Trends and correlates of Internet support group participation for mental health problems in the United States, 2004–2018

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A B S T R A C T

Purpose: This study sought to examine the trends in Internet support group (ISG) participation among U.S. adults and to investigate the sociodemographic and behavioral health profiles of ISG participants.
Methods: Data was derived from the National Survey on Drug Use and Health (2004–2018, n = 625,883). Logistic regression was used to examine significance of trend year and correlates of ISG participation. Latent class analysis was conducted to identify subtypes of ISG participants.
Results: The proportion of U.S. adults participating in ISG increased significantly from 2.29% (2004–2007) to 3.55% (2016–2018). ISG participants were less likely to be male, 35 or older, be part of an ethnic/racial minority group, or have household incomes between $20,000 and $49,999. Black/African American participants and those classified as "other" race showed the largest percent increases, while Hispanics showed no change. ISG participants were more likely to have experienced a depressive episode and to have used cannabis. Three subtypes of ISG participants were identified, including the Lower Behavioral Health Risk group (62%), the Elevated Behavioral Health Risk group (24%), and the Depression, Cigarettes, and Cannabis group (14%).
Conclusion: Overall, we found an increasing trend in seeking mental health care through ISG among US adults since the early 2000s. While disparities among some disadvantaged groups such as Blacks/African Americans and individuals with lower household income were diminishing, continuing efforts to engage men, older adults, and Hispanics in ISG are needed. This investigation also identified distinct subtypes of ISG participants and provides important implications for future research on ISG.

Introduction

We are living in an historical moment in which Internet-based therapeutic options for mental health problems such as Internet support groups (ISGs), individual teletherapies, and online communities are more relevant than ever. This is the case both because of advances in Internet connectivity and technology, which have facilitated breakthroughs in Internet-based psychotherapeutic intervention modalities, and—since early 2020—as a function of the tremendous disruption of the COVID-19 outbreak. As in-person mental health therapy options were halted due to social distancing and isolation measures in the United

States (U.S.) and across much of the world, many individuals and their therapists began experimenting with options for remote mental health support (Coronel, 2020; Travers, 2020). Indeed, as we enter into what is largely new terrain in Internet-based or enhanced mental health treatment and support, it seems likely that the changes we are observing will lead to new innovation and increased interest in Internet-based and remote therapy (Travers, 2020).

A plethora of Internet-based intervention modalities have been developed for the prevention and treatment of mental health problems, including ISGs, psychoeducational websites, interactive self-help programs, counseling via e-mail exchanges or videoconferencing, social

media websites, etc. In addition, ISG via videoconferencing or chat rooms is one of the commonly adopted modalities (DeAndrea, 2015).

Research on ISG is still in its nascency. More high quality studies with ample sample sizes and rigorous research designs are needed to draw definitive conclusions about ISG's effectiveness (Ali et al., 2015; Banbury et al., 2018). However, existing evidence generally indicates that ISGs are feasible, acceptable, and show promise in effectively preventing and treating mental health problems. For example, Banbury and colleagues' systematic review found that ISGs, through videoconferencing in home settings, were able to replicate face-to-face group processes such as bonding and cohesiveness (Banbury et al., 2018). In addition, they observed a trend for improvement in mental health outcomes including quality of life, depression, social connectedness, and social support (Banbury et al., 2018). Other reviews found ISGs to be promising in providing emotional support and information for parents (Niela-Vilén et al., 2014), improving mental health problems among adolescents and young adults (Ali et al., 2015), and being flexible, accessible, and cost-effective (Langarizadeh et al., 2017; Sander et al., 2016).

Given the increasing public engagement in Internet activities and ISGs' promise in offering accessible, efficacious, and cost-effective treatment options for mental health problems, it is likely that ISG may become more prevalent in the future. However, a number of important questions remain unanswered. First, little is known about the prevalence of engagement in ISGs as a source of treatment, counseling, or support for mental health problems. While it seems likely that such engagement has increased in the past decade, no recent studies have examined this question using national data. Second, we have a poor understanding of the characteristics of individuals who elect to pursue mental health care via an ISG, as compared to those who pursue in-person mental health care or do not pursue mental health care at all. Prior studies show that women were more active users of ISGs than men (DeAndrea, 2015; Niela-Vilén et al., 2014) and adults who are younger, have higher income, and higher education were more likely to use ISGs than traditional mental health treatment (DeAndrea, 2015). However, these findings are based on decade old data and no studies have investigated the behavioral health characteristics of ISG participants. Acquiring a deeper understanding of the sociodemographic and behavioral health characteristics of such individuals using up-to-date data is critical to better understand the potential for disseminating ISGs to those who are already interested, and engaging those who are more reluctant or unable to access therapeutic supports online. Third, it is likely that not all individuals who participate in ISGs are the same in terms of their sociodemographic and behavioral health characteristics. An understanding of the subtypes or subgroups of those already involved in ISGs would greatly assist us in knowing what types of clients we are likely to encounter in the online milieu.

The present study aims to address these questions and research gaps. Specifically, using the most current national data from the National Survey of Drug Use and Health (NSDUH) collected between 2004 and 2018, we sought to (1) examine trends in ISG participation among all U.S. adults with specific attention to the sociodemographic and behavioral health characteristics of ISG participants a) compared to those who pursue in-person mental health supports and b) compared to those who do not pursue mental health care at all, and (2) extend objective one by uncovering subtypes of ISG participants based on their behavioral health characteristics. Achievement of these objectives will provide a necessary up-to-date empirical platform to inform next stage implementation and evaluation of ISG preventive interventions.

Material and methods

Data and sample

The present study used data from the NSDUH collected between 2004 and 2018. The NSDUH is a nationally representative, cross-

sectional household survey conducted annually in all 50 U.S. states and the District of Columbia. Using a multi-stage probability sampling design, the NSDUH samples from civilian, noninstitutionalized U.S. residents ages 12 and older. It provides national estimates for a wide range of variables related to substance use, mental health, and other health-related issues. A detailed description of the NSDUH design and methodology is available elsewhere (Substance Abuse and Mental Health Services Administration, 2020). The present study's analytic sample included 625,883 adults ages 18 or older interviewed between 2004 and 2018 (the 2002–2003 surveys did not include data on our key variable of interest and were therefore excluded). The public-use NSDUH data are de-identified by SAMHSA and therefore this study was exempt from Institutional Review Board review from the first author's home institution.

Measures

ISG participation was measured based on respondent self-report of past 12-month participation in an "Internet support group or chat room" as a "source of treatment, counseling, or support" for problems with one's "emotions, nerves or mental health" (0 = *no*, 1 = *yes*).

Receipt of in-person mental health supports was measured by asking respondents, "During the past 12 months, did you receive any outpatient treatment or counseling for any problem you were having with your emotions, nerves, or mental health at any of the places listed below? Please do not include treatment for alcohol or drug use" (0 = *no*, 1 = *yes*). Listed places included "An outpatient mental health clinic or center, the office of a private therapist, psychologist, psychiatrist, social worker, or counselor that was not part of a clinic, a doctor's office that was not part of a clinic, an outpatient medical clinic, a partial day hospital or day treatment program, or some other place."

Several items were measured related to behavioral health. Consistent with recent NSDUH-based research (Holzer et al., 2018; Oh et al., 2018), we used a dichotomous measure of one or more *major depressive episodes* (MDE) in the past 12 months (0 = *no episode*, 1 = *one or more episodes*) (American Psychiatric Association, 2013). We also examined self-reported *cigarette use*, *binge alcohol use*, *cannabis use*, and *other illicit drug* use (0 = *no*, 1 = *yes*). With the exception of binge alcohol use (which is measured only for the past 30 days), all items were measures of past 12-month use. We also examined past 12-month mental health functional impairment severity using the World Health Organization Disability Assessment Schedule (WHODAS; range = 0 [low severity] to 24 [high severity]) and DSM-IV-based substance use disorder (SUD) diagnosis (0 = *no*, 1 = *yes*) (Jordan et al., 2008; Ustun et al., 2010).

Sociodemographic variables commonly used in NSDUH-based trend studies were measured as well (Oh et al., 2020; Salas-Wright et al., 2017). These include age (*18–25, 26–34, 35–49, 50 or older*), gender (*male, female*), race/ethnicity (*White, Black/African American, Hispanic, other [American Indian, Alaska Native, Asian, Pacific Islander, more than one race]*), and *household income* (< *$20,000, $20,000–$39,999, $40, 000–$74,999, ≥ $75,000*). All of these variables are fully comparable across all 15 years of NSDUH data. We also measured the year in which the survey was administered as a continuous variable (2004–2018).

Analyses

First, we examined trends in participation in ISGs between 2004 and 2018. Specifically, we generated survey-adjusted estimates of the annual rates of ISG participation in the full adult sample. Based on observed gender differences we also provide year-by-year estimates of participation by gender. We also conducted trend tests using survey-adjusted logistic regression analysis in accordance with the Center for Disease Control and Prevention's guidelines for secular trend analysis (Centers for Disease Control and Prevention, 2018). Specifically, ISG participation was specified as the dichotomous dependent variable, survey year was specified as the continuous independent variable, and

sociodemographic variables were included as control variables. We also conducted joinpoint regression to detect the points in time when significant changes in a trend occur (National Cancer Institute, 2020). The joinpoint program starts with zero joinpoints, which represents a straight line, and determines the optimal number of joinpoints using the Monte Carlo permutation method (Kim et al., 2000).

Second, we examined the characteristics of ISG participants. Specifically, we conducted logistic regression analyses in which Internet support group/chat room participation was specified as the dependent variable with sociodemographic variables, including survey year, as independent variables. For the examination of behavioral health factors, we conducted multivariable regression analyses controlling for sociodemographic factors and survey year (Hidalgo and Goodman, 2013). These analyses were limited to the most recent survey years (2015–2018) in order to provide the most up-to-date practice-relevant information.

Third, we modeled the subtypes of ISG participants based on their behavioral health characteristics, using latent class analysis (LCA) and, in turn, descriptive and multinomial regression analyses. LCA is a statistical procedure that assigns individual cases to their most likely latent subgroups on the basis of observed data (McLachlan and Peel, 2004). Multinomial regression is designed for nominal outcomes where the categories can be assumed to be unordered (Long and Freese, 2006).

We began by identifying a sequence of latent profile models ranging from one to five classes by using Latent GOLD® 5.1 software (Vermunt and Magidson, 2016). Five statistical criteria were used to identify the best fitting model: Bayesian Information Criterion (BIC), Akaike's Information Criterion (AIC), Consistent Akaike's Information Criterion (CAIC), log likelihood (LL), and entropy. Higher entropy values—approaching .80—indicate clear class delineation (Celeux and

Soromenho, 1996). In addition to quantitative criteria, the parsimony and substantive interpretability of the latent class solutions also function as model selection criteria. After modeling the latent classes, we examined the sociodemographic characteristics of the latent classes using Stata 16 (StataCorp, 2019). As with Part 2 analyses, LCA and multinomial regression analyses were limited to the most recent survey years (2015–2018).

Results

Trends in internet support group participation, 2004–2018

Between 2004 and 2018, the proportion of U.S. adults receiving mental health care via ISGs increased significantly from 2.29% (2004–2007) to 3.55% (2016–2018) (AOR = 1.04, 95% CI = 1.03–1.06). Examining the interaction term between gender and survey year, however, revealed that gender significantly modified the association between survey year and participation (AOR = 0.96, 95% CI = 0.94–0.99). As such, we present the year-by-year trend estimates (see Fig. 1) and conducted tests of linear trend among demographic subgroups (see Table 1) separately for men and for women.

Fig. 1 illustrates the year-by-year prevalence estimates of women and men receiving mental health care via ISGs in the U.S. between 2004 and 2018. Consistent with the interaction effect described above, we observed that the proportion of adults who participated in ISGs—compared to those who sought other forms of outpatient mental health care—significantly increased *only* among women *but* not men. For women, the prevalence of ISG participation increased from 2.39% (2004–2007) to 4.26 (2016–2018), indicating a 78% increase (AOR = 1.05, 95% CI = 1.03–1.07). The single year peak of participation was
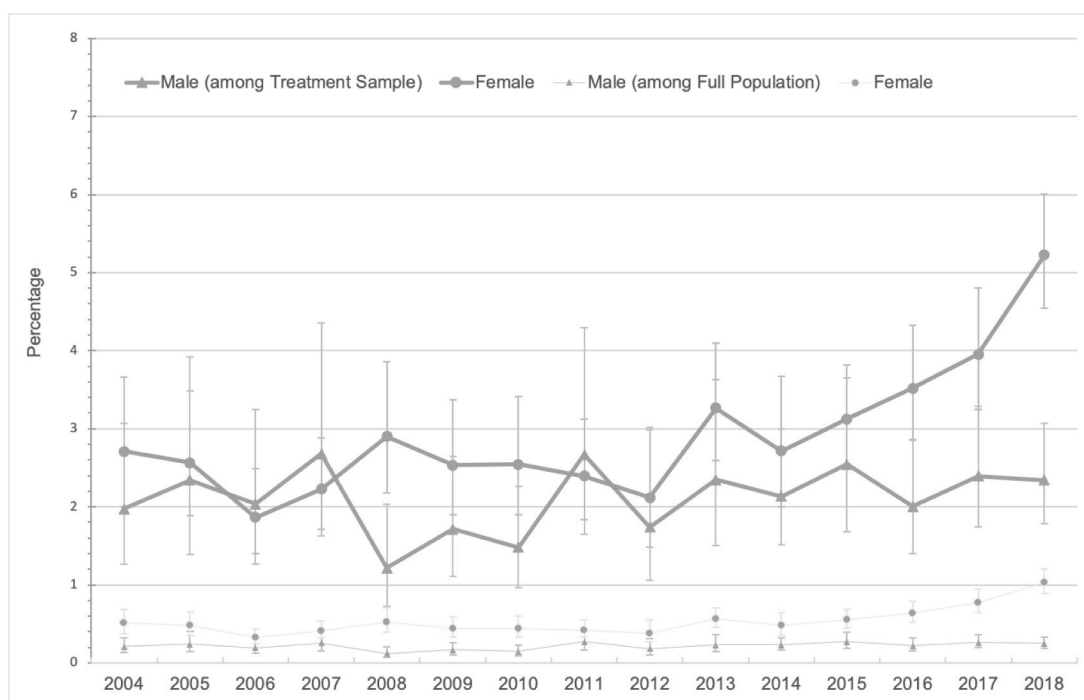
Notes. The more heavily weighted lines show the proportion of adults who participated in a therapeutic Internet support group as compared to adults who sought other forms of outpatient therapeutic care (*n* = 51,413). The lighter lines show the proportion of adults who participated in a therapeutic Internet support group in the general population of American adults (N = 625,883). Error bars display 95 percent confidence intervals around point estimates.

Fig. 1. Year-by-year rates of individuals receiving mental health care via an Internet support group in the United States, 2004–2018.
Notes. The more heavily weighted lines show the proportion of adults who participated in a therapeutic Internet support group as compared to adults who sought other forms of outpatient therapeutic care (*n* = 51,413). The lighter lines show the proportion of adults who participated in a therapeutic Internet support group in the general population of American adults (N = 625,883). Error bars display 95 percent confidence intervals around point estimates.

Table 1

Rates and correlates of participation in an internet support group for mental health problem (NSDUH, 2004–2018).

	Received treatment, counseling, or support from an internet support group or chat room in the past 12 months?									
	Male					Female				
	2004–2007		2016–2018		Δ pp (% change)	2004–2007		2016–2018		Δ pp (% change)
	%	(95% CI)	%	(95% CI)		%	(95% CI)	%	(95% CI)	
Sociodemographic Characteristics										
Overall Rate	2.12	(1.62–2.77)	2.25	(1.94–2.60)	.13 (6)	2.39	(2.01–2.83)	4.26	(3.85–4.71)	**1.87 (78)**
Age										
18-25	2.64	(1.79–3.87)	4.73	(3.87–5.77)	**2.09 (79)**	3.01	(2.44–3.70)	6.20	(5.34–7.20)	**3.19 (106)**
26-34	4.08	(2.37–6.94)	4.06	(2.97–5.53)	−.02 (0)	3.75	(2.79–5.01)	6.07	(4.83–7.59)	**2.32 (62)**
35-49	1.95	(1.24–3.06)	1.54	(1.10–2.14)	−.41 (−21)	2.72	(2.01–3.66)	5.00	(4.16–5.98)	**2.28 (84)**
50 or older	.86	(.36–2.01)	1.01	(.58–1.73)	.15 (17)	1.02	(.55–1.86)	2.15	(1.60–2.88)	**1.13 (111)**
Race/Ethnicity										
White	1.77	(1.31–2.39)	2.09	(1.75–2.50)	**.32 (18)**	2.52	(2.08–3.05)	4.16	(3.70–4.68)	**1.64 (65)**
Black	1.27	(.36–2.44)	2.20	(1.13–4.23)	.93 (73)	1.26	(.58–2.71)	4.64	(3.44–6.22)	**3.38 (268)**
Hispanic	5.56	(2.76–10.86)	2.87	(1.86–4.39)	−2.69 (−48)	2.57	(1.40–4.69)	3.77	(2.61–5.43)	1.20 (47)
Other	1.41	(.56–3.51)	3.14	(1.96–4.97)	1.73 (123)	1.68	(.92–3.01)	5.66	(3.80–8.35)	**3.98 (237)**
Income										
<$20,000	3.35	(2.04–5.46)	2.57	(1.71–3.86)	−.78 (−23)	2.99	(2.11–4.23)	4.67	(3.61–6.03)	1.68 (56)
$20,000-$39,999	2.54	(1.53–4.19)	2.64	(1.89–3.67)	.10 (4)	2.31	(1.66–3.21)	3.77	(3.09–4.59)	**1.46 (63)**
$40,000-$74,999	.77	(.41–1.44)	3.39	(2.20–5.21)	**2.62 (340)**	2.23	(1.58–3.13)	4.08	(3.02–5.49)	**1.85 (83)**
≥$75,000	1.66	(.93–2.95)	1.56	(1.16–2.08)	−.10 (−6)	2.18	(1.48–3.20)	4.45	(3.87–5.11)	**2.27 (104)**

Notes: Δ *pp* = percentage point change from 2004 to 2007 to 2016–2018. % change determined by dividing the pp change by the 2004–2007 value and multiplying by 100.

Δ *pp* and % change values in **bold** signify a significant linear trend increase (p < .05). All estimates adjusted for the NSDUH's complex sampling design.

observed in 2018 when 5.22% (95% CI = 4.54–6.00) of women seeking mental health care participated in ISGs.

As shown in Table 1, significant trend increases were observed among all female subgroups, except Hispanic women and women earning less than $20,000 per year. The largest percent changes were observed for Black/African American women (a 265% increase) and women classified as "other" race (a 237% increase). While no significant change was observed in the male population as a whole, a closer inspection revealed significant increases among a few male subgroups. Most notably, a 340% increase was observed among men earning $40,000-$74,999 per year. This subgroup had markedly low levels of participation in 2004–2007 and was found to have the highest levels of participation of any income group in 2016–2018. Significant increases were also observed among young men ages 18–25 (a 79% increase) and among White men (an 18% increase). Closer inspection of the year-by-year trend data for White men revealed that participation in this group reached a peak of 2.99% in 2015 before declining (but not significantly) in subsequent years to 2.09% between 2016 and 2018.

Given the sharp upward increase among females in the latter years of the study, we conducted a joinpoint analysis among men and women. This revealed a significant increase in therapeutic ISG participation among women (but not men) beginning in 2015 (*b* = 0.72, SE = 0.28, *t* = 2.56, *p* < .05).

Characteristics of Internet Support Group Participants, 2015–2018

Demographic Characteristics of Internet Support Group Participants. Drawing from the most recent survey years (2015–2018), we

examined the sociodemographic characteristics of ISG participants compared to (a) other individuals seeking outpatient mental health services and (b) the general population of adults in the U.S. who did not participate in ISGs.

Compared to others seeking mental health services, ISG participants were more likely to be female (AOR = 1.74, 95% CI = 1.48–2.04) and less likely to be 35–49 years of age (AOR = 0.68, 95% CI = 0.55–0.83) or age 50 or older (AOR = 0.30, 95% CI = 0.21–0.42).

Compared to the general population, ISG participants were also more likely to be female (AOR = 3.14, 95% CI = 2.68–3.68) and less likely to be 35–49 (AOR = 0.74, 95% CI = 0.60–0.90) or age 50 or older (AOR = 0.22, 95% CI = 0.16–0.31). In the general population, ISG participants were less likely to be part of an ethnic/racial group (Black/African American: AOR = 0.41, 95% CI = 0.31–0.54; Hispanic: AOR = 0.38, 95% CI = 0.27–0.54; Other: AOR = 0.64, 95% CI = 0.46–0.89). Also, compared to individuals residing in households earning less than $20,000, individuals with incomes between $20,000 and $49,999 were less likely to report participation (AOR = 0.70, 95% CI = 0.53–0.91).

Behavioral health characteristics of Internet Support Group Participants

Compared to adults who sought other forms of mental health care, individuals who participated in ISGs since 2015 were more likely to have experienced a MDE (AOR = 1.25, 95% CI = 1.06–1.48), less likely to report cigarette use (AOR = 0.78, 95% CI = 0.63–0.96) or binge drinking (AOR = 0.81, 95% CI = 0.67–1.00), and more likely to report cannabis use (AOR = 1.31, 95% CI = 1.10–1.56).

Compared to the general population, individuals who participated in

Table 2

Fit indices for latent classes (NSDUH, 2015–2018).

Class Solution	Log Likelihood | *LL*	Bayesian Information Criterion | *BIC*	Akaike's Information Criterion | *AIC*	Consistent Akaike's Information Criterion | *CAIC*	Entropy R²
1 Class	−3378.99	6793.14	6767.98	6798.14	n/a
2 Class	−3154.65	6485.09	6359.30	6510.09	0.62
3 Class	−3084.02	6484.47	6258.04	6529.47	0.76
4 Class	−3028.63	6514.32	6187.26	6579.32	0.67
5 Class	−2996.35	6590.40	6162.71	6675.40	0.67

ISGs were substantially more likely to have experienced an MDE (AOR = 9.06, 95% CI = 7.62–10.78) and to have used cannabis (AOR = 2.46, 95% CI = 2.04–2.95) or any other illicit drug (AOR = 2.31, 95% CI = 1.93–2.77).

Subtypes of Internet Support Group Participants, 2015–2018

Analyzing the potential modeling of latent class solutions suggests a three-class solution as the statistically optimal and conceptually best-fitting model of the data (Table 2). Table 3 shows demographic characteristics by latent class. As shown in Fig. 2, *Class One* (the "Lower Behavioral Health Risk" group), which comprised 62% of the sample, is characterized by relatively low levels of MDE and substance use. Notably, this class had the largest proportion of respondents residing in households earning $75,000 or more per year. *Class Two* (the "Elevated Behavioral Health Risk" group) comprised 24% of the sample and was characterized by universally elevated levels (above 50%) of all behavioral health risk items examined, including very elevated levels of cannabis (82%) and other illicit drug use (67%). This class was predominantly comprised of younger adults aged 18–34. *Class Three* (the "Depression, Cigarettes, and Cannabis" group) accounted for 14% of the sample and was characterized by elevated levels of MDE and cigarette use as well as somewhat elevated levels of cannabis use. This class tended to be older (90% were ages 35 and older) and to reside in lower-income households (99% lived in households earning less than $40,000 per year). Notably, this group included no Black/African American participants and included a disproportionately large number of individuals classified as "other" race.

Correlates of class membership

Controlling for sociodemographic confounds, we found—in comparing to Class One (Mean Score: 11.17)—that the mean value of mental health severity was significantly greater in Class Two (Mean Score: 14.86; RR = 1.08, 95% CI = 1.04–1.11) and Class Three (Mean Score: 14.97; RR = 1.13, 95% CI = 1.06–1.22). No differences were observed in comparing Classes Two and Three.

In terms of SUD, no difference was observed in comparing Class One (Point Estimate: 8.54%, 95% CI = 5.98–12.07) and Class Three (Point Estimate: 16.06%, 95% CI = 7.09–32.40). However, compared to Class One, Class Two were substantially more likely to meet criteria for a substance use disorder (Point Estimate: 47.66%, 95% CI = 39.15–56.30;
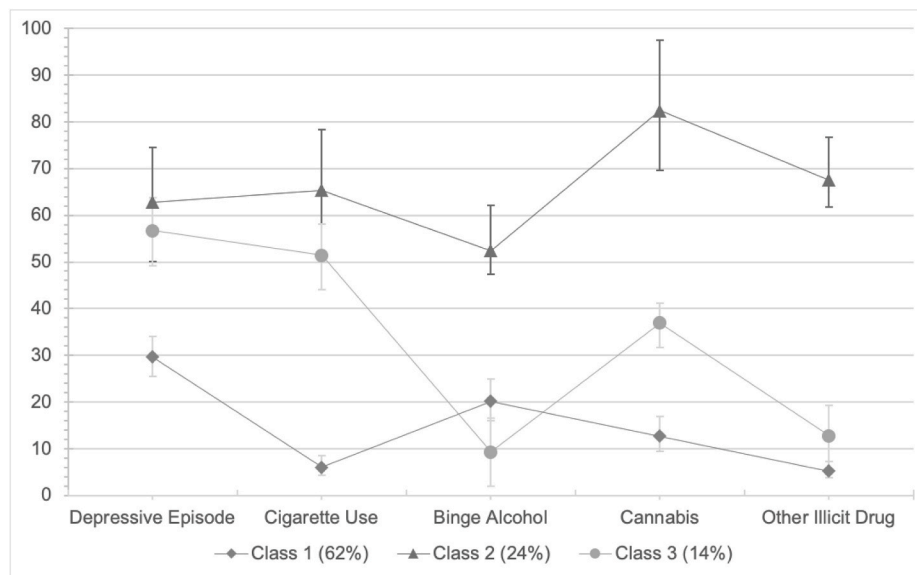
RR = 13.07, 95% CI = 7.11–24.04). Class Two were also more likely than Class Three to meet the criteria for a substance use disorder (RR = 8.45, 95% CI = 2.65–29.59).

Discussion

We found clear evidence that the proportion of U.S. adults receiving mental health care through ISGs has increased significantly since the early 2000s. However, a closer inspection of the trend revealed that the upward trend is driven by women. Significant trend increases were observed among most of the female subgroups, while no significant increases were observed among any male subgroups except for men who are younger, White, and earning between $40,000 and $74,999 per year. This gender difference is consistent with previous study findings that women are more likely to use online mental health support than men (Batterham and Calear, 2017; DeAndrea, 2015; Niela-Vilén et al., 2014). Furthermore, this finding reflects the broader phenomenon that men are less likely to engage in mental health services and to seek help in general, due to barriers such as viewing help-seeking as in conflict with traditional masculine ideals, distrust of caregivers, privacy concerns, and need for emotional control (Lynch et al., 2018; Mansfield et al., 2005; Vogel et al., 2014). Our finding suggests that, similar to traditional mental health services, online psychotherapeutic interventions also need to increase the engagement of men, through additional measures, such as enhancing mental health providers' cultural competence regarding working with male clients.

Besides gender differences, we also found age and racial/ethnic differences in ISG utilization for mental health purposes. Consistent with the well-documented digital divide between younger and older people, we observed that the highest levels of ISG engagement were among individuals who are younger and ISG participants were more likely to be younger than 35 (Mullangi et al., 2019). ISG participants were also less likely to be part of an ethnic/racial group compared to others in the general population. However, gaps in ISG participation rates between Whites and some minority groups were diminishing, with Black/African Americans and those classified as "other" race showing the largest percent increases among both women and men. In contrast, the trend of ISG participation among Hispanics remained stable over time. Previous studies have shown that Hispanic populations prefer group-based therapy (Pineros-Leano et al., 2017; Stacciarini et al., 2007), however, our findings demonstrate that Hispanic women showed no significant percent change between 2004 and 2018 and had the lowest ISG participation rate in recent years compared to other racial/ethnic groups. Although no statistically significant change was found regarding Hispanic men's ISG participation, Hispanic men had the largest reduction in raw numbers and percent change of ISG participation among all subgroups. It is possible that the virtual nature of ISGs is not appealing to Hispanics as it may not reduce feelings of physical isolation or may not promote *personalismo*, an important cultural value (Interian and Díaz-Martínez, 2007), suggesting a potential need for cultural adaptation. The persistent age and racial/ethnic differences highlight the need for continuing efforts to engage Hispanics and older adults in Internet psychotherapeutic interventions.

Our findings suggest that when it comes to taking advantage of Internet resources for mental health care, the gap between the higher- and lower-income groups might be narrowing. Contrary to prior findings that adults with higher income were more likely to seek mental health help from ISGs rather than in-person treatment (DeAndrea, 2015), this study found that individuals with household incomes between $20,000 and $49,999 were less likely to report ISG participation than individuals residing in households earning $20,000 or less per year. This could be a result of (a) the narrowing disparities in Internet access and usage between the higher- and lower-income groups and (b) the low cost of ISGs leading individuals with lower income to seek mental health support from ISGs instead of traditional options (Pew Research Center: Internet & Technology, 2019).

Table 3
Demographic characteristics by latent class (NSDUH, 2015–2018).

Demographic Factors	Class One | [62%] "Lower Behavioral Health Risk"		Class Two | [24%] "Elevated Behavioral Health Risk"		Class Three | [14%] "Depression and Smoking"	
	N	%	N	%	N	%
Age						
18-25	266	21.19	173	35.42	8	4.15
26-34	155	26.57	120	44.06	14	5.23
35-49	183	31.12	43	17.20	77	52.45
50 or older	46	21.12	6	3.32	31	38.16
Gender						
Female	512	76.86	237	70.26	104	81.00
Male	148	23.14	105	29.74	26	19.00
Race/Ethnicity						
White	484	76.19	250	74.60	84	75.41
Black	53	8.55	19	7.33	0	0.00
Hispanic	68	8.20	42	11.71	14	9.78
Other	55	7.05	31	6.36	32	14.81
Income						
<$20,000	93	10.03	90	21.21	68	54.36
$20,000-$39,999	152	16.66	115	29.84	65	44.42
$40,000-$74,999	120	19.50	57	18.99	3	1.22
≥$75,000	295	53.80	80	27.96	0	0.00

Fig. 2. Behavioral health characteristics of the latent subgroups of adults participating in online support groups in the United States (NSDUH, 2015–2018).
Notes. Other illicit drug include hallucinogens, heroin, cocaine, inhalants, sedatives, tranquilizers, stimulants, and analgesics.

Given the high comorbidity between mental health problems and substance use, it was not surprising to find that adults seeking mental health care via ISGs demonstrated a higher likelihood to report substance use (Lai et al., 2015). Compared to the general population, ISG participants were substantially more likely to have experienced a MDE and to have used cannabis or any other illicit drug in the past year. This might indicate that people are more likely to seek help for MDE and cannabis use than they are for more "normalized" behavioral health issues like tobacco use and binge drinking. Compared to adults who sought other forms of mental health care, individuals who participated in ISGs since 2015 were slightly more likely to have experienced a MDE and cannabis use, indicating a greater need for discussions about risks associated with cannabis use in ISGs.

The latent class analysis findings suggest an important degree of heterogeneity within the ISG participant population. The identified subgroup with the largest membership was the Lower Behavioral Health Risk group (62%), which was characterized by relatively low levels of depression and substance use and had the largest proportion of respondents with a yearly household income higher than $75,000. Nearly 1 in 4 ISG participants were categorized into the Elevated Behavioral Health Risk group. This group was characterized by universally elevated levels of behavioral health risk (depression, smoking, binge drinking, cannabis, and other illicit drug use) and was predominantly comprised of younger adults between the ages of 18 and 34. This is consistent with prior findings that younger adults tend to have higher behavioral health risks (Redonnet et al., 2012; Schulte and Hser, 2014).

Approximately 14% of ISG participants were categorized into the Depression, Cigarettes, and Cannabis group, which was characterized by elevated levels of depressive episodes and cigarette use as well as somewhat elevated levels of cannabis use. The Depression, Cigarettes, and Cannabis group tended to be older and to reside in lower-income households. This is consistent with previous epidemiological findings that the rates of cannabis use among US adults ages 50 and older increased significantly in the past decade (Pacula and Smart, 2017; Salas-Wright et al., 2017) and cannabis use in the older adult population was associated with depression, cigarette smoking, and lower household income (Salas-Wright et al., 2017). Regarding the racial/ethnic composition of the Depression, Cigarettes, and Cannabis group, this

study, on the one hand, shows that this group included a larger number of individuals classified as "other" race, which comports with previous findings that cannabis use was associated with a higher likelihood of being multiracial and American Indian among older adults (Choi et al., 2016; Han et al., 2017). On the other hand, contrary to previous studies that indicate cannabis users among older adults were more likely to be Black/African American (Choi et al., 2016; Han et al., 2017), we found that the Depression, Cigarettes, and Cannabis group included no Black/African American ISG participants. This may, to some extent, be attributable to the Black/African American older adults' lessened likelihood of health-related Internet use (Choi and Dinitto, 2013; Hunsaker and Hargittai, 2018; Levine et al., 2016).

The three classes of ISG participants that we identified generally mirror the established typologies in criminological research, which consistently found that a small portion of study populations ("the severe 5%") account for a preponderance of externalizing behaviors and psychiatric disturbance (e.g., Moffitt, 1993; Vaughn et al., 2011). Given the treatment seeking nature of our study population, we expectedly found an overrepresentation of "the severe 5%" group in the ISG participant population, with 24% of our sample characterized by universally elevated levels of all behavioral health risk items examined. In addition, our Lower Behavioral Health Risk group (62%) and the Depression, Cigarettes, and Cannabis group (14%) roughly parallel with the normative class (approximately 65% who demonstrate low levels of externalizing and psychiatric symptoms) and the in-between classes (approximately 30% who show diverse externalizing and psychiatric symptoms) in criminological research, respectively (Vaughn et al., 2011). We identified three relatively discrete subtypes of ISG participants, but many questions remain about whether there is a need to and (if so) how to adapt ISGs specifically for the needs and characteristics of each subtype.

Current study's limitations include measures of ISG participation that did not capture participation frequency, duration, or the level of engagement, nor did they account for differences in ISG types or characteristics. Additional limitations include the cross-sectional nature of the data, the reliance on respondent self-reports, and therefore susceptible to social desirability or other reporting biases.

Despite these limitations, findings from this study provide fresh and

important epidemiologic insights into the trends and correlates of ISG participation for mental health problems and extend previous research on subtypes of ISG participants in the US. Overall, we found an increasing trend in seeking mental health care through ISGs among US adults since the early 2000s. We observed the diminishing disparities in ISG participation among some disadvantaged groups such as Blacks/African Americans and individuals with lower household income. However, our findings about the lack of increase in ISG participation among men and Hispanics as well as the lack of participation in ISGs among older adults underscore the importance of continuing efforts to engage these populations. In addition, this investigation sheds light on the distinct subtypes of ISG participants based on their behavioral health risks and provides valuable implications for future research on the development of Internet interventions for mental health problems. Finally, we were only able to examine the NSDUH data from years (2002–2018) before the COVID-19 pandemic, which likely exerts a significant impact on the prevalence and correlates of ISG participation in the US. Future research should examine the impact of the COVID-19 pandemic and the sociodemographic and behavioral health profiles in the use of ISG and other internet-based psychotherapeutic interventions post pandemic.

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CRediT authorship contribution statement

Audrey Hang Hai: Conceptualization, Formal analysis, Methodology, Project administration, Writing - original draft, Writing - review & editing. **Christina S. Lee:** Conceptualization, Writing - review & editing. **Sehun Oh:** Methodology, Formal analysis, Software. **Michael G. Vaughn:** Methodology, Supervision, Validation, Writing - review & editing. **María Piñeros-Leaño:** Writing - review & editing. **Jorge Delva:** Supervision, Validation. **Christopher P. Salas-Wright:** Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing.

Declaration of competing interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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