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***Is Social Media Legislation Too Broad?  An Empirical Analysis***


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# Phoenix Center Policy Paper No. 59
## *Is Social Media Legislation Too Broad?  An Empirical Analysis*

## George S. Ford, PhD†

*Abstract:*  Research suggests that excessive social media use may cause psychological distress in adolescents and teens.  While there are questions about the quality of the evidence and size of the effects, without question this research is driving legislation at the state and federal levels.  While some of these legislative efforts target social media directly, others take a broad approach and impose regulatory mandates on a wide range of online services, including online television services.  We use a large survey of American teens to quantify the mental health consequences of online television and computer use on teen mental health.  We find no evidence to support the inclusion of online television services in these regulatory mandates.  In fact, television viewing in moderation is associated with better mental health outcomes.  A closer look at other types of online services may show that the breadth of coverage of social media legislation should be further narrowed.

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## I.   Overview

The last ten years have witnessed a significant increase in mental health issues among adolescents and teens.[1]   Between 2010 and 2019, people aged 12-17 reporting depressive episodes within the past year nearly doubled, rising from 8.1% to 15.8%.[2]  In 2019, 41% of high schoolers reported regular feelings of sadness and hopelessness or suicide ideation, up 21% since 2011.  Over the same period, the nation has witnessed extraordinary changes in the digital economy and tech policy landscape.  Social media services have captured the public's attention, sometimes surpassing one-billion users worldwide.[3]   Given the increasingly young age at which parents give their children sophisticated smartphones, teens and adolescents have easy and unsupervised access to such services.[4]   A substantial and growing body of evidence suggests the use of social media services may contribute to this mental health crisis in teens and adolescents based on Social Comparison Theory, Fear of Missing Out, Cyberbullying and Online Harassment, among other theories of such linkages.[5]  Yet, social media also may provide a social support system, positive emotional contagion, among other positive benefits.

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[1]    S. Wilson and N.M. Dumornay, *Rising Rates of Adolescent Depression in the United States: Challenges and Opportunities in the 2020s*, 70 JOURNAL OF ADOLESCENT HEALTH 354-355 (2022); M. Daly, *Prevalence of depression Among Adolescents in the U.S. from 2009–2019: Analysis of Trends by Sex, Race/Ethnicity, and Income*, 70 JOURNAL OF ADOLESCENT HEALTH 496-499 (2022); M. Richtel, *"It's Life or Death": The Mental Health Crisis Among U.S. Teens*, NEW YORK TIMES (April 23, 2022) (available at: https://www.nytimes.com/2022/04/23/health/mental-health-crisis-teens.html).

[2]    National Survey on Drug Use and Health (NSDUH), U.S. Department of Health & Human Services (available at:   https://www.datafiles.samhsa.gov/dataset/nsduh-2002-2019-ds0001-nsduh-2002-2019-ds0001).

[3]    D. Ruby, *Social Media Users in The World – (2023 Demographics)*, DEMANDSAGE (March 20, 2023) (available at: https://www.demandsage.com/social-media-users).

[4]    *See, e.g.,* O. Reingold, *The Parents Saying No to Smartphones*, THE FREE PRESS (May 22, 2023) (available at: https://www.thefp.com/p/the-parents-saying-no-to-smartphones).

[5]    *See, e.g.,* J. Twenge, *How Much Is Social Media to Blame for Teens' Declining Mental Health?*, IFS BLOG (April 11, 2022) (available at: https://ifstudies.org/blog/how-much-is-social-media-to-blame-for-teens-declining-mental-health); *#StatusOfMind: Social Media and Young People's Mental Health and Wellbeing*, YOUNG HEALTH MOVEMENT (2017) (available at: https://www.rsph.org.uk/static/uploaded/d125b27c-0b62-41c5-a2c0155a8887cd01.pdf); J. Haidt and J. Twenge, *Social Media and Mental Health: A Collaborative Review*, Unpublished Manuscript (Ongoing) (available at: http://tinyurl.com/SocialMediaMentalHealthReview).

While there is substantial and legitimate debate about the quality and strength of the evidence linking social media use to mental health problems,[6] without dispute the asserted link is behind an increasing array of legislative efforts at both the state and federal levels designed to mitigate these alleged social media enabled harms.  At the federal level the most prominent effort has been the recently re-introduced Kids Online Safety Act ("KOSA"),[7] which was subsequently joined by the Protecting Kids on Social Media Act.[8]  The Biden Administration has also announced its own multi-agency initiative to "safeguard children's privacy, health, and safety from online harms."[9]

Yet, the breadth of services impacted by these legislative proposals varies greatly, and for unclear reasons.[10]  While Utah's Social Media Regulation Code Act and Arkansas' Social Media Safety Act target social media services directly by reference to User-Generated Content ("UGC"), California's Age-Appropriate Design Code Act applies its suite of regulatory obligations to virtually any online

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[6]     P.M. Valkenburg, *Social Media Use and Well-Being: What We Know and What We Need to Know*, 45 CURRENT OPINION IN PSYCHOLOGY 101294 (2022); L. Denworth, *Social Media Has Not Destroyed a Generation*, SCIENTIFIC AMERICAN (November 1, 2019); A. Brown, *The Statistically Flawed Evidence That Social Media Is Causing the Teen Mental Health Crisis*, REASON (March 3, 2023) (available at: https://reason.com/2023/03/29/the-statistically-flawed-evidence-that-social-media-is-causing-the-teen-mental-health-crisis).

[7]     Kids          Online          Safety          Act          (available          at: https://www.blackburn.senate.gov/services/files/D89FC49B-0714-4124-B8B1-4F35A85F5E02).

[8]     Protecting     Kids     on     Social     Media     Act     (available     at: https://www.schatz.senate.gov/imo/media/doc/protecting_kids_on_social_media_act_2023.pdf).

[9]     *Fact Sheet: Biden-Harris Administration Announces Actions to Protect Youth Mental Health, Safety    &    Privacy    Online*,    The    White    House    (23,    2023)    (available    at: https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/23/fact-sheet-biden-harris-administration-announces-actions-to-protect-youth-mental-health-safety-privacy-online/?source=email).

[10]     Testimony of Frances Haugen before the United States Senate Committee on Commerce, Science     and     Technology     (October     4,     2021)     (available     at: https://www.commerce.senate.gov/services/files/FC8A558E-824E-4914-BEDB-3A7B1190BD49); N. Killion and A. Novak, *Senators Reintroduce Kids Online Safety Act to Help Protect Kids from Harmful Online Content,* CBS MORNINGS (May 3, 2023) (available at: https://www.cbsnews.com/news/kids-online-safety-act-social-media-harmful-content-senators-reintroduce; Statement of Advocates Fairplay, American Academy of Pediatrics, Center for Digital Democracy, and Eating Disorders Coalition on the Advancement of the Kids Online Safety Act and the Children and Teens' Online Privacy     Protection     Act     (July,     27     2022)     (available     at: https://www.commondreams.org/newswire/2022/07/27/statement-advocates-fairplay-american-academy-pediatrics-center-digital).

product or service "likely to be accessed by children."[11]  Similarly, KOSA defines a "covered entity" as "a social media service, social network, online video game (including educational games), messaging application, video streaming service, or an online platform that connects to the internet and that is used, or is reasonably likely to be used, by a minor."[12]  Given the expansive regulatory mandates of these efforts—most notably California's Age Appropriate Design Code Act and KOSA[13]—casting a wide net over online services, many of which have no demonstrated nexus to recent trends in youth mental health, is concerning and raises questions about the motivations behind these legislative efforts.

Take, for instance, television viewing, or its modern equivalent "streaming video services."  Professionally created and curated video services have been available for decades without a worsening pattern in youth mental health.  And their modern streaming equivalents bear little resemblance to the social media services motivating legislative and regulatory scrutiny today. For example, professionally curated video streaming services' libraries of content are almost entirely populated with professionally produced films and shows that take millions of dollars to create and are the product of collaboration between creators, producers, financiers and other stakeholders—often taking years to produce.[14]  By

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[11]   *California Age-Appropriate Design Act* (available at: https://leginfo.legislature.ca.gov/faces/billCompareClient.xhtml?bill_id=202120220AB2273&showamends=false).  Criticisms of the broad scope of the legislation are provided in E. Goldman, *California Legislators Seek To Burn Down The Internet – For The Children*, TECHDIRT (Jun 29, 2022) (available at: https://www.techdirt.com/2022/06/29/california-legislators-seek-to-burn-down-the-internet-for-the-children); M. Masnick, *Dear California Law Makers: How The Hell Can I Comply With Your New Age-Appropriate Design Code?*, TECHDIRT (August 24, 2022) (available at: https://www.techdirt.com/2022/08/24/dear-california-law-makers-how-the-hell-can-i-comply-with-your-new-age-appropriate-design-code).

[12]   KOSA's sponsors, in their own summary of the bill, make no mention of the harms from, or regulation of, any service but social media.  *The Kids Online Safety Act of 2022* (available at: https://www.blackburn.senate.gov/services/files/8B57D7C0-BE43-4CA0-91E8-86BB84DE65A5).

[13]   These proposals and others aimed at curbing social media enabled harms (perceived or otherwise) have a history of raising significant First Amendment concerns.  For instance, both California's and Arkansas' laws are currently being challenged in the courts (*see* https://netchoice.org/wp-content/uploads/2022/12/NetChoice-v-Bonta_-Official-AB-2273-Complaint-final.pdf and https://netchoice.org/wp-content/uploads/2023/06/NetChoice-v-Griffin_-Complaint_2023-06-29.pdf) and KOSA, if enacted, would likely face a similar Constitutional challenge.

[14]   K. DeGuzman, *How Long Does It Take to Make a Movie – Production Timeline,* STUDIOBINDER (October 3, 2021) (available at: https://www.studiobinder.com/blog/how-long-does-it-take-to-make-a-movie/#:~:text=But%20given%20all%20of%20the,to%205%20years%20to%20produce).

contrast, social media services primarily feature UGC (including the disturbing and dangerous variety which is the focus of regulatory efforts[15]) which can be posted to social media services in minutes or hours by virtually any user at any time.  Prior to upload, professionally curated video streaming services rate their content using long-established and well-understood age-rating systems.[16] Social media services employ no such rating systems prior to making content available to users. Additionally, professionally-curated video streaming services are one-way.  Consumers select a film or show and passively watch, whereas social media services facilitate user-to-user interaction which can lead to bullying and harassment and is allegedly contributing to the negative teen mental health outcomes the academy is so keen on measuring.  Moreover, the viewing times of professionally produced content by America's youth has declined over the recent decade as young people (in particular) spend more and more time on UGC-reliant services.[17]

Why then do bills like KOSA include such streaming services in their regulatory frameworks?  In this POLICY PAPER, we contrast the relationships between television viewing and social media (and other types of computer use) on teen mental health.  Like prior studies, we find computer use to be positively correlated with worse mental health.  In contrast, we find that moderate consumption of television is associated with better teen mental health, and television consumption never worsens it.  Teens with the best mental health view between one-to-three hours of television daily, a fact in direct conflict with the need for onerous regulations of such services.  Plainly, the sprawling and imprecise coverage of online services in these legislative efforts is unsupported by the data.  Additional research breaking out the various sorts of computer uses (e.g., social media, gaming, texting) may indicate that other services, including online gaming which has likewise been a staple of youth entertainment for many decades, should be left out of these regulatory efforts.

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[15]    A.S. Levine, *These TikTok Accounts Are Hiding Child Sexual Abuse Material In Plain Sight,* FORBES          (November          14,          2022)          (available          at: .https://www.forbes.com/sites/alexandralevine/2022/11/11/tiktok-private-csam-child-sexual-abuse-material/?sh=4e34eb743ad9).

[16]    Descriptions available at: http://www.tvguidelines.org; https://www.filmratings.com.

[17]    A. Hutchinson, *New Report Finds Social Media Video Now Sees as Much Consumption Time as Traditional     TV,* SOCIALMEDIATODAY     (January     4,     2022)     (available     at: https://www.socialmediatoday.com/news/new-report-finds-social-media-video-now-sees-as-much-consumption-time-as-tr/616657).

## II.  Data

Data are obtained from the publicly-available, bi-annual Youth Risk Behavior Survey ("YRBS") managed by the Center for Disease Control ("CDC").[18]  The YRBS is the largest public health surveillance system in the United States and permits us to consider (with a large sample) two types of screen time use on mental health: computer use and television viewing.  Data were obtained for high school students aged 14 to 18 (or more) for years 2011, 2013, 2015, 2017, and 2019.  Data from 2021 are excluded since the YRBS no longer separates television from computer use but includes only an overall screen time indicator, an unfortunate reduction in the detail and thus value of the survey as researchers look for more, not less, specificity regarding how screen time is allocated across services.

### A.  *Mental Health*

The YRBS includes several questions regarding mental health.  We construct a single indicator of depressive symptoms by combining questions related to mood and suicide ideation.[19]  First is the question: *During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?*  We code the dichotomous response as 1.0 for a "yes" response, so a positive coefficient on a covariate indicates a worsening of mental health.  Second, there are two questions related to suicide ideation: (1) *During the past 12 months, did you ever seriously consider attempting suicide?*; (2) *During the past 12 months, did you make a plan about how you would attempt suicide?*  The responses are dichotomous (yes/no).  "Seriously consider" and "making plans" are comparable concepts and the tetrachoric correlation between the responses is very high ($\rho = 0.88$), so the two variables are measuring the same basic situation.  Also, the tetrachoric correlation between sadness and suicide ideation is large for both females ($\rho = 0.718$) and males ($\rho = 0.715$).  As such, an outcome variable measuring *depressive symptoms* is set equal to 1.0 for a positive response to any of these questions.

### B.  *Screen Time*

YRBS includes two measures of screen time.  As for television use, the survey asks: *On an average school day, how many hours do you watch TV?*  As streaming video

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[18]     Data available at: https://www.cdc.gov/healthyyouth/data/yrbs/data.htm#national.

[19]     There are two questions on suicide attempts, but missing data are common for these questions (about 20% of the sample), and the affirmative responses to both questions are relatively few (7.7% and 2.4%).  As such, we exclude these questions from our analysis.

services are merely a type of television viewing, this question is a suitable measure of the quantity of time spent on streaming services.  Another screen time variable is time spent on the computer doing various things: *On an average school day, how many hours do you play video or computer games or use a computer for something that is not schoolwork (Count time spent playing games, watching videos, texting, or using social media on your smartphone, computer, Xbox, PlayStation, iPad, or other tablet.)?*  This question on computer use reaches beyond pure social media use and is a portmanteau of multiple uses of the computer.  Consequently, the relationships between mental health and computer usage levels cannot be said to measure the effect of social media directly.  For each question, seven categorical responses are available: (1) no use on the average school day; (2) less than 1 hour per day; (3) 1 hour per day; (4) 2 hours per day; (5) 3 hours per day; (6) 4 hours per day; and (7) 5 or more hours per day.  We keep the categorical responses in our empirical analysis to avoid imposing a linear relationship between use and mental health outcomes.  The polychoric correlation between the two screen time variables is positive but small ($\rho$ = 0.17).

### C.  *Confounders*

The YRBS includes responses on several questions may be used to condition the outcome responses.   In appealing to the Conditional Independence Assumption, it may seem that including as many covariates is desirable, but doing so poses risks.  Any covariate that may be considered an outcome of computer or television use could bias the coefficients on these screen time variables (Angrist and Pischke 2009: Ch. 3), and computer use (in particular, social media) has been taken to be a determinant of a variety of outcomes.[20]  As such, we limit the set of covariates that are plausibly unrelated to computer or television use.  We note however that the YRBS is somewhat limited in its demographic data.

First are variables that are clearly exogenous including gender (male, female), age, race, and the year of the survey.  Other covariates we treat as plausibly exogenous but likely to influence mental wellbeing include: (1) being bullied at school; (2) missing at least one day of school due to feeling unsafe at school, (3) the respondent has been physically forced to have sexual intercourse (dichotomous); (4) the respondent is in a physically abusive relationship (dichotomous); (5) the respondent eats breakfast at least five days per week (dichotomous); (6) whether the respondent has been offered drugs at school (dichotomous); and (7) whether

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[20]     *Social Media and Mental Health: A Collaborative Review, supra* n. 5.

the respondent rides in a car with someone that has been drinking for more than six of the last thirty days (dichotomous, a possible measure of parental care).

We apply pairwise deletion (complete case analysis) of any respondent with missing values on key variables including age (0.49%), gender (0.60%), race (1.21%), the primary mental health variables (2.31%), and the television or computer use responses (4.59%).  These deletions, which often overlap, amount to 7.9% of the total sample.  The proportions of missing values for these covariates are small, and no pattern was observed for missing values between the mental health outcomes and screen time variables.[21]  As for the confounders, the proportion of missing data among these covariates is 21.6% (about 5% coming from missing values for the breakfast variable).  Pairwise deletion is applied, which assumes the data to be missing at random and implies unbiased coefficients but perhaps standard errors that are too large.  If the data are not missing at random, then the coefficients may be biased.   Given the large share of missing values on the confounders, multiple imputation is also employed.

## III. Empirical Model

There is a sizable and growing literature on the relationship between computer use (of varying sorts) and youth mental health.  Perhaps because of the coincidence of the rise of social media and the increasing rates of youth depression and suicidality, a great deal of recent research and practical attention has focused on the relationship between social media and mental health, both for kids and adults. Professors Jonathan Haidt (New York University) and Jean Twenge (San Diego State University) offer an ongoing review of this literature, a now 300-page document summarizing a huge collection of research papers of varying quality, sample sizes, dates, and findings.[22]   A common takeaway from the research is that social media use is correlated with (and possibly causing) worse mental health among young people in the U.S. and elsewhere.  This work is not without its critics,

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[21]    Studies suggest a missing proportion greater than 10% may be problematic.  *See*, *e.g.*, D.A. Bennett, *How Can I Deal with Missing Data in My Study?* 25 AUSTRALIA AND NEW ZEALAND JOURNAL OF PUBLIC HEALTH 464–469 (2001); Dong and C.Y. Peng, *Principled Missing Data Methods for Researchers*. 2 SPRINGERPLUS 222 (2013). *Also see*, *e.g.*, P. Madley-Dowd, R. Hughes, K. Tilling, and J. Heron, *The Proportion of Missing Data Should Not be Used to Guide Decisions on Multiple Imputation*, 110 JOURNAL OF CLINICAL EPIDEMIOLOGY 63-73 (2019).

[22]    *Social Media and Mental Health: A Collaborative Review, supra* n. 5.

and some offer compelling criticisms of the research.[23]  Still, numerous experts in the area, including Professors Haidt and Twenge, believe that the research and experience and recommendations of mental health professionals suffice to warrant a public policy response.

Our analysis follows the typical approach and uses some of the same data used to study this problem.  As the data are cross-sectional, we rely on the Conditional Independence Assumption to lend plausibly causal interpretations to the results.  The empirical model is,

$$y = t\delta + s\lambda + x\beta + \varepsilon \, , \tag{1}$$

where $y$ is a dichotomous indicator of depressive symptoms, $t$ is categorical response to television viewing time, $s$ is the categorical response to computer use, and $x$ is matrix of covariates, and $\varepsilon$ is a disturbance term.  The dependent variable is dichotomous, so the model is estimated by Logit Regression.  The coefficients are not directly interpretable, so we compute the marginal effects and report those rather than the coefficients.[24]   All analysis accounts for the sample weights provided in the YRBS data using Stata's survey method.[25]

The (vector of) coefficients of primary interest are the $\delta$, which measure the relationships between various levels of television viewing on the outcome, and the $\lambda$, which measure the relationships of various levels of computer use on the outcome.  By retaining the categories of use and viewing levels, the specification of Equation (1) allows for non-linear responses to use and viewing times.  To avoid the dummy trap, all the $\delta$ and $\lambda$ coefficients measure comparisons to the base response of no use or viewing.  Marginal effects are computed from the base level (no screen time of the type).

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[23]    *Supra* n. 6.  The criticisms of the social-media-causes-depression research are varied, but the gist of them is that the data and/or the methods used do not permit the quantification of a causal relationship, or else do not provide a causal claim of sufficient strength or specificity to warrant legislative action.

[24]    Preliminary analysis suggests that estimating models separately using the Linear Probability Model ("LPM") provides nearly identical results.  O. Hellevik, *Linear Versus Logistic Regression when the Dependent Variable is a Dichotomy*, 43 QUALITY & QUANTITY 59–74 (2009); J.S. Long, REGRESSION MODELS FOR CATEGORICAL AND LIMITED DEPENDENT VARIABLES (1997).

[25]    Stata 18 is used for all estimations.

A check on random assignment is constructed to see if the means of the $x$ variables are very different across treatment levels since the differences in the $x$ between the treated and untreated should be approximately equal if the treatment was randomly assigned. (If you assigned a drug and a placebo randomly among 100 persons, then we would expect the average weight of the two groups to be approximately equal.) To evaluate covariate balance, treatment levels for both screen times are dichotomized into low and high use at a two-hour threshold. The means of the covariates are well-balanced across the computer use and television viewing times for both males and females, with Absolute Standardized Differences ("ASD") never exceeding 0.25 (Imbens and Wooldridge, 2009).[26] Low and high users of both screen times variables are comparable in all measured aspects, so selection bias does not arise from differences in the characteristics of respondents across television or computer use. Such comparability does not guarantee unbiased coefficients as the included covariates may not account for all relevant characteristics, but the well-balanced sample is encouraging.

A. *Descriptive Statistics*

In Table 1, we see a general decline in the mental wellbeing of females, with mostly steady increases in sadness and suicide ideation. For males, the mental health measures are relatively stable over this period. For both females and males, particularly large increases in sadness, suicide ideation, or either condition for males, are observed in 2019.[27] Other data, such as the National Survey on Drug Use and Health ("NSDUH"), suggest a more pronounced trend in rising depression (measured in a different way than here) among America's youth.[28]

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[26]    G. Imbens and J. Wooldridge, *Recent Developments in the Econometrics of Program Evaluation*, 47 JOURNAL OF ECONOMIC LITERATURE 5-86 (2009) at pp. 43-4.

[27]    A similar sharp increase in 2019 was observed in depression data. *See*, *e.g.*, R.D. Goodwin, et al., *Trends in U.S. Depression Prevalence From 2015 to 2020: The Widening Treatment Gap*. 63 AMERICAN JOURNAL OF PREVENTATIVE MEDICINE 726-733 (2022) (available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9483000).

[28]    Data available at: https://www.datafiles.samhsa.gov/dataset/nsduh-2002-2019-ds0001-nsduh-2002-2019-ds0001.

**Table 1.  Trends in Mental Health**

| | Females | | | Males | | |
|---|---|---|---|---|---|---|
| Year | Sadness | Ideation | Either | Sadness | Ideation | Either |
| 2011 | 0.358 | 0.225 | 0.411 | 0.210 | 0.157 | 0.271 |
| 2013 | 0.388 | 0.251 | 0.442 | 0.206 | 0.143 | 0.255 |
| 2015 | 0.400 | 0.272 | 0.455 | 0.203 | 0.151 | 0.258 |
| 2017 | 0.407 | 0.252 | 0.449 | 0.209 | 0.140 | 0.254 |
| 2019 | 0.467 | 0.279 | 0.509 | 0.267 | 0.161 | 0.312 |

Table 2 shows the trends in screen time for both males and females.  The data show a general decline in television viewing over the last decade, with substantial increases in no watching or viewership of less than one hour and large declines at very high levels of viewing.  The attention of youth is shifting toward computer use, which suggests television viewing may not be contributing to the mental health crisis.  Though the share of respondents with no computer time is rising, perhaps reflecting parental adjustments to worries about mental health and other concerns, the shares of the other categories are shifting to higher usage, especially for the three highest usage groups (and especially the highest group).

**Table 2.  Trends in Screen Time**

| | None | < 1 hour | 1 hour | 2 hours | 3 hours | 4 Hours | 5+ Hours |
|---|---|---|---|---|---|---|---|
| *Television* | | | | | | | |
| 2011 | 0.115 | 0.171 | 0.159 | 0.230 | 0.156 | 0.072 | 0.097 |
| 2013 | 0.143 | 0.177 | 0.145 | 0.211 | 0.154 | 0.074 | 0.097 |
| 2015 | 0.187 | 0.204 | 0.161 | 0.200 | 0.127 | 0.052 | 0.069 |
| 2017 | 0.261 | 0.207 | 0.140 | 0.186 | 0.105 | 0.044 | 0.058 |
| 2019 | 0.281 | 0.207 | 0.145 | 0.168 | 0.096 | 0.043 | 0.058 |
| *Computer* | | | | | | | |
| 2011 | 0.126 | 0.205 | 0.174 | 0.186 | 0.127 | 0.067 | 0.116 |
| 2013 | 0.147 | 0.155 | 0.130 | 0.157 | 0.129 | 0.084 | 0.198 |
| 2015 | 0.180 | 0.137 | 0.110 | 0.155 | 0.135 | 0.089 | 0.195 |
| 2017 | 0.196 | 0.121 | 0.102 | 0.151 | 0.131 | 0.086 | 0.214 |
| 2019 | 0.174 | 0.102 | 0.102 | 0.160 | 0.155 | 0.101 | 0.206 |

Table 3 summarizes the descriptive statistics of the data between females and males with case-wise deletion of missing values.  As for the outcomes, we see that females have much higher rates of depressive symptoms (nearly twice the rate).  The means for television viewing, computer use, and the other covariates are comparable across the groups, with a few exceptions.  Television viewing is moderate across both groups, with less than 10% of respondents viewing television for more than four hours daily.  Computer use is mostly moderate, except for the highest category where nearly 20% of respondents use social media (or gaming) for at least five hours daily.  No use of either television or the computer is higher for females (20.3%) than males (12.5%).  Males, on average, use the computer (or online gaming devices) more intensely, which is not surprising.

| Table 3. Descriptive Statistics | | | | | |
|---|---|---|---|---|---|
| | **Female** | **Male** | | **Female** | **Male** |
| Sadness | 0.402 | 0.218 | Age | 16.02 | 16.10 |
| Sui. Ideation | 0.255 | 0.151 | White | 0.548 | 0.550 |
| Sad or Sui. Ideation | 0.452 | 0.269 | Hispanic | 0.222 | 0.220 |
| | | | Black | 0.132 | 0.132 |
| *Television* | | | AAPI | 0.043 | 0.046 |
| None | 0.193 | 0.197 | Native | 0.006 | 0.008 |
| < 1 hour | 0.200 | 0.185 | Mixed | 0.049 | 0.044 |
| 1 hour | 0.148 | 0.152 | Bullied at School | 0.232 | 0.158 |
| 2 hours | 0.198 | 0.202 | Sexual Abuse | 0.106 | 0.031 |
| 3 hours | 0.125 | 0.132 | Abusive Relation. | 0.248 | 0.263 |
| 4 hours | 0.059 | 0.056 | Unsafe at School | 0.062 | 0.052 |
| 5+ hours | 0.076 | 0.076 | Drugs at School | 0.191 | 0.237 |
| | | | Driver Alcohol | 0.133 | 0.138 |
| *Computer* | | | Breakfast (5 days) | 0.467 | 0.544 |
| None | 0.203 | 0.125 | | | |
| < 1 hour | 0.137 | 0.154 | *Year* | | |
| 1 hour | 0.119 | 0.130 | 2011 | 0.216 | 0.217 |
| 2 hours | 0.147 | 0.177 | 2013 | 0.187 | 0.199 |
| 3 hours | 0.124 | 0.146 | 2015 | 0.211 | 0.214 |
| 4 hours | 0.079 | 0.091 | 2017 | 0.202 | 0.193 |
| 5+ hours | 0.191 | 0.178 | 2019 | 0.183 | 0.177 |

As for the other covariates, age and race are comparable across the groups. Note that the Native American racial group is thinly populated. Sexual abuse (forced sexual intercourse) is more common among females as is being bullied at school. Males are more likely to be offered drugs at school and eat breakfast daily. The sample is closely divided among years.

## IV. Results

Given substantial prior evidence of a difference between gender in the relationship between computer use or social media use and mental health, our empirical analysis separates the sample by gender. While the model is estimated by Logit Regression, Table 4 summarizes the average marginal effects ("AME") and their percentage differences ("%AME") from the base level of no use. Since the dichotomous dependent variable is coded 1 for a "yes" response, a positive coefficient indicates a worsening of the mental health outcomes.

**Table 4.  Regression Results, Females**

| | Females | | | | |
| --- | --- | --- | --- | --- | --- |
| | AME | %AME | | AME | %AME |
| *Computer* | | | | | |
| < 1 hour | 0.009 | 0.025 | | 0.023* | 0.112 |
| 1 hour | 0.016 | 0.045 | | 0.017 | 0.084 |
| 2 hours | 0.047*** | 0.130 | | 0.040*** | 0.192 |
| 3 hours | 0.067*** | 0.182 | | 0.071*** | 0.319 |
| 4 hours | 0.117*** | 0.302 | | 0.083*** | 0.363 |
| 5+ hours | 0.147*** | 0.368 | | 0.128*** | 0.521 |
| *Television* | | | | | |
| < 1 hour | -0.030** | -0.077 | | -0.027** | -0.107 |
| 1 hour | -0.053*** | -0.136 | | -0.043*** | -0.171 |
| 2 hours | -0.039*** | -0.099 | | -0.045*** | -0.182 |
| 3 hours | -0.048*** | -0.124 | | -0.064*** | -0.268 |
| 4 hours | -0.011 | -0.027 | | -0.044*** | -0.179 |
| 5+ hours | -0.031* | -0.078 | | -0.030* | -0.118 |
| Obs. | 27,329 | | | 26,877 | |

Stat. Significance *** 1%, ** 5%, * 10%

Regarding computer use (for non-school purposes), the results are consistent with prior research.  Low levels of computer use (an hour or less) do not have any apparent relationship to depressive symptoms (a small and marginally significant effect is found for males at less-than one-hour of use).  At two hours of use, however, the marginal effects turn positive and consistently increase in usage levels thereafter.  The increase in depressive symptoms at four-or-more hours of use is large and exceeds 30%.  While the AMEs are comparable for males and females, the percentage marginal effects are larger for males, a consequence of the lower mean depressive symptoms rate for males.  At the highest level of use (five or more hours), depressive symptoms are 36.8% higher for females but 52.1% higher for males.  The odds ratios for these effects is about 2.0 for both males and females.

Television viewing, in contrast, is not associated with poorer mental health outcomes.  In fact, the coefficients are all negative and the null hypothesis of "no effect" is frequently rejected.  For moderate television viewing, depressive symptoms are reported approximately 10% less frequently for females and nearly 20% less for males.

Using the estimates of Equation (1) we can calculate the mix of television viewing and computer use that produces the best mental health outcomes.  There are 49 combinations of television and computer use and we compute the mix of usage levels for the five best outcomes.  For females, the best mental health outcome occurs with less-than-an-hour of computer use and between one-to-three

hours of television viewing. For males, the best mental health outcomes occur with an hour or less of computer use and one-to-four hours of television viewing.

Figure 1 plots the predictions from the model. The horizontal lines mark the mean prediction for the base category (no use). The figure illustrates the worsening of mental health outcomes as computer use rises, though the predictions are close to the base level for usage levels of one-hour-or-less. Beyond one-hour of use, we see a steady increase in respondents reporting poorer mental health. These figures are comparable to those in Twenge and Campbell (2019: 326), which is unsurprising since the same data are used (though only through 2017).[29]



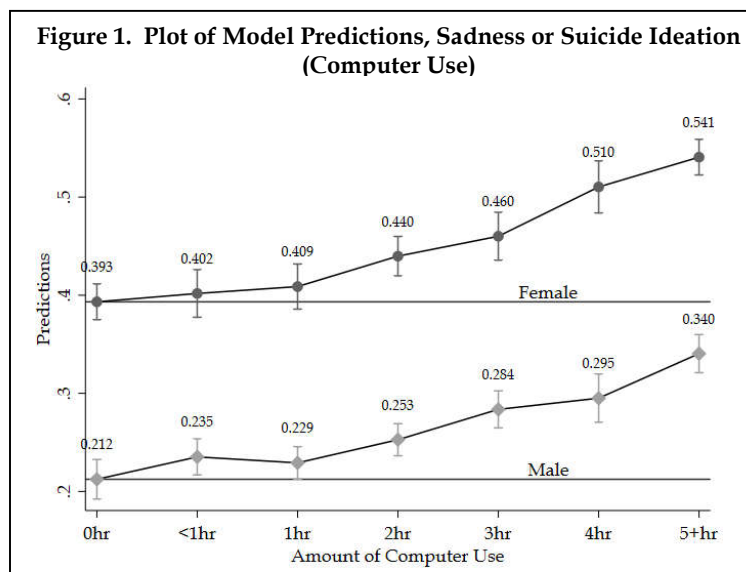Figure 1. Plot of Model Predictions, Sadness or Suicide Ideation (Computer Use)

Figure 2 illustrates the model's prediction across television viewing times. The predictions for all levels of television viewing are below the base level. Moderate use is associated with better mental health and very high use is nearly equivalent to no viewing at all, and sometimes better. For both computer use and television viewing, the relationship between screen time and mental health outcomes is non-linear across the usage categories, though more so for television.

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[29]    J.M. Twenge and W.K. Campbell, *Media Use Is Linked to Lower Psychological Well-Being: Evidence from Three Datasets*, 90 THE PSYCHIATRIC QUARTERLY 311–331 (2019).

Figure 2.  Plot of Model Predictions, Sadness or Suicide Ideation (Television Viewing)
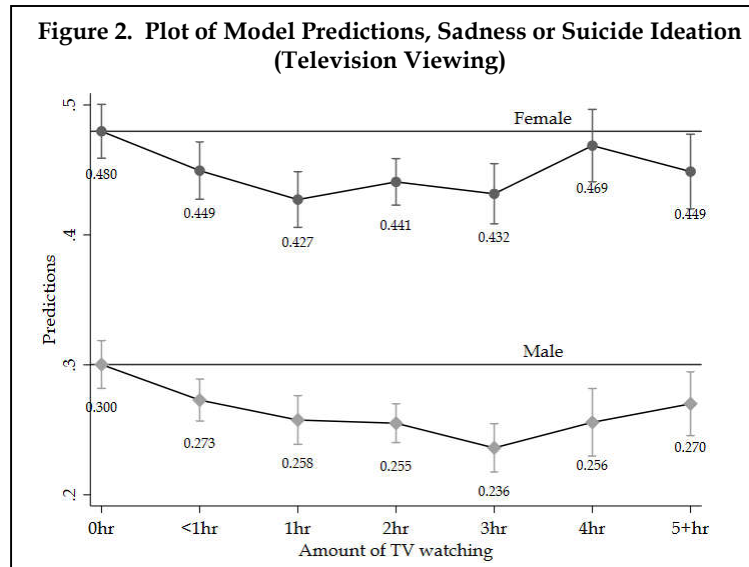
Also observe that the patterns in the predictions across usage levels between males are females and screen time types are remarkably similar, especially for computer use.  Reports that males and females respond differently to computer use seems largely to reflect an attention to the coefficients of regression models without regard to the difference in means between genders of the dependent variable.  In fact, on a percentage basis, the marginal effects of computer use are larger for males.

A.  *Multiple Imputation*

As noted above, several of the covariates have relatively high proportions of missing values, though none above 10%.  Collectively the proportion of missing values is near 21%.  Whether pairwise deletion or multiple imputation is preferred is unclear, so for comparison purposes we apply multiple imputation.  Logit and Ordered Logit are used for the dichotomous and categorical responses, respectively.  Predictors include the exogenous covariates, the screen time variables, the outcome variables, the survey weight, and a fixed effect for the survey stratum.  We create 10 imputations.[30]

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[30]    The Stata command -how_many_imputations- calculates how many imputations are needed to obtain reliable standard errors, which was determined to be no more than 10.

**Table 4.  Regression Results, Multiple Imputation**

|  | Females | | Males | |
|---|---|---|---|---|
|  | Complete Case AME | Imputed AME | Complete Case AME | Imputed AME |
| *Computer* | | | | |
| < 1 hour | 0.009 | 0.009 | 0.023* | 0.017 |
| 1 hour | 0.016 | 0.019 | 0.017 | 0.010 |
| 2 hours | 0.047*** | 0.051*** | 0.040*** | 0.038*** |
| 3 hours | 0.067*** | 0.068*** | 0.071*** | 0.066*** |
| 4 hours | 0.117*** | 0.113*** | 0.083*** | 0.078*** |
| 5+ hours | 0.147*** | 0.145*** | 0.128*** | 0.121*** |
| *Television* | | | | |
| < 1 hour | -0.030** | -0.023* | -0.027** | -0.029*** |
| 1 hour | -0.053*** | -0.045*** | -0.043*** | -0.043*** |
| 2 hours | -0.039*** | -0.030** | -0.045*** | -0.047*** |
| 3 hours | -0.048*** | -0.034*** | -0.064*** | -0.062*** |
| 4 hours | -0.011 | -0.003 | -0.044*** | -0.050*** |
| 5+ hours | -0.031* | -0.021 | -0.030* | -0.032** |
| Obs. | 27,329 | 34,031 | 26,877 | 32,954 |

Stat. Significance *** 1%, ** 5%, * 10%

Table 4 summarizes the results.  The complete case results (from above) are provided. Imputation has little effect on the results.  The general implications are identical:  moderate television viewing is associated with better outcomes and high levels of computer use are associated with worse mental health.

B. *Summary*

A tide of legislative efforts aims to address the alleged mental health consequences of screen time use on adolescents and teens.  In some cases, the legislation is targeted to social media platforms, while in others the breadth of coverage is broad.  All screen time is not the same, however.  Here, we evaluate the effects of television use and computer use separately to determine whether curated, professionally-produced video content should be included in these legislative efforts.

We find no evidence that television viewing is detrimental to teen mental health.  In fact, television use is associated with better mental health outcomes.  We see no reason for legislation to include television (or streaming video services) in the list of covered services and doing so may do more harm than good.  Maybe other services (*e.g.*, online gaming or texting), here included in a broad measure of computer use, should likewise be excluded from the list of covered services, but that possibility warrants a detailed analysis of those specific services.  Certainly, the evidence presented here does not support broad legislative remedies but a more targeted approach.

## V. Conclusion

Most data suggest that adolescent and teen mental health has worsened over the past decade. Seeking causes, researchers have produced a vast literature on the relationship between social media and mental health. While the results are mixed, the purported relationship between social media use and mental health are of significant policy relevance today. Legislative efforts at the state and federal level are now targeting the functional aspects of social media platforms, among other services for which evidence is lacking, to attenuate their undesirable effects, especially on worsened adolescent and teen mental health. Conflicting findings and the opaqueness of some of the research frustrates good policy making in this area.

In this POLICY PAPER, we provide a straightforward, policy-relevant assessment of the relationship between teen screen time use and mental health to guide the reasonable breadth of coverage for legislation. To do so, we used multiple years of data from a large survey of high school students to quantify the relationship between the time spent daily watching television and teen mental health. Mental health is measured by persistent feelings of sadness and hopelessness and suicide ideation. Television viewing is found here to have a favorable effect on mental health when used in moderation (a few hours per day), and it never worsens mental health. The best mental health outcomes for females occurs with one-to-three hours of television viewing and less than one hour of computer use. For males, the best mental health outcomes are for one-to-four hours of television and an hour or less of computer use.

Every regulatory intervention has unintended consequences, some so unfavorable as to make intervention unproductive. Regulation imposes compliance costs that may distort markets and undermine smaller and less well funded competitors—here, independent, less commercial, and diverse streaming services serving smaller and non-mainstream audiences. Some market participants may respond by trying to block access to streaming video programming to ensure compliance with the statute, an overcorrection that could ultimately steer more younger viewers to the very social media platforms policymakers are trying to reign in.

Trying to solve unlike problems with a single instrument makes those negative unintended consequences even greater. If teen mental health motivates the Kids Online Safety Act and similar legislation, then there is little reason to include video streaming in the list of covered platforms, as television viewing appears to have no negative association with teen mental health.