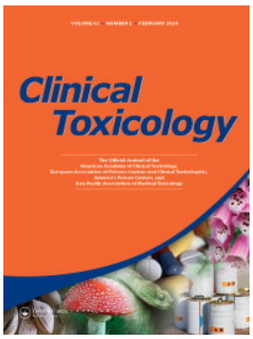

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POISON CENTRE RESEARCH

Impact of social media "challenges" on poison center case volume for intentional ingestions among school-aged children: an observational study

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ABSTRACT

Introduction: Mental health problems among youth have escalated over the past decade, with increased rates of self-harm, including suicide attempts by ingestion. Social media use has been linked to youth mental health, including "challenges" urging youth to ingest substances for recreational and other purposes. We hypothesized that social media challenges for particular substances would temporally correspond with increased ingestions of these substances.

Methods: We identified peak Google Trends search times for social media ingestion challenges involving diphenhydramine, laundry pods, nutmeg, and cinnamon, and used data from America's Poison Centers National Poison Data System to plot reported ingestions 3 months before and after peak searches in school-aged children.

Results: There were 2,169 individuals in the analysis. Diphenhydramine was the most frequently reported ingestion for misuse/abuse and suicidal purposes ($n = 266$ and 1,609, respectively). For all ingestions together, 45 percent ($n = 979$) had a moderate health effect, and 6.35 percent ($n = 137$) had a major health effect. Time of peak searches corresponded with increased ingestions for each substance.

Discussion: We found a temporal relationship between peak Google Trends searches for ingestion challenges and ingestions of that substance reported to United States poison centers. Compared to misuse/abuse ingestions, most suicidal ingestions peaked 1–2 months later, suggesting a public health opportunity for intervention.

Limitations: This retrospective observational study does not establish causal effect. All data are a result of self-reporting of the exposures, which may lead to a reporting bias. Google Trends is not the only search engine and likely underestimates the true incidence of social media posts.

Conclusions: Additional research is needed on the relationship between social media and youth mental health, particularly around "challenges" that place youths' health at risk. There may be opportunities for intervention to decrease medical and mental health sequelae of these challenges.

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Ingestions; adolescent; self-harm; social media; ingestion challenges

Introduction

Children and adolescents have experienced escalating mental health problems over the past decade, with increased rates of self-harm [1,2]. Research using data from the National Poison Data System (NPDS) of America's Poison Centers from 2000 to 2020 found increasing rates of poison center consults for suicide attempts by ingestion [3]. Several studies have noted that self-harm attempts among youth have grown at higher rates since early in the second decade of the 2000s [4–6].

Some researchers have posited an association between increasing self-harm in youth and the rise of social media platforms [7,8]. Research on the mental health impacts of social media use has been mixed. Some studies suggest that technology can positively impact youth mental health, including by providing avenues to seek mental health help and support, as well as through increased social connectedness [9–11]; others suggest harmful impacts such as isolation and loneliness, decreased empathy, and increased depression and suicidality [11–13]. The popular press and medical communities have described social media "challenges" that cause youth to engage in unsafe or disruptive activities and post photos or videos online as proof of completion [13,14]. These challenges encourage behaviors such as binge drinking and driving-related stunts, such as the "car surfing" challenge, and causing bodily harm to themselves or others, including the "salt and ice," "fire," "hot water," and "skull breaker" challenges [15–17]. A subset of these posts involve youth misusing substances via ingesting medications, foods, or household products.

Illuminating potential connections between social media trends and medical consequences may enhance our

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understanding of the real-world effects of social media on youth. To date, a relationship has not been established between youth substance ingestions and specific social media trends. Our study identified times of peak Google Trend searches for social media challenges regarding ingestion of potentially harmful substances and examined whether these searches corresponded temporally with increased United States (US) poison centers consults for ingestions of these substances in persons aged 6–19.

Methods

We identified a priori four ingestion "challenges" that were popular on social media platforms in the US within the past several years: Benadryl® (diphenhydramine), Tide PODS® (laundry detergent pods), cinnamon, and nutmeg. These challenges were chosen based on their frequency in the medical literature (such as case reports) [18–21], the abundance of media coverage related to them, and previously identified general trends regarding the ingestion of these substances. The "Benadryl® challenge" encouraged viewers to take large doses of diphenhydramine to induce hallucinations. The "Tide POD® challenge" dared individuals to put a laundry detergent pod in their mouth and bite down on it. The "nutmeg challenge" encouraged viewers to consume two tablespoons of ground nutmeg mixed in water to produce a hallucinogenic high. The "cinnamon challenge" dared individuals to eat a spoonful of cinnamon in less than 60 s without drinking anything.

To identify the peak in US web search trends, we used Google Trends (https://www.google.com/trends) and searched for the following terms from 2004 to 2021: "Benadryl® challenge," "Tide POD® challenge," "cinnamon challenge," and "nutmeg challenge." We identified search peaks and repeated the Google Trends searches within a more granular time frame (3 months pre- and post-peak), then extracted ingestion data for each substance from the NPDS for 3 months before and 3 months after the peak search time. For this analysis, we limited our analysis to ingestions of a single substance.

The NPDS compiles information from each certified regional poison center in the US. Initial data are collected by specialists at each center and entered into regional databases in real time using uniform definitions for clinical effects, therapies, and outcomes. America's Poison Centers maintains all data as deidentified case numbers in an electronic database. Our study population included all consults regarding ingestions patients six through 19 years, from 2000 to 2020. Laundry pods were the defined coding nomenclature, although the internet challenge included the brand Tide PODS®. The analysis included consults that were coded for each of three reasons: "Intentional - suspected suicide," "Intentional - misuse," and "Intentional - abuse." Coding is based on the NPDS coding user manual definitions and on the judgment of specialists in poisons information after discussion with the calling party to determine the likely reason for the ingestion. "Intentional-suspected suicide" is defined as an exposure resulting from the use of a substance for self-harm reasons. "Intentional-misuse" is an exposure resulting from the intentional, improper, or incorrect use of a substance for reasons other than label indications for other than the pursuit of a psychotropic effect. "Intentional-abuse" is defined as an exposure resulting from the intentional improper use of a substance where the patient is attempting to gain a high or other psychotropic effect, including recreational use of a substance for any effect. Data variables included age, gender, route of ingestion, the reason for ingestion, clinical outcome, and substance(s) ingested. Clinical outcome was coded using a priori definitions from the NPDS coding manual, divided into no effect, minor effect, moderate effect, major effect, or death (Supplemental Table 1). Further definitions for each clinical outcome can be found in the NPDS coding manual version 3.1 [22]. Our institutional review board deemed this study exempt from informed consent as it uses deidentified data.

Results

There were 2,169 individuals in this analysis, with 1,640 (75.6%) female, 525 (24.2%) male and four (0.2%) unknown. Overall misuse/abuse numbers were similar for laundry pods ($n = 76$) and cinnamon ($n = 71$), with fewer nutmeg ingestions ($n = 38$) and over threefold-greater diphenhydramine ingestions ($n = 266$). Greater proportions of males misused or abused laundry pods (56%) and cinnamon (50.7%), whereas greater proportions of females misused or abused diphenhydramine (51.1%) and nutmeg (71.1%). Laundry pod ingestions increased from pre- to post-search trends spike among males (25–56.5% of ingestions), whereas the proportion of laundry pod ingestions decreased among females (75–43.5%). Among suspected suicidal ingestions, there were lower numbers (laundry pods $n = 13$, cinnamon $n = 1$, and nutmeg $n = 6$), except for diphenhydramine ($n = 1,609$). There were higher proportions of females for all substances for suspected suicidal ingestions (laundry pods 53.9%, cinnamon 100%, diphenhydramine 82.5%, and nutmeg 66.7%). The majority of ingestions were in the 13–15 age category and occurred at the individual's residence. Of all ingestions together, 377 (17.4%) had no effect, 676 (31.2%) had a minor effect, 979 (45.1%) had a moderate effect, 137 (6.3%) had a major effect, and none resulted in death. Of the major effects, there were three cases of respiratory arrest and 44 patients who were intubated and ventilated. There were increased ingestions within 3 months of peak internet searches for ingestion challenges for all substances (Table 1).

The majority of single-substance ingestions were misuse/abuse of diphenhydramine ($n = 266$) or suspected suicidal ingestions of diphenhydramine ($n = 1,698$). Among misuse/abuse ingestions, 48 (18.1%) were categorized as no effect, 79 (29.7%) as minor, 129 (48.5%) as moderate and 10 (3.8%) as major. Among suicidal ingestions, 260 (15.3%) had no effect, 493 (29%) had a minor effect, 821 (48.4%) had a moderate effect, and 124 (7.3%) had a major effect (Table 1). In the 3 months prior to peak searches, average diphenhydramine ingestions for abuse/misuse were 32 cases per month. The increase in total ingestions comparing the average

Table 1. Single substance ingestions pre- and post- Google trends spike.

	Diphenhydramine $N = 1{,}964$		Cinnamon, $N = 72$		Nutmeg, $N = 44$		Laundry pods, $N = 89$	
	June 2020–August 2020, $n = 687$	September 2020–December 2020, $n = 1{,}277$	November 2011–January 2012, $n = 19$	February 2012–May 2012, $n = 53$	January 2020–March 2020, $n = 7$	April 2020–July 2020, $n = 37$	October 2017–December 2017, $n = 4$	January 2018–April 2018, $n = 85$
Gender								
Female	518	1,018	6	27	4	27	3	37
Male	168	259	13	23	3	10	1	48
Unknown	1	0	0	3	0	0	0	0
Age, years								
6–9	3	11	1	1	0	0	2	5
10–12	38	116	5	1	2	3	1	11
13–15	343	625	7	19	3	19	1	41
16–18	303	525	6	20	2	15	0	28
Reason								
Intentional abuse/misuse	92	174	19	52	6	32	2	74
Suspected suicide	595	1,103	0	1	1	5	2	11
Exposure site								
Own residence	655	1,217	10	25	6	35	3	60
School	2	8	6	24	0	0	0	19
Other/unknown	30	52	3	4	1	2	1	6
Geographic region, rate per one million persons aged 6–19								
Midwest	13.2	23.7	0.2	0.9	0.2	0.9	0	1.3
Northeast	8	14.7	0.4	0.8	0.1	0.2	0.1	0.6
South	10.2	22.1	0.5	1.2	0.1	0.5	0.1	1.3
West	12.8	20.1	0.1	0.4	0.1	0.8	0.1	2.1
Clinical effects**								
Bradycardia	1	4	1	1	0	0	0	5
Tachycardia	175	348	3	10	2	5	1	19
Hypotension	3	5	1	0	0	0	0	0
Respiratory arrest	0	1	0	1	0	0	0	1
Ventricular tachycardia/fibrillation	0	1	0	0	0	0	0	0
Seizure	2	24	1	4	0	0	0	0
Aspartate aminotransferase/alanine aminotransferase >100 U/L	1	2	0	0	0	1	0	0
Therapies**								
Cardiopulmonary resuscitation	1	1	0	0	0	0	0	0
Intubation	20	24	0	0	0	0	0	0
Ventilator	22	22	0	0	0	0	0	0
Vasopressors	2	3	0	0	0	0	0	0
Seen at health care facility*	480	838	7	11	5	19	2	28
Admitted*	259	463	0	3	1	6	0	2
Intensive care unit*	158	269	0	1	0	2	0	1
Outcomes**								
No effect	112	196	5	16	1	4	2	41
Minor	196	376	12	30	5	18	2	37
Moderate	329	621	2	6	1	13	0	7
Major	50	84	0	1	0	2	0	0

*Seen at healthcare facility, admitted and insensive care unit were missing for 34 (1.7%), 52 (72.2%), 15 (34.1%), 51 (57.3%), 30 (1.2%) of cases for diphenhydramine, cinnamon, nutmeg, and laundry pods, respectively.
**There were no cases of cardiac arrest, dysrhythmia not otherwise specified, extracorporeal membrane oxygenation, hemodialysis, or death, therefore these were not reported.

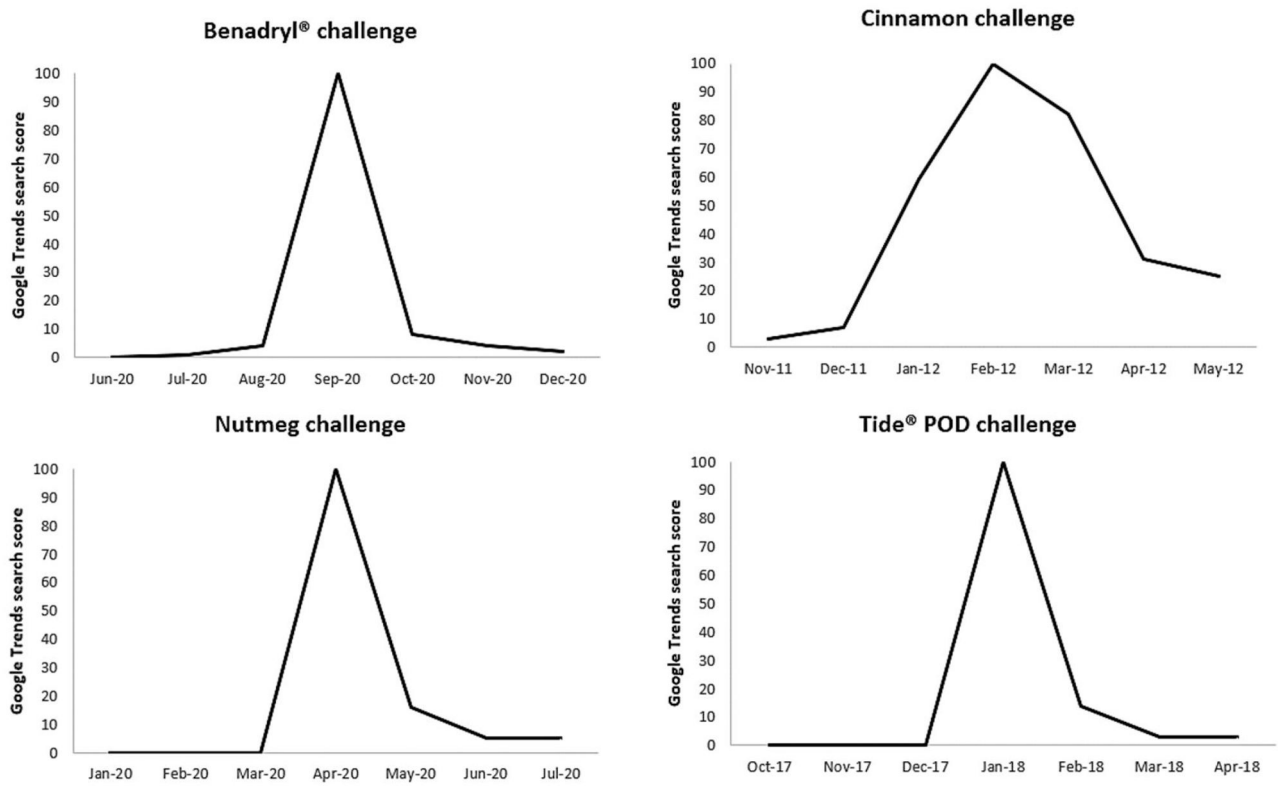

Figure 1. Google Trends searches for ingestion challenges over time.

monthly number in the 3 months prior to peak Google Trend searches with the average monthly number at the time of peak Google Trends searches was 43.8% or a 1.4-fold increase (Supplemental Table 2).

Among laundry pod ingestions, 76 cases were misuse/abuse, and 13 were suicidal ingestions. Among misuse/abuse ingestions, 38 (50%) had no effect, 32 (42.1%) had a minor effect, six (7.9%) had a moderate effect, and none were categorized as having a major effect. Among suicidal ingestions, five (38.5%) had no effect, seven (53.9%) had a minor effect, one (7.8%) had a moderate effect, and none had a major effect. The increase in total ingestions comparing the average monthly number in the 3 months prior to peak search with the average monthly number at the time of peak searches was 3,200% or a 33-fold increase (Supplemental Table 2).

Cinnamon ingestions included 71 misuse/abuse cases and one suicidal ingestion. Most misuse/abuse ingestions had no effect ($n = 21$; 29.6%) or a minor effect ($n = 41$; 57.8%); a smaller proportion had a moderate effect ($n = 8$; 11.3%) or major effect ($n = 1$; 1.4%). One suicidal ingestion had a minor effect. For abuse/misuse cases, the average number of ingestions increased from 6.6 cases per month for the 3 months prior to peak searches to 31 cases per month, a 367% or near 4.7-fold increase (Supplemental Table 2). The cinnamon ingestion with suspected suicidal intent occurred 2 months after peak Google Trend searches (Table 1).

There were 38 cases of misuse/abuse nutmeg ingestions and six suspected suicidal ingestions. Among misuse/abuse ingestions, 5 (13.2%) had no effect, 20 (52.6%) minor, 11 (29%) moderate, and two (5.3%) major. Among suicidal ingestions, none had no effect, while three (50%) had minor effects, three (50%) had moderate, and none had major effects (Table 1). In the 3 months prior to peak Google Trend searches, there was an average of two nutmeg ingestions for abuse/misuse. The increase in total ingestions comparing average monthly number in the 3 months prior to peak Google Trend searches with the average monthly number at the time of peak Google Trend searches was 885.7%, a 9.9-fold increase (Supplemental Table 2).

For all substances, Google Search Trends scores were plotted for 3 months before and 3 months after the peak search time (Figure 1). There were ingestion peaks corresponding with the time of peak Google Trend searches for all ingestion challenges (Figure 2). There were delayed suicidal ingestion peaks except for nutmeg, which initially peaked at the time of the peak Google Trend searches, and peaked again 3 months later (Figure 2).

Geographically, a greater percentage of total ingestions were reported in the South US for all substances (39.5%); this was also reflected across single-substance ingestions. The Northeast US had the lowest percentage of ingestions overall (11.4%). However, the Midwest US had the highest rate of ingestions per 1,000,000 children ages 6–19 years in the population (40.37, compared to 36.47 for the West US, 35.89 for the South US, and 24.90 for the Northeast US) (Supplemental Table 3).

Discussion

The impact of social media use on adolescents' mental health is a complex issue, with research identifying both the benefits and risks of youth social media use. One mechanism

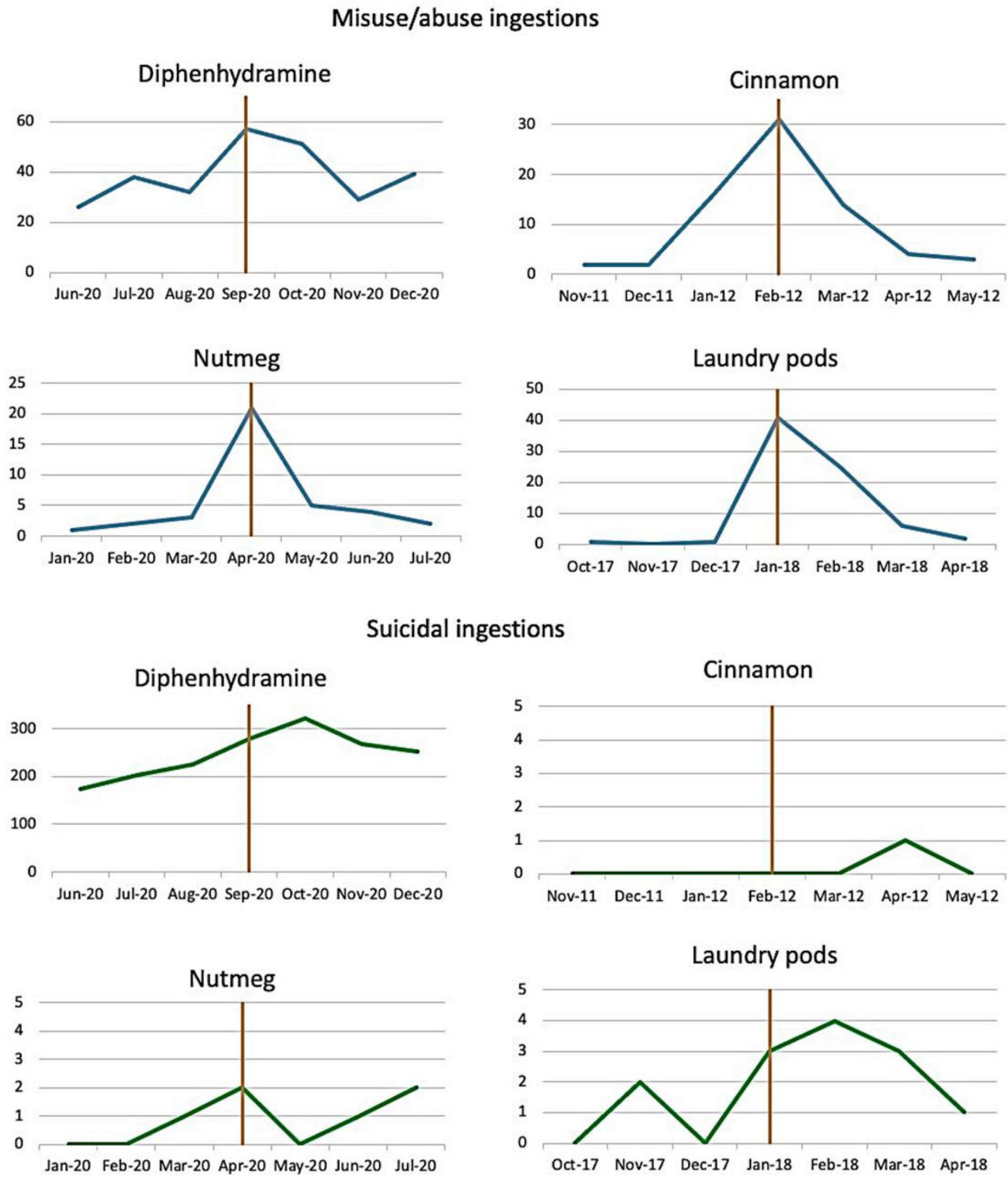

Figure 2. Number of reported ingestions for abuse/misuse and suicidal purposes from 3 months before to 3 months after peak Google Trends searches for ingestion challenges.

for benefits and risks may be through a contagion effect, which has been identified as an essential influence in adolescent social development and a factor in self-harming behaviors [23–25]. This study helps substantiate the potential risk of social media use by teens regarding risk-taking behavior, specifically ingestions following social media challenges. While there have been articles in the press and warnings in the medical community [26] about these trends, this is the first study to our knowledge to show an increase in nationally reported ingestions temporally associated with an uptick in the online presence of their corresponding "challenges." Of note, the age group of 10–12 years old had the largest increase in ingestions from pre- to post-Google Trends search peaks compared to other age groups. Many important

developmental changes occur in these years; this may include increased access to social media, with the average age at which children get their first cell phone recently cited as 11.6 years [27]. However, more research is needed to understand the factors which may influence these observed trends. Our study also identified regional trends in ingestions, with the Midwest having the highest overall rate and the Northeast having the lowest rate. Further research is also needed to understand these trends.

Diphenhydramine has significant health risks in supratherapeutic doses. We show an increased number of ingestions following the Google Trends search peak related to the Benadryl® challenge, beyond what was expected by underlying NPDS trends. There is less robust research about the medical consequences of laundry pod, cinnamon, and nutmeg ingestions; however, we show that these ingestions resulted in significant medical sequelae among dozens of youth. While no deaths resulted from these ingestions, even minor or moderate medical effects may result in far-reaching disruptions to the lives of children and families, as well as substantial healthcare costs.

Our study found that overall recreational ingestions peaked earlier than suicidal ingestions, suggesting that there may be a delayed effect, with recreational abuse of a substance being followed by the use of the substance with suicidal intent. This provides a window for outreach to youth and parents around the risks of substances for particular challenges, as well as increasing safety measures around these substances.

As children and adolescents seek increased independence from parents or caregivers, they are more likely to engage in impulsive, risk-taking behaviors. Parents, educators, and physicians should be aware of potential risks of social media use in youth, discuss these risks with youth, and encourage safe engagement with social media. Parents should consider monitoring their child's social media use and should lock up all medications, including over-the-counter/nonpresciption medicines, to reduce the risk of impulsive ingestions.

Limitations

Limitations of this study include its retrospective study design and observational nature, which does not establish a causal effect. All data are a result of self-reporting of the exposures, which may lead to a reporting bias. We could not confirm that a true ingestion occurred, the substance ingested, or the actual amount of the substance. Additionally, it is possible that not all the information, such as therapies and clinical effects, were recorded in their entirety, although critical events such as intubation, ventilation, dialysis, other resuscitative measures, and fatality are usually reported correctly. However, no individual case reports or electronic health records were available to review, and we could not review data for errors or miscoding. America's Poison Centers maintains the NPDS, which houses only de-identified case records managed by US poison centers. National Poison Data System data do not reflect the total incidence of exposures to a particular substance as additional exposures may go unreported to poison centers. Exposures do not necessarily represent a poisoning or overdose. Neither America's Poison Centers nor the individual regional poison center can completely verify the accuracy of every report.

Our study used Google Trends to search for ingestion trends. Google may capture general interest in a topic but is not the only search engine and likely underestimates the true incidence of social media posts.

Conclusions

Our study reports on increased ingestions of four substances reported to US poison centers in the 3 months surrounding peaks in Google Trends searches for social media ingestion challenges. Recently, public awareness has increased regarding mental health concerns among youth, the potential hazards of adolescent social medial use, and the responsibility of social media platforms and public agencies in regulating and monitoring this use. Our study suggests one area of risk for adolescents and a significant potential target for prevention, monitoring, and treatment efforts.

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America's Poisons Centers made the National Poison Data System available to the authors for this study. The findings and conclusions reported are those of the authors alone and do not necessarily represent the official position of America's Poisons Centers. America's Poison Centers maintains the National Poison Data System, which houses de-identified records of self-reported information from callers to the country's Poison Centers. National Poison Data System data do not reflect the entire universe of United States exposures and incidences related to any substances. Exposures do not necessarily represent a poisoning or overdose, and America's Poison Centers are not able to completely verify the accuracy of every report.

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References

[1] Mojtabai R, Olfson M, Han B. National trends in the prevalence and treatment of depression in adolescents and young adults. Pediatrics. 2016;138(6):e20161878. doi:10.1542/peds.2016-1878.

[2] Cybulski L, Ashcroft DM, Carr MJ, et al. Temporal trends in annual incidence rates for psychiatric disorders and self-harm among children and adolescents in the UK, 2003–2018. BMC Psychiatry. 2021;21(1):229. PMID: 33941129; PMCID: PMC8092997 doi:10.1186/s12888-021-03235-w.

[3] Spiller HA, Ackerman JP, Smith GA, et al. Suicide attempts by self-poisoning in the United States among 10–25 year-olds from 2000 to 2018: substances used, temporal changes and demographics. Clin Toxicol (Phila). 2020;58(7):676–687. doi:10.1080/15563650.2019.1665182.

[4] Leyenaar JK, Tolpadi A, Parast L, et al. Hospitalization for suicide ideation or attempt: 2008–2015. Pediatrics. 2018;150(6): e20172426. doi:10.1542/peds.2017-2426.

[5] Twenge JM, Joiner TE, Rogers ML, et al. Increases in depressive symptoms, suicide-related outcomes, and suicide rates among U.S. adolescents after 2010 and links to increased new media screen time. Clin Psychol Sci. 2018;6(1):3–17. doi:10.1177/2167702617723376.

[6] Sheridan DC, Grusing S, Marshall R, et al. Changes in suicidal ingestion among preadolescent children from 2000 to 2020. JAMA Pediatr. 2022;176(6):604–606. doi:10.1001/jamapediatrics.2022.0069.

[7] Sedgwick R, Epstein S, Dutta R, et al. Social media, internet use and suicide attempts in adolescents. Curr Opin Psychiatry. 2019; 32(6):534–541. doi:10.1097/YCO.0000000000000547.

[8] Twenge JM. Increases in depression, self-harm and suicide among US adolescents after 2012 and links to technology use: possible mechanisms. Psychiatr Res Clin Pract. 2020;2(1)19–25. doi:10.1176/appi.prcp.20190015.

[9] Berryman C, Ferguson CJ, Negy C. Social media use and mental health among young adults. Psychiatr Q. 2018;89(2):307–314. doi:10.1007/s11126-017-9535-6.

[10] Marchant A, Hawton K, Stewart A, et al. A systematic review of the relationship between internet use, self-harm and suicidal behaviour in young people: the good, the bad and the unknown. PLoS One. 2017;12(8):e0181722. Erratum in: PLoS One. 2018 Mar 1;13(3):e0193937. PMID: 28813437; PMCID: PMC5558917. doi:10.1371/journal.pone.0181722.

[11] Seong E, Noh G, Lee KH, et al. Relationship of social and behavioral characteristics to suicidality in community adolescents with self-harm: considering contagion and connection on social media. Front Psychol. 2021;12:691438. doi:10.3389/fpsyg.2021.691438.

[12] Twenge JM, Campbell WK. Associations between screen time and lower psychological well-being among children and adolescents: evidence from a population-based study. Prev Med Rep. 2018;12: 271–283. doi:10.1016/j.pmedr.2018.10.003.

[13] Gupta A, Dhingra A. The role of primary care physicians in curtailing harmful social media trends. Cureus. 2018;10(9):e3271. PMID: 30430060; PMCID: PMC6221514. doi:10.7759/cureus.3271.

[14] Deslandes SF, Coutinho T, Ferreira TRSC, et al. Online challenges among children and adolescents: self-inflicted harm and social media strategies. Salud Colect. 2020;16:e3264. doi:10.18294/sc.2020.3264.

[15] Young TK, Oza VS. Digital dermatoses: skin disorders engendered by social media in tweens and teens. Curr Opin Pediatr. 2021;33(4):373–379. PMID: 34101705. doi:10.1097/MOP.0000000000001037.

[16] Wombacher K, Reno JE, Veil SR. NekNominate: social norms, social media, and binge drinking. Health Commun. 2017;32(5): 596–602. doi:10.1080/10410236.2016.1146567.

[17] Zapata M. 15 Most dangerous social media challenges to avoid. Family Minded. 2021. https://www.familyminded.com/s/dangerous-social-media-challenges-31c1b2b2be14413b

[18] Atherton RR. The 'Nutmeg Challenge': a dangerous social media trend. Arch Dis Child. 2020;106. doi:10.1136/archdischild-2020-319407.

[19] Gurevich Y, Sahn B, Weinstein T. Foreign body ingestion in pediatric patients. Curr Opin Pediatr. 2018;30(5):677–682. PMID: 30036203. doi:10.1097/MOP.0000000000000670.

[20] Bosmia AN, Leon KJ. Lung injury and the cinnamon challenge: college students should beware this internet dare. J Inj Violence Res. 2015;7(1):41–42. doi:10.5249/jivr.v7i1.541.

[21] Grant-Alfieri A, Schaechter J, Lipshultz SE. Ingesting and aspirating dry cinnamon by children and adolescents: the "cinnamon challenge". Pediatrics. 2013;131(5):833–835. doi:10.1542/peds.2012-3418.

[22] American Association of Poison Control Centers. National Poison Data System (NPDS): NPDS coding users' manual. Version 3.1. American Association of Poison Control Centers; 2014. [accessed 2023 March 16]. Available from: https://aapcc.s3.amazonaws.com/pdfs/member-resources/NPDS_Coding_Users_Manual_v3.1_07May2014.pdf.

[23] Dishion TJ, Tipsord JM. Peer contagion in child and adolescent social and emotional development. Annu Rev Psychol. 2011;62(1): 189–214. doi:10.1146/annurev.psych.093008.100412.

[24] Brechwald WA, Prinstein MJ. Beyond homophily: a decade of advances in understanding peer influence processes. J Res Adolesc. 2011; 21(1):166–179. doi:10.1111/j.1532-7795.2010.00721.x.

[25] Yıldız M, Orak U, Walker MH, et al. Suicide contagion, gender, and suicide attempts among adolescents. Death Stud. 2019;43(6): 365–371. doi:10.1080/07481187.2018.147891410.1080/07481187.2018.1478914.

[26] Johnston D, Johnston LPA. Tik Tok Benadryl Challenge: an alert to physicians. BC Med J. 2021. https://bcmj.org/blog/tiktok-benadryl-challenge-alert-physicianshttps://bcmj.org/blog/tiktok-benadryl-challenge-alert-physicians.

[27] Sun X, Haydel KF, Matheson D, et al. Are mobile phone ownership and age of acquisition associated with child adjustment? A 5-year prospective study among low-income latinx children. Child Dev. 2023;94(1):303–314. doi:10.1111/cdev.13851.