



## Association between family or peer views towards tobacco use and past 30-day smoking cessation among adults with mental health problems

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### ABSTRACT

Adults with mental health problems have a higher prevalence of cigarette smoking. We examined the association between family or peer views towards tobacco use and past 30-day cessation among adult with mental health conditions who smoke.

We used nationally representative data from the Population Assessment of Tobacco and Health Study. We included individuals who currently smoked and reported mental health symptoms over the past year ( $n = 4201$ ). We used the Global Appraisal of Individual Needs Short Screener questionnaire to assess mental health conditions. Logistic regression models were used to estimate the odds ratios (OR) and 95% confidence intervals (95% CI) in the association between family and peer views towards tobacco use and past 30-day smoking cessation.

Compared to participants who had family or peers with negative views towards tobacco use, those with family or peers with neutral or positive views were 32% less likely (adjusted OR: 0.68, 95%CI: 0.51 – 0.93) to report past 30-day smoking cessation. The association between family/peer views towards tobacco use and smoking cessation was statistically significant for individuals with symptoms on the both internalizing and externalizing sub-scales (adjusted OR: 0.62, 95%CI: 0.42 – 0.92), but not for those reporting symptoms on a single sub scale.

Our findings suggest that having family members or peers who hold neutral or positive views towards tobacco use may deter cessation efforts of people with mental health conditions who smoke. Efforts to modify these views are needed to improve quit rates in people with mental health conditions who smoke.

### 1. Introduction

In the United States, adults with mental health conditions have a higher prevalence of smoking (31%) than the general adult population (17%). (Lipari and Van Horn, 2017) Smoking-related diseases account for nearly half of all deaths in individuals diagnosed with depression, schizophrenia, and bipolar disorder. (Callaghan et al., 2014) Although people with mental health conditions who smoke are interested in quitting, (February 2016) their quit rate is much lower (24%) than that of the general population (52%). (Streck et al., 2020) Quit rates in people with mental health conditions who smoke have not increased over the past decade, (Streck et al., 2020) despite advances in evidence-based cessation approaches.

Social support from family or peers can positively impact successful

smoking cessation. (Ajzen, 1991; Zimmerman and Connor, 1989; Povey et al., 2000) Family members and peers can support people who smoke by providing tangible resources (e.g., medication reminders), informational support (e.g., how to cope with nicotine withdrawal symptoms), or emotional support (e.g., encouragement to stay smoke-free) during quitting attempts. (Westmaas et al., 2010) Findings from exploratory qualitative studies that enrolled people with mental health conditions who quit smoking show that positive influences from family or friends (such as smoking cessation role models, tangible and emotional support) were key facilitators of quit attempts and successful quitting. (Aschbrenner et al., 2017a; McKay and Dickerson, 2012; Aschbrenner et al., 2019).

People with mental health conditions misperceive smoking as an activity that helps with mental health symptom management.

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(Aschbrenner et al., 2017b; Lawn et al., 2015) This belief is supported by family members or peers of people with mental health conditions, who incorrectly believe that quitting smoking may interfere with mental health functioning. (Hyland et al., 2017) Such misconceptions about smoking and mental health likely create social spaces where smoking is acceptable or even encouraged. Examining whether family members' and peers' views towards tobacco use impact quitting, can inform development of cessation interventions for people with mental health conditions who smoke. Yet, past studies that have assessed the association of supportive versus non-supportive family or peer views on smoking behaviors have primarily been done in the general population.

The goal of this study was to examine the association between family or peer views towards tobacco use and smoking cessation. We hypothesized that participants who report having family or peers with positive or neutral views towards tobacco use will be less likely to quit smoking than those who report having family members or peers with negative views towards tobacco use.

## 2. Methods

### 2.1. Study design

Using the Population Assessment of Tobacco and Health (PATH) study publicly available dataset, we prospectively examined associations between family or peer views towards tobacco use and smoking cessation in people with mental health conditions who smoke. (Kalton et al., 2014) The PATH study is a nationally representative, ongoing longitudinal study of 32,320 adults aged 18 and older, and 13,651 youths aged 12–17 years, in the United States. (Kalton et al., 2014) Although data collection began in September 2013, we used data that was collected in the third (October 2015, baseline in the present study) and fourth year (December 2016, follow-up in the present study) of the study. Participants in the current study were followed up for one calendar year. We selected these two time points because detailed information on family and peer influences on smoking was not captured at earlier time points.

Respondents completed surveys via computer-assisted personal interviewing and audio computer-assisted self-interviewing. The PATH study used a four-stage stratified area probability sample design. (Kalton et al., 2014) First, geographical primary sampling units (PSUs) were selected. Second, smaller geographical segments were sampled within each PSU. Third, households within the smaller geographical segments were selected, using residential addresses in the United States Postal Service Computerized Delivery Sequence Files, with coverage enhancement procedures used to include addresses not listed in those files. (Dennis et al., 2006a) Fourth, individuals were sampled from selected households. A roster of all members in the sampled household was constructed by interviewing one adult household member. Information contained in this roster was used to oversample sub-groups of interest. This means that study weights need to be applied during the analysis stage to account for the complex sampling design used in the PATH study.

### 2.2. Study sample

We included individuals in the current study if they were: 1) adults ( $\geq 18$  years), 2) smoking at the baseline timepoint of the current study, and 3) had experienced two or more mental health symptoms over the past year. Current smoking status was defined as having smoked at least 100 cigarettes in one's lifetime and having smoked cigarettes in the past 30 days. Individuals who had smoked  $<100$  cigarettes in their lifetime and/or had not smoked in the past 30 days were classified as either nonsmokers or former smokers and were therefore excluded from this study.

**Assessing mental health:** Mental health symptoms were measured using the Global Appraisal of Individual Needs Short Screener (GAIN-

SS). (Dennis et al., 2003) The items for the GAIN-SS are derived from the full GAIN instrument, a validated and standardized biopsychosocial assessment for individuals entering treatment for behavioral health disorders. (Dennis and PDTFLHS, 2006; Dennis et al., 2006b) The GAIN-SS is an efficient screener for identifying people with mental health conditions and can be used to route patients to the right services for more detailed assessments. (Dennis et al., 2003).

We used the internalizing disorder GAIN-SS sub-scale and the externalizing disorder GAIN-SS sub-scale to identify individuals with mental health conditions. Scores range from zero to four on the internalizing disorder sub-scale and zero to seven on the externalizing disorder sub-scale. A score of one was assigned to each mental health symptom experienced over the past year. High scores on the internalizing sub-scale are most closely associated with disorders such as depression, anxiety, trauma, and (at extremely high levels) schizophrenia and bipolar disorder, while high scores on the externalizing sub-scale are most closely associated with diagnoses of attention deficit disorders and impulsivity. Examples of questions on the internalizing sub-scale included, "When was the last time you had significant problem with feeling very trapped, lonely, sad, blue, depressed, or hopeless about the future?" and questions on the externalizing sub scale included, "When was the last time you did the following things two or more times? had a hard time paying attention at school, work, or home?" Participants were included in the current study if they reported at least two mental health symptoms over the past year, regardless of the subscale. Validation studies indicate that those who report two or more symptoms are likely to have a mental health diagnosis. (Dennis et al., 2003; Hamilton et al., 2011) This is consistent with clinically relevant cut points, (Hamilton et al., 2011) as used in past studies. (Conway et al., 2017; Velicer and Prochaska, 2004).

Of the 32,320 adults enrolled, 28,146 had complete baseline data. We excluded individuals who had never smoked or formerly smoked at baseline ( $n = 18,749$ ), those who had no mental health symptoms (i.e., individuals who indicated no symptoms by checking off 'none' on the survey) or had scored 'one' on the mental health symptom sub-scales within the past year ( $n = 4342$ ), and those who had missing data on primary exposures and outcomes (i.e., had not completed relevant survey section,  $n = 610$ ). This resulted in a final analytical sample size of 4201 individuals (Supplementary Fig. 1) Publicly available deidentified data were used for this study. Therefore, this research received an exemption from the from the institutional review board at the University of Massachusetts Chan Medical School.

### 2.3. Study measures

**Exposures: family or peer views towards tobacco use.** Participants reported family or peer views towards tobacco use at baseline using the question: "Thinking about the people who are important to you, how would you describe their views on using tobacco in general?" (Response options included: very positive ( $n = 160$ , 4%), positive ( $n = 209$ , 5%), neutral ( $n = 1346$ , 32%), negative ( $n = 1419$ , 34%), very negative ( $n = 1067$ , 25%)). Given that small cell sizes in some of the response categories, participants were grouped the data into broader categories to facilitate a meaningful analysis of this variable.

Participants who indicated that they had family or peers with positive or neutral views towards tobacco use were classified as having family or peers with positive or neutral views towards tobacco use. Those who indicated that they had family or peers with negative views towards tobacco use were classified as having family or peers with negative views towards tobacco use. We also conducted a sensitivity analysis with the three original sub-groups (family or peers with positive views towards tobacco use, family or peers with neutral views towards tobacco use, family or peers with negative views towards tobacco use).

**Outcomes: smoking cessation.** The primary outcome of interest was past 30-day smoking cessation measured at follow-up. This was captured using the question, "In the past 30 days, have you smoked a cigarette,

even one or two puffs? (Fagerstrom, 2003) (Response options: yes, no).

**Covariates: sociodemographic and smoking characteristics.** Data collected included age, gender, marital status, education level, whether a participant had received assistance or income from the state or federal government, their overall mental health status (response options were excellent, very good, good, fair, poor), and whether a participant currently lived alone. Smoking characteristics included the number of cigarettes smoked per day, age when individuals first smoked cigarettes regularly, use of electronic cigarettes (e-cigarettes), and level of nicotine dependence (measured using the Fagerstrom scale (VanderWeele, 2019).

PATH also collected data on home smoking rules, captured using the question: “For tobacco products that are burned, such as cigarettes, cigars, pipes or hookah, which statement best describes the rules about smoking a tobacco product inside your home?” (Response options: allowed anywhere, at any time; allowed in some places and sometimes; not allowed anywhere or at any time). Data on family or peer smoking status was captured using the question, “Thinking about the people who are important to you, do any of them use cigarettes?” (Response options: yes, no).

## 2.4. Analysis

We calculated frequency distributions, medians, and inter-quartile ranges (IQR) for sociodemographic, mental health, and smoking characteristics factors by family or peer views towards tobacco use. Differences in the characteristics of participants by family or peer views were examined using chi-square for categorical variables and t-tests for continuous variables. We present the percent distribution of past 30-day smoking cessation by family or peer views and family members’ or peers’ smoking status.

We used logistic regression models to estimate the crude and adjusted odds ratios (ORs) and 95% confidence intervals (CI), using family or peer views towards tobacco use as the dependent variable and past 30-day smoking cessation as the independent variable. We used the change-in-estimate procedure to assess confounding. (Budtz-Jørgensen et al., 2007) Following the forward selection procedure, all covariates were initially added to the crude model individually. Variables that caused a 10% change in the crude estimate were retained as confounders in the final model. (Maldano and Greenland, 1993; Archer and Lemeshow, 2006) We used the Hosmer-Lemeshow goodness of fit to test for logistic regression model fit. (Krueger and Eaton, 2015) A p-value greater than 0.05 indicated good model fit. Data analysis was conducted in STATA v15. All analyses were conducted using replicate weights to account for the PATH Study’s complex survey design.

## 2.5. Stratified analysis

Since differences in mental health symptom manifestation may impact how family and peers interact with people with mental health conditions regarding smoking, we further examined the association between family and peer views towards tobacco use and past 30-day cessation stratified into three groups: those reporting symptoms on the internalizing disorder sub-scale only, externalizing disorder sub-scale only, or on both sub-scales. The terms “internalizing” and “externalizing” are widely used and distinguish between groups of individuals based on their behavioral, emotional, and social problems. (Association and Diagnostic, 1980; Cicchetti and Toth, 2014) Internalizing symptoms include those related to anxiety and depression and focus on internal expression of distress, while the externalizing symptoms are directed outwardly and include those related to conduct, aggression, and delinquency. (Cicchetti and Natsuaki (2014), Colston et al. (2021).

## 3. Results

### 3.1. Demographic, smoking, and mental health characteristics

Close to half of the study participants were male (48%), one in four (25%) were between 25 and 35 years of age. Most (71%) of the participants self-identified as Non-Hispanic Whites and 11% self-identified as Non-Hispanic Blacks. About half (51%) of the participants had an education attainment level of high school or less. More than half (57%) of the participants first smoked cigarettes regularly before they were 18 years old. The average number of cigarettes smoked per day was 14 (median: 14 Inter-quartile range: 11). At baseline, 62% of the participants smoked their first cigarette within 30 min of waking up. At follow-up, 10% (unweighted n = 384) of participants reported past 30-day cessation (95% CI: 8.7% to 11.0%) (Table 1).

More than half (58%) of participants reported mental health symptoms on both the internalizing and externalizing sub-scales, with the rest reporting on a single sub-scale (28% reported symptoms on the internalizing sub scale only, and 14% reported symptoms on the externalizing sub scale only). The mean number of mental health symptoms was five (mean: 5.4; SD 3.1). Participants who reported mental health symptoms on both the internalizing and externalizing sub-scales had on average of seven mental health symptoms (SD: 2.3). Participants who reported symptoms on the externalizing sub-scale only and those who reported on the internalizing scale only, each had an average of three mental health symptoms (SD: 1.0 for internalizing sub-scale and SD: 1.1 for externalizing sub-scale).

### 3.2. Differences in participant characteristics by family or peer views towards tobacco use

Participants who reported having family members or peers with neutral or positive views towards tobacco use smoked a significantly higher number of cigarettes per day at baseline (mean: 16; SD: 54.5), than those who reported having family or peers with negative views towards tobacco use (mean: 12, S.D:19) (p-value < 0.01). Sixty five percent of the participants who reported having family or peers with neutral or positive views towards tobacco use smoked within the first 30 min of waking, which was significantly higher than the proportion reported in those had family or peers with negative views (57%; p < 0.01). In comparison to individuals who reported having family or peers with negative views towards tobacco use, those who reported having family or peers with neutral or positive views towards tobacco use had a significantly higher proportions of non-Hispanic Black individuals, individuals with a high school education level or less, and those who received assistance or income from the federal or state government (p-values < 0.01) (Table 1). Participants who had family or peers with negative views towards tobacco use were more likely to report past 30-day smoking cessation at follow-up (12%) compared to those with family or peers with positive or neutral views towards tobacco use (7%) (p-value < 0.01).

### 3.3. Association between family/peer views towards tobacco use and past 30-day smoking cessation

In the unadjusted analysis, we found that individuals who had family or peers with neutral or positive views towards tobacco use were 45% less likely to report past 30-day cessation than those reporting negative family or peer views (OR: 0.55, 95% CI: 0.42 – 0.73). In the adjusted analysis, participants with family or peers with neutral or positive views towards tobacco use were 32% less likely to report past 30-day cessation than those reporting negative family or peer views (OR: 0.68, 95% CI: 0.51 – 0.93) (Table 2). The adjusted model accounted for effects of age, gender, race/ethnicity, and baseline cigarettes smoked per day. We observed similar results when we used the three original study groups (i. e. (family or peers with positive views towards tobacco use, family or

**Table 1**

Distribution of sociodemographic and smoking characteristics by family or peer views towards tobacco use among people with mental health conditions who smoke, using data from the Population Assessment of Tobacco and Health (PATH) study 2015–2016.

Participant Characteristics	Total (%)	Family/Peer views towards tobacco use <sup>a</sup>		p-value
		Negative views (%)	Neutral or Positive views (%)	
<b>N</b>	4201	2486 (61.8%)	1715 (38.2%)	
<b>Age<sup>a</sup></b>				
18 to 24	17.3	15.9	19.5	<0.01
25 to 34	25.4	25.0	25.9	
35 to 44	20.0	21.3	17.7	
45 to 54	19.5	18.6	20.9	
55 and older	17.9	19.2	15.9	
<b>Men</b>	47.9	47.6	48.5	0.63
<b>Race/ethnicity<sup>a</sup></b>				
NH Whites	70.9	72.8	67.9	<0.01
NH Blacks	11.3	9.2	14.8	
Hispanics	9.8	9.8	9.7	
Other	7.9	8.2	7.8	
<b>Education attainment<sup>a</sup></b>				
High school or less than high school	51.3	45.2	61.4	<0.01
<b>Marital Status<sup>a</sup></b>				
Married	31.9	33.3	29.8	0.14
Widowed/Separated/Divorced	30.8	30.2	31.8	
Never married	37.2	36.5	38.4	
<b>Mental Health Symptoms</b>				
Reporting symptoms on internalizing sub-scale only	28.8	27.1	31.4	0.02
Reporting symptoms on internalizing sub-scale only	15.1	16.1	13.5	
Reporting symptoms on both sub-scales	56.1	56.7	55.1	
<b>Received assistance/income from state<sup>a</sup></b>	35.0	31.2	41.2	<0.01
<b>Age first smoked cigarettes regularly<sup>a</sup></b>				
<18 years old	56.7	52.9	62.8	<0.01
18 to 24 years old	36.3	39.7	30.7	
25 years and older	7.1	7.4	6.6	
<b>Cigarettes smoked per day at baseline, median (IQR)<sup>a</sup></b>	14 (11)	12.1 ± 19.0	15.8 ± 54.5	<0.01
<b>Used e-cigarettes in the past year</b>	36.0	36.7	34.9	0.29
<b>How soon after waking do you use cigarettes</b>				
Within 5 min	26.5	24.0	30.6	<0.01
5-30 min	33.1	32.6	33.9	
31-60 min	15.1	15.8	13.8	
After 60 min	25.4	27.6	21.8	
<b>Family or peers smoke cigarettes</b>	69.7	61.7	82.1	<0.01

<sup>a</sup> Missing values: family/peer views (n = 85), age (n = 105), race/ethnicity (n = 76), education (n = 116), marital status (n = 74), received assistance/income from state (n = 25), cigarettes smoked per day (n = 43), age first smoked regularly (n = 695); IQR: Inter-quartile range.

peers with neutral views towards tobacco use, family or peers with negative views towards tobacco use) as shown in Supplemental Table 1.

### 3.4. Association between family or peer views towards tobacco use and past 30-day smoking cessation stratified by mental health symptoms

Participants were stratified by type of mental health symptoms: those who reported mental health symptoms on the internalizing disorder sub-

scale only, those who reported symptoms on the externalizing disorder sub-scale only, and those who reported symptoms on both sub-scales. Among participants with mental health symptoms on the internalizing disorder subscale, the odds of past 30-day cessation were 17% lower (OR: 0.83; 95% CI: 0.43 – 1.62) for participants who had family or peers with neutral or positive views towards tobacco use compared to those who had family or peers with negative views towards tobacco use. Among participants with mental health symptoms on the externalizing disorder subscale, the odds of past 30-day cessation were 26% lower (OR: 0.74; 95% CI: 0.38 – 1.46) for participants who had family or peers with positive views towards tobacco use compared to those who had family or peers with negative views towards tobacco use. Among participants who reported mental health symptoms on both the internalizing and externalizing disorder subscale, the odds of past 30-day cessation were 38% lower (OR: 0.62 95% CI: 0.42 – 0.92) for those who had family or peers with positive views towards tobacco use compared to those who had family or peer with negative views towards tobacco use.

## 4. Discussion

In a US nationally representative sample of people with mental health conditions who smoke, about 10% reported past 30-day cessation. The proportion of individuals who abstained from cigarettes in the past month in this study is comparable to proportions reported in the general population. (Paul et al., 2010) We found that having family or peers who hold positive or neutral views towards tobacco use is associated with reduced odds of quitting smoking in people with mental health conditions. We observed similar findings in magnitude and direction in the sensitivity analysis in which we analyzed three study groups (positive, neutral, and negative views towards tobacco use). In the stratified analysis, the association between family or peer views towards tobacco use and smoking cessation was significant in those who had mental health symptoms on both sub-scales (internalizing and externalizing mental health sub-scales), but not for those with single scale symptoms.

We found that having family or peers who hold positive or neutral views towards tobacco use was associated with reduced odds of quitting smoking in people with mental health conditions. This finding is in line with studies conducted in the general population that show that quit attempts tend to be unsuccessful in social situations where smoking is normative or accepted. (Van Den Putte et al., 2005; Dennis et al., 2013) A qualitative study that was conducted in people with mental health conditions found that family or peers tended to believe that smoking helped with mental health symptoms management in this population. (Aschbrenner et al., 2017b) Another study showed that family members who take on a caregiving role get involved in the purchase of cigarettes to ‘maintain the routine’ of the individual with a mental health condition. (Lawn et al., 2015) Acceptance of smoking behavior undermines the family and peers’ role in supporting cessation. Therefore, educating family members or peers about the benefits of quitting in people with mental health conditions can contribute to higher quit rates in this population. This is because individuals are more likely to quit smoking when family members and close friends whose opinion is valued think they should quit, and believe that smoking is unacceptable behavior in social situations. (Dennis et al., 2013).

In the analysis stratified by type of mental health symptoms (internalizing versus externalizing mental health symptoms), we found that the association between family or peer views towards tobacco use and smoking cessation was statistically significant for individuals who reported mental health symptoms on both sub-scales, but not those with single scale symptoms. This finding is likely due to the relatively smaller sample sizes in the internalizing and externalizing sub-groups. This is because the direction of the relationship is similar in all the analyses and reaches significance only in the analyses with larger samples. If the association between family or peer views towards tobacco use and

**Table 2**

Odds ratios from logistic regression analysis showing the association between family or peer tobacco use views and past 30-day smoking cessation, using data from the Population Assessment of Tobacco and Health study 2015 – 2016.

Characteristics	Adjusted for demographic variables			Adjusted for demographic variables and cigarettes/day			Adjusted for demographic variables and cigarettes/day and family/peer smoking status		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
<b>Family/peer views towards tobacco use</b>									
Negative views	1.00	reference		1.00	reference		1.00	reference	
Neutral/positive	0.55	0.42 – 0.72	<0.01	0.66	0.49 – 0.89	0.01	<b>0.68</b>	<b>0.51 – 0.93</b>	<b>0.02</b>
<b>Age</b>									
18 to 24	1.00	reference		1.00	reference		1.00	reference	
25 to 34	0.83	0.60 – 1.14	0.24	0.96	0.69 – 1.33	0.79	0.95	0.68 – 1.32	0.76
35 to 44	0.45	0.31 – 0.67	<0.01	0.66	0.43 – 1.00	0.05	0.65	0.43 – 0.99	0.04
45 to 54	0.52	0.33 – 0.85	0.01	0.86	0.51 – 1.46	0.59	0.86	0.51 – 1.46	0.58
55 and older	0.55	0.33 – 0.92	0.02	0.78	0.49 – 1.22	0.28	0.74	0.47 – 1.17	0.20
<b>Sex</b>									
Male	1.00	reference		1.00	reference		1.00	reference	
Female	0.89	0.70 – 1.13	0.34	0.84	0.67 – 1.06	0.15	0.86	0.68 – 1.09	0.20
<b>Race/ethnicity</b>									
NH Whites	1.00	reference		1.00	reference		1.00	reference	
NH Blacks	0.81	0.53 – 1.27	0.37	0.58	0.36 – 0.94	0.03	0.55	<b>0.34 – 0.89</b>	<b>0.02</b>
Hispanics	1.07	0.63 – 1.82	0.79	0.68	0.39 – 1.17	0.16	0.66	0.38 – 1.14	0.14
Other	1.48	0.82 – 2.66	0.19	0.85	0.52 – 1.38	0.52	0.83	0.52 – 1.34	0.45
<b>Cigarettes/day</b>	–	–	–	0.89	0.87 – 0.91	<0.01	0.89	<b>0.87 – 0.91</b>	<b>&lt;0.01</b>
<b>Family/peers smoking status</b>									
Smoke	–	–	–	–	–	–	1.00	Reference	
Do not smoke	–	–	–	–	–	–	0.83	0.60 – 1.14	0.24

Crude model: OR:0.55; 95% CI: 0.42 – 0.73; P-value: <0.01.

Complete case count (n = 3880).

smoking cessation does not differ by type of mental health symptoms, this could indicate that people with mental health conditions who smoke could uniformly benefit from family or peer-based support interventions. Further exploration of how family or peers engage with people with mental health reasons regarding smoking is needed to clarify our finding.

#### 4.1. Limitations

This study had limitations. The survey question used to determine family or peer views towards tobacco use did not capture family or peer views that were specific to smoking and having a mental health condition. It is possible that the measure used in the current study led to the underestimation of the proportion of family members or peers who normalize smoking based on the incorrect belief that quitting smoking interferes with recovery from mental illness. This in turn likely resulted in an underestimation our point estimates. Other studies have shown higher levels of social acceptance regarding smoking if a person has a mental health diagnosis. The use of a secondary data source limited the availability of information on other potential confounders. For instance, we did not have information on the frequency of healthcare service utilization.

#### 4.2. Conclusion

Given that people with mental health conditions are more likely to experience pro-smoking social norms, understanding the association between family or peer attitudes and quitting can be informative to the development of more nuanced cessation interventions. Our findings suggest that having family members or peers who hold neutral or positive views towards tobacco use deters cessation in people with mental health conditions who smoke. Thus, educating family members or peers about the benefits of quitting in people with mental health conditions can contribute to higher quit rates in this population.

#### CRedit authorship contribution statement

**Catherine S. Nagawa:** Conceptualization, Formal analysis, Writing – original draft. **Lori Pbert:** Validation, Writing – review & editing. **Bo**

**Wang:** Validation, Writing – review & editing. **Sarah L. Cutrona:** Validation, Writing – review & editing. **Maryann Davis:** Validation, Writing – review & editing. **Stephenie C. Lemon:** Supervision, Validation, Funding acquisition, Writing – review & editing. **Rajani S. Sadasivam:** Supervision, Funding acquisition, Validation, Writing – review & editing.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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The National Cancer Institute had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2022.101886>.

#### References

- Lipari, R.N., Van Horn, S., 2017. Smoking and mental illness among adults in the United States. The CBHSQ report.
- Callaghan, R.C., Veldhuizen, S., Jeysingh, T., Orlan, C., Graham, C., Kakouris, G., Remington, G., Gatley, J., 2014. Patterns of tobacco-related mortality among

- individuals diagnosed with schizophrenia, bipolar disorder, or depression. *Journal of psychiatric research*. 48 (1), 102–110.
- February, C.V.S., 2016. Adult Smoking: Focusing on People with Mental Illness.
- Streck, J.M., Weinberger, A.H., Pacek, L.R., Gbedemah, M., Goodwin, R.D., 2020. Cigarette smoking quit rates among persons with serious psychological distress in the United States from 2008 to 2016: are mental health disparities in cigarette use increasing? *Nicotine and Tobacco Research*. 22 (1), 130–134.
- Ajzen, I., 1991. The theory of planned behavior. *Organizational behavior and human decision processes*. 50 (2), 179–211.
- Zimmerman, R.S., Connor, C., 1989. Health promotion in context: the effects of significant others on health behavior change. *Health Education Quarterly*. 16 (1), 57–75.
- Povey, R., Conner, M., Sparks, P., James, R., Shepherd, R., 2000. The theory of planned behaviour and healthy eating: Examining additive and moderating effects of social influence variables. *Psychology & Health*. 14 (6), 991–1006.
- Westmaas, J.L., Bontemps-Jones, J., Bauer, J.E., 2010. Social support in smoking cessation: reconciling theory and evidence. *Nicotine & Tobacco Research*. 12 (7), 695–707.
- Aschbrenner, K.A., Naslund, J.A., Gill, L., Bartels, S.J., O'Malley, A.J., Brunette, M.F., 2017a. Preferences for smoking cessation support from family and friends among adults with serious mental illness. *Psychiatric Quarterly*. 88 (4), 701–710.
- McKay, C.E., Dickerson, F., 2012. Peer supports for tobacco cessation for adults with serious mental illness: a review of the literature. *Journal of Dual Diagnosis*. 8 (2), 104–112.
- Aschbrenner, K.A., Naslund, J.A., Gill, L., Hughes, T., O'Malley, A.J., Bartels, S.J., Brunette, M.F., 2019. Qualitative analysis of social network influences on quitting smoking among individuals with serious mental illness. *Journal of Mental Health*. 28 (5), 475–481.
- Aschbrenner, K.A., Dixon, L.B., Naslund, J.A., Bienvenida, J.C.M., McManus, K.L., Bartels, S.J., Brunette, M.F., 2017b. An online survey of family members' beliefs and attitudes about smoking and mental illness. *Journal of dual diagnosis*. 13 (3), 179–183.
- Law, S., McNaughton, D., Fuller, L., 2015. What carers of family members with mental illness say, think and do about their relative's smoking and the implications for health promotion and service delivery: a qualitative study. *International Journal of Mental Health Promotion*. 17 (5), 261–277.
- Hyland, A., Ambrose, B.K., Conway, K.P., Borek, N., Lambert, E., Carusi, C., Taylor, K., Crosse, S., Fong, G.T., Cummings, K.M., Abrams, D., Pierce, J.P., Sargent, J., Messer, K., Bansal-Travers, M., Niaura, R., Vallone, D., Hammond, D., Hilm, N., Kwan, J., Piesse, A., Kalton, G., Lohr, S., Pharris-Ciurej, N., Castleman, V., Green, V. R., Tessman, G., Kaufman, A., Lawrence, C., van Bommel, D.M., Kimmel, H.L., Blount, B., Yang, L., O'Brien, B., Tworek, C., Alberding, D., Hull, L.C., Cheng, Y.-C., Maklan, D., Backinger, C.L., Compton, W.M., 2017. Design and methods of the Population Assessment of Tobacco and Health (PATH) Study. *Tobacco control*. 26 (4), 371–378.
- Kalton, G., Kali, J., Sigman, R., 2014. Handling frame problems when address-based sampling is used for in-person household surveys. *Journal of Survey Statistics and Methodology*. 2 (3), 283–304.
- Dennis, M.L., Chan, Y.-F., Funk, R.R., 2006a. Development and validation of the GAIN Short Screener (GSS) for internalizing, externalizing and substance use disorders and crime/violence problems among adolescents and adults. *The American Journal on Addictions*. 15 (s1), 80–91.
- Dennis, M.L., Titus, J.C., White, M.K., Unsicker, J.L., Hodgkins, D., 2003. Global appraisal of individual needs: Administration guide for the GAIN and related measures. Chestnut Health Systems, Bloomington, IL.
- Michael L. Dennis PDTFLHS, Ph.D.; Liliana Bedoya, B.A.. *Global Appraisal of Individual Needs—Short Screener (GAIN-SS): Administration and Scoring Manual for the GAINSS Version 2.0.1. Bloomington, IL: Chestnut Health Systems. 2006.*
- Dennis, M.L., Chan, Y.-F., Funk, R.R., 2006b. Development and validation of the GAIN Short Screener (GSS) for internalizing, externalizing and substance use disorders and crime/violence problems among adolescents and adults. *American Journal on Addictions*. 15 (sup1), 80–91.
- Hamilton, C.M., Strader, L.C., Pratt, J.G., Maiese, D., Hendershot, T., Kwok, R.K., Hammond, J.A., Huggins, W., Jackman, D., Pan, H., Nettles, D.S., Beaty, T.H., Farrer, L.A., Kraft, P., Marazita, M.L., Ordovas, J.M., Pato, C.N., Spitz, M.R., Wagener, D., Williams, M., Junkins, H.A., Harlan, W.R., Ramos, E.M., Haines, J., 2011. The PhenX Toolkit: get the most from your measures. *American journal of epidemiology*. 174 (3), 253–260.
- Conway, K.P., Green, V.R., Kasza, K.A., Silveira, M.L., Borek, N., Kimmel, H.L., Sargent, J.D., Stanton, C., Lambert, E., Hilm, N., Reissig, C.J., Jackson, K.J., Tanski, S.E., Maklan, D., Hyland, A.J., Compton, W.M., 2017. Co-occurrence of tobacco product use, substance use, and mental health problems among adults: Findings from Wave 1 (2013–2014) of the Population Assessment of Tobacco and Health (PATH) Study. *Drug and alcohol dependence*. 177, 104–111.
- Velicer, W.F., Prochaska, J.O., 2004. A comparison of four self-report smoking cessation outcome measures. *Addictive behaviors*. 29 (1), 51–60.
- Fagerstrom, K., 2003. Time to first cigarette; the best single indicator of tobacco dependence? *Monaldi Archives for Chest Disease*. 59 (1), 91–94.
- VanderWeele, T.J., 2019. Principles of confounder selection. *European journal of epidemiology*. 34 (3), 211–219.
- Budtz-Jørgensen, E., Keiding, N., Grandjean, P., Weihe, P., 2007. Confounder selection in environmental epidemiology: assessment of health effects of prenatal mercury exposure. *Annals of epidemiology*. 17 (1), 27–35.
- Maldano, G., Greenland, S., 1993. Simulation study of confounded-selection strategies. *Am J Epidemiol*. Find this article online. 138 (1), 923–936.
- Archer, K.J., Lemeshow, S., 2006. Goodness-of-fit test for a logistic regression model fitted using survey sample data. *The Stata Journal*. 6 (1), 97–105.
- Krueger, R.F., Eaton, N.R., 2015. Transdiagnostic factors of mental disorders. *World Psychiatry*. 14 (1), 27–29.
- American Psychiatric Association A. *Diagnostic and statistical manual of mental disorders. Vol 3: American Psychiatric Association Washington, DC; 1980.*
- Cicchetti, D., Toth, S.L., 2014. Internalizing and Externalizing Expressions of Dysfunction, Volume 2. Psychology Press.
- Cicchetti, D., Natsuaki, M.N., 2014. Multilevel developmental perspectives toward understanding internalizing psychopathology: Current research and future directions. *Dev Psychopathol* 26 (4pt2), 1189–1190.
- Colston, D.C., Cho, B., Thrasher, J.F., Titus, A.R., Xie, Y., Emery, S., Elliott, M.R., Fleischer, N.L., 2021. Anti-Smoking Media Campaigns and Disparities in Smoking Cessation in the United States, 2001–2015. *American Journal of Health Promotion*. 35 (5), 658–668.
- Paul, C.L., Ross, S., Bryant, J., Hill, W., Bonevski, B., Keevy, N., 2010. The social context of smoking: a qualitative study comparing smokers of high versus low socioeconomic position. *BMC public health*. 10 (1), 1–7.
- Van Den Putte, B., Yzer, M.C., Brunsting, S., 2005. Social influences on smoking cessation: a comparison of the effect of six social influence variables. *Preventive medicine*. 41 (1), 186–193.
- Dennis M, Feeney T, Titus J. *GAIN-SS: Global Appraisal of Individual Needs—Short Screener (GAIN-SS): Administration and Scoring Manual. 2013.*