly increased odds of developing depression ($AOR=2.77$, 95% $CI=1.38, 5.56$). However, there was no association between the presence of baseline depression and increasing social media use at follow-up ($OR=1.04$, 95% $CI=0.78, 1.38$).”²²⁹ The authors conclude, “In a national sample of young adults, baseline social media use was independently associated with the development of depression by follow-up, but baseline depression was not associated with an increase in social media use at follow-up. This pattern suggests temporal associations

²²⁵ Ferguson, C. J. (2024). Do social media experiments prove a link with mental health: A methodological and meta-analytic review. *Psychology of Popular Media*. Advance online publication. <https://doi.org/10.1037/ppm0000541>, at p. 1.

²²⁶ Thrul, J., Devkota, J., AlJuboori, D., Regan, T., Alomairah, S., & Vidal, C. (2025). Social media reduction or abstinence interventions are providing mental health benefits—Reanalysis of a published meta-analysis. *Psychology of Popular Media*, 14(2), 207–209. <https://doi.org/10.1037/ppm0000574>

²²⁷ Primack, B. A., Shensa, A., Sidani, J. E., Escobar-Viera, C. G., & Fine, M. J. (2021). Temporal Associations Between Social Media Use and Depression. *American journal of preventive medicine*, 60(2), 179–188. <https://doi.org/10.1016/j.amepre.2020.09.014>

²²⁸ Primack, B. A., Shensa, A., Sidani, J. E., Escobar-Viera, C. G., & Fine, M. J. (2021). Temporal Associations Between Social Media Use and Depression. *American journal of preventive medicine*, 60(2), 179–188. <https://doi.org/10.1016/j.amepre.2020.09.014>

²²⁹ Primack, B. A., Shensa, A., Sidani, J. E., Escobar-Viera, C. G., & Fine, M. J. (2021). Temporal Associations Between Social Media Use and Depression. *American journal of preventive medicine*, 60(2), 179–188. <https://doi.org/10.1016/j.amepre.2020.09.014>

between social media use and depression, an important criterion for causality.”²³⁰

- c. As stated previously, I am familiar with the work of Eva Telzer, and I find consistency between my own patients’ conditions and Dr. Telzer’s research findings that teens who find social media more salient are more likely to be heavy users of social media and are more likely to be depressed as a result of heavy social media use.²³¹ In a school-based sample of 687 adolescents (48.6% girls; Mage = 14.3; 38.1% White, 29.4% Hispanic, 23.0% Black), participants were assessed at two time points, one year apart, allow for assessment of a potential causal interaction between social media exposure at time point one, and depressive symptoms at time point two.²³² Findings show that greater positive emotional responses to social media at time point one were associated with increased social media use frequency and increased depressive symptoms at time point two.²³³ The researchers noted, “Findings of the current study suggest that more frequent positive emotional responses to social media may precede and predict depressive symptoms....”²³⁴ In my opinion, this study’s results are entirely consistent with the phenomenology of addiction, whereby the individual who finds any drug to be initially reinforcing (salient) is more likely to return to using that drug again and again, leading to neurodaptation and tolerance, i.e. needing more of the drug over time to get the same effect or finding that the drug is no longer effective at a given dose. Tolerance drives increased use, leading ultimately to addictive use and the development of consequences related to use, such as depression.

²³⁰ Primack, B. A., Shensa, A., Sidani, J. E., Escobar-Viera, C. G., & Fine, M. J. (2021). Temporal Associations Between Social Media Use and Depression. *American journal of preventive medicine*, 60(2), 179–188. <https://doi.org/10.1016/j.amepre.2020.09.014>

²³¹ Nesi, J., Rothenberg, W. A., Bettis, A. H., Massing-Schaffer, M., Fox, K. A., Telzer, E. H., Lindquist, K. A., & Prinstein, M. J. (2022). Emotional Responses to Social Media Experiences Among Adolescents: Longitudinal Associations with Depressive Symptoms. *Journal of clinical child and adolescent psychology : the official journal for the Society of Clinical Child and Adolescent Psychology*, American Psychological Association, Division 53, 51(6), 907–922. <https://doi.org/10.1080/15374416.2021.1955370>

²³² Nesi, J., Rothenberg, W. A., Bettis, A. H., Massing-Schaffer, M., Fox, K. A., Telzer, E. H., Lindquist, K. A., & Prinstein, M. J. (2022). Emotional Responses to Social Media Experiences Among Adolescents: Longitudinal Associations with Depressive Symptoms. *Journal of clinical child and adolescent psychology : the official journal for the Society of Clinical Child and Adolescent Psychology*, American Psychological Association, Division 53, 51(6), 907–922. <https://doi.org/10.1080/15374416.2021.1955370>

²³³ Nesi, J., Rothenberg, W. A., Bettis, A. H., Massing-Schaffer, M., Fox, K. A., Telzer, E. H., Lindquist, K. A., & Prinstein, M. J. (2022). Emotional Responses to Social Media Experiences Among Adolescents: Longitudinal Associations with Depressive Symptoms. *Journal of clinical child and adolescent psychology : the official journal for the Society of Clinical Child and Adolescent Psychology*, American Psychological Association, Division 53, 51(6), 907–922. <https://doi.org/10.1080/15374416.2021.1955370>

²³⁴ Nesi, J., Rothenberg, W. A., Bettis, A. H., Massing-Schaffer, M., Fox, K. A., Telzer, E. H., Lindquist, K. A., & Prinstein, M. J. (2022). Emotional Responses to Social Media Experiences Among Adolescents: Longitudinal Associations with Depressive Symptoms. *Journal of clinical child and adolescent psychology : the official journal for the Society of Clinical Child and Adolescent Psychology*, American Psychological Association, Division 53, 51(6), 907–922. <https://doi.org/10.1080/15374416.2021.1955370>

- d. A 2022 meta-analysis by Liu et al. including 21 cross-sectional studies and five longitudinal studies with a total of 55,340 participants, found that the risk of depression increased by 13% (OR = 1.13, 95%CI: 1.09 to 1.17, $p < 0.001$) for each hour increase in social media use in teens.²³⁵
- e. A 2023 systematic review of 11 English-language studies examined the connection between social media use (Facebook, Instagram, Other Product, Snapchat, TikTok, YouTube) and depression symptoms in children and adolescents.²³⁶ The authors found that "Research demonstrated a modest but statistically significant association between social media use and depression symptoms" while noting that causality is unclear.²³⁷ "Higher levels of social media usage were connected with worse mental health outcomes, and higher levels of social media use were associated with an increased risk of internalizing and externalizing difficulties among adolescents, especially females. The use of social media was also connected with body image problems and disordered eating, especially among young women, and social media may be a risk factor for alcohol consumption and associated consequences among adolescents and young adults."²³⁸
- f. Data from several cross-sectional, longitudinal, and empirical research studies, show that smartphone and social media use among teenagers relates to an increase in mental distress, self-harming behaviors, and suicidality.²³⁹ The authors also discussed benefits received through social media use, including social connectedness.²⁴⁰ As noted elsewhere in this Report, benefits of social media to some users do not negate the substantial harms on other users due to products designed to be addictive.
- g. I am familiar with the work of Jean Twenge, whom I understand to be an expert witness for plaintiffs in this litigation and will testify to her own research and findings regarding correlational studies. I find consistency between my own patients' conditions and Dr. Twenge's findings that heavy

²³⁵ Liu, M., Kamper-DeMarco, K. E., Zhang, J., Xiao, J., Dong, D., & Xue, P. (2022). Time Spent on Social Media and Risk of Depression in Adolescents: A Dose-Response Meta-Analysis. *International journal of environmental research and public health*, 19(9), 5164. <https://doi.org/10.3390/ijerph19095164>

²³⁶ Khalaf A M, Alubied A A, Khalaf A M, et al. (August 05, 2023) The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. *Cureus* 15(8): e42990. doi:10.7759/cureus.42990

²³⁷ Khalaf A M, Alubied A A, Khalaf A M, et al. (August 05, 2023) The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. *Cureus* 15(8): e42990. doi:10.7759/cureus.42990, at p. 4.

²³⁸ Khalaf A M, Alubied A A, Khalaf A M, et al. (August 05, 2023) The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. *Cureus* 15(8): e42990. doi:10.7759/cureus.42990, at p. 4.

²³⁹ Khalaf A M, Alubied A A, Khalaf A M, et al. (August 05, 2023) The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. *Cureus* 15(8): e42990. doi:10.7759/cureus.42990, at p. 1.

²⁴⁰ Khalaf A M, Alubied A A, Khalaf A M, et al. (August 05, 2023) The Impact of Social Media on the Mental Health of Adolescents and Young Adults: A Systematic Review. *Cureus* 15(8): e42990. doi:10.7759/cureus.42990, at pp.8-9.

users of social media are more likely to be unhappy, depressed, or to have attempted suicide, than those with lesser social media use.²⁴¹ The Orben & Przybylski (2019) study has been colloquially called the “potato study” because it found “the association of well-being with regularly eating potatoes was nearly as negative as the association with technology use...”²⁴² Jean Twenge and colleagues have analyzed the same datasets used by Orben & Przybylski (2019) and found methodological flaws with the novel approach used in Orben & Przybylski (2019),²⁴³ and upon Twenge’s re-analysis of the data found much larger relationships with social media use and poor mental health.²⁴⁴

- h. A study by Xiao et al looking at addictive screen use specifically and its impact on suicidality, followed nearly 4,300 U.S. children, starting at age 9–10, over a period of four years. Instead of measuring total screen time, they tracked patterns of addictive use—like compulsive checking, distress when separated from devices, and using screens to escape. They found that addictive usage is common: ~50% showed high or increasing addictive mobile phone use; ~40% showed similar patterns with video games; ~30% with social media. Youth with high or rising addictive use were 2–3 times likelier to report suicidal thoughts or behaviors than those with low, stable use. These youth also had more symptoms of depression, anxiety, aggression, and attention problems. Importantly, this study showed that adverse impacts of digital media including social media are not about “screen time” alone: Merely spending more hours on devices did not predict mental health issues. It’s the addictive, compulsive use that matters.²⁴⁵
- i. The growing body of literature that shows excessive use of social media can contribute to psychological and physical health harms in youth are largely heterogeneous in design and outcome and generally do not distinguish high and low-risk groups, thereby insufficiently appreciating the increased risk to

²⁴¹ Twenge, J. M., & Campbell, W. K. (2019). Media Use Is Linked to Lower Psychological Well-Being: Evidence from Three Datasets. *The Psychiatric quarterly*, 90(2), 311–331. <https://doi.org/10.1007/s11126-019-09630-7> ; Twenge, J. M., Joiner, T. E., Rogers, M. L., & Martin, G. N. (2018). Increases in Depressive Symptoms, Suicide-Related Outcomes, and Suicide Rates Among U.S. Adolescents After 2010 and Links to Increased New Media Screen Time. *Clinical Psychological Science*, 6(1), 3-17. <https://doi.org/10.1177/2167702617723376>

²⁴² Orben, A., & Przybylski, A. K. (2019). The association between adolescent well-being and digital technology use. *Nature human behaviour*, 3(2), 173–182. <https://doi.org/10.1038/s41562-018-0506-1>

²⁴³ Twenge, J. M., Haidt, J., Joiner, T. E., & Campbell, W. K. (2020). Underestimating digital media harm. *Nature human behaviour*, 4(4), 346–348. <https://doi.org/10.1038/s41562-020-0839-4>

²⁴⁴ Twenge, J. M., Haidt, J., Lozano, J., & Cummins, K. M. (2022). Specification curve analysis shows that social media use is linked to poor mental health, especially among girls. *Acta psychologica*, 224, 103512. <https://doi.org/10.1016/j.actpsy.2022.103512>

²⁴⁵ Xiao Y, Meng Y, Brown TT, Keyes KM, Mann JJ. Addictive Screen Use Trajectories and Suicidal Behaviors, Suicidal Ideation, and Mental Health in US Youths. *JAMA*. Published online June 18, 2025. doi:10.1001/jama.2025.7829.

vulnerable youth. Youth with emotional distress are more vulnerable to social media addiction and related harms than youth without.

- i. Psychiatric symptoms and emotional distress can increase the risk of social media addiction.²⁴⁶ One mechanism by which this may occur is through self-medication, that is the attempt to alleviate psychiatric symptoms and psychological distress by using mood enhancing drugs and behaviors. But addictive drugs and behaviors most often make the individual's psychiatric disorder worse in the long term.²⁴⁷
- ii. A study by Fassi et al. in a nationally representative sample of 3,340 teens, aged 11–19 years, analyzed how teens with and without mental health disorders, diagnosed by clinical raters using standardized clinical assessment tools, used and were impacted by social media.²⁴⁸ They found that adolescents with mental health conditions spent more time on social media and were less happy about the number of online friends they had than adolescents without mental health conditions. Importantly, they found that teens with internalizing conditions specifically (anxiety, depression, body dysmorphic disorder, eating disorder, etc.) reported spending more time on social media, engaging in more negative social comparisons, and experiencing greater negative impact of feedback on mood. Although the authors note “no causal or directional inference can be drawn from these findings”, the findings are consistent with experimental studies such as Davis and Goldfield (2025) and my experience, and are thus supportive of my opinions.
- iii. Although youth with emotional distress are more vulnerable to the harms of social media, the social medium itself confers greater risk than users' individual characteristics. In a Danish survey study of social media addiction, the authors found that “Despite the importance of individual characteristics, overuse seemed to show a stronger relationship with the product than with the user. The analysis revealed that the tendency to over-use was far more prevalent among individuals who use social media mainly for viewing content (e.g., TikTok and

²⁴⁶ Schou Andreassen, C., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of addictive behaviors : journal of the Society of Psychologists in Addictive Behaviors*, 30(2), 252–262. <https://doi.org/10.1037/adb0000160>.

²⁴⁷ Lembke A. (2012). Time to abandon the self-medication hypothesis in patients with psychiatric disorders. *The American journal of drug and alcohol abuse*, 38(6), 524–529.

<https://doi.org/10.3109/00952990.2012.694532>²⁴⁸ Fassi, L., Ferguson, A. M., Przybylski, A. K., Ford, T. J., & Orben, A. (2025). Social media use in adolescents with and without mental health conditions. *Nature human behaviour*, 10.1038/s41562-025-02134-4. Advance online publication. <https://doi.org/10.1038/s41562-025-02134-4>

²⁴⁸ Fassi, L., Ferguson, A. M., Przybylski, A. K., Ford, T. J., & Orben, A. (2025). Social media use in adolescents with and without mental health conditions. *Nature human behaviour*, 10.1038/s41562-025-02134-4. Advance online publication. <https://doi.org/10.1038/s41562-025-02134-4>

Instagram) than among those who use social media mainly for chatting (e.g., Messenger and Discord).”²⁴⁹ This finding highlights the important distinctions among different types of social media and their risk-benefit ratios.

- j. My clinical experience has demonstrated that some patients who come to clinic seeking help for depression anxiety, insomnia, and other mental health symptoms are consuming social media in high volumes. In my opinion, social media is often a substantial contributing factor to their poor mental health.
 - i. When these individuals give up or reduce their high-volume use of social media long enough for their brains to adjust to the loss of the high-stimulus reward--on average four weeks--the majority experience significant improvement in psychiatric symptoms independent of any other psychiatric treatment or intervention.
 - ii. This improvement is similar to the long-term improvements seen in mood and functioning in addicted patients who abstain for long enough from addictive drugs.²⁵⁰
- k. In sum, I find that the weight of the evidence is consistent with my clinical experience, that is, as social media use goes up, physical and mental health harms increase, and as social media use goes down, in particular in youth with emotional distress and diagnosed mental health conditions, physical and mental health improves. Youth with co-occurring mental health disorders and other forms of emotional distress are more vulnerable to social media addiction and related harms than youth without. Nonetheless, the social medium itself confers greater risk than users’ individual characteristics. When distressed youth reduce or discontinue social media use, they show improvements in physical and emotional well-being.

D. Conclusion

Addictive social media platforms exploit our innate need for human connection by increasing access, quantity, potency, novelty, and uncertainty of social rewards, leading to brain and behavioral changes consistent with social media addiction. Young people are especially vulnerable to these harms, in particular those struggling with poor mental health. While some users may benefit from social media, such benefit does not negate the harm caused to a substantial population of users. Defendants’ own documents show that their products are addictive and that as a result, a subset of their youth users are harmed.

²⁴⁹ Danish Competition and Consumer Authority. (2025). Young consumers and social media. <https://www.em.dk/Media/638744252848589136/KFST%20analyse%20-%20Young-consumers-and-social-media.pdf>, at p.6.

²⁵⁰ Brown, S. A., & Schuckit, M. A. (1988). Changes in depression among abstinent alcoholics. *Journal of studies on alcohol*, 49(5), 412–417. <https://doi.org/10.15288/jsa.1988.49.412>.