Smoking and the Reduced Life Expectancy of Individuals With Serious Mental Illness

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Introduction: People with serious mental illness experience substantially reduced life expectancy, likely due in part to their higher smoking rates relative to the general population. However, the extent to which smoking affects their life expectancy, independent of mental illness, is unknown. This study quantifies the potential contribution of smoking to reduced life expectancy among individuals with serious psychological distress (SPD), a measure that screens for serious mental illness in national surveys.

Methods: A cohort of 328,110 U.S. adults was examined using the 1997–2009 National Health Interview Surveys linked to the 2011 National Death Index. Cox models were used to estimate mortality hazard ratios for current smoking, former smoking, and SPD and construct life tables by smoking and SPD status. The smoking-attributable fraction of deaths by SPD status was calculated. Analyses were conducted in 2015.

Results: Among those with SPD, being a current smoker doubles the risk of death. Current smokers with SPD lose 14.9 years of life relative to never smokers without SPD. Among never smokers, having SPD reduces life expectancy by 5.3 years. Thus, smoking may account for up to two thirds of the difference in life expectancy between smokers with SPD and never smokers without SPD. One third of deaths among those with SPD can be attributed to smoking.

Conclusions: The life expectancy difference between current smokers with SPD and never smokers without SPD is primarily due to smoking. Aiding individuals with serious mental illness to avoid smoking will translate into sizeable gains in life expectancy.
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Introduction

The annual risk of death for individuals with psychiatric disorders is more than twice that of the general population.[1] Those with mental illness lose 10 years of potential life on average[1] and their quality of life is reduced by the contribution of these disorders to overall disability.[2] Many with serious mental illness die from unnatural causes such as suicide or accidents. High levels of psychological distress are associated with suicide ideation and completion,[3,4] and more than 40,000 U.S. deaths are due to suicide each year.[5] However, a large proportion of deaths among those with psychiatric disorders is ultimately due to chronic diseases such as heart disease, cancer, and stroke.[6]

This poor physical health is attributed to a combination of factors.[7–9] Those with serious mental illness are disproportionately living in poverty or lack housing, and are subject to health risks associated with social deprivation. Patients with psychiatric disorders are less likely to receive adequate physical health care than the mentally healthy. Some antipsychotic medications come with hazardous side effects. Finally, those with serious mental illness are more likely to engage in harmful health behaviors such as poor diet, alcohol or substance abuse, and smoking.[6,10–14]

Both substantial burdens to health, serious mental illness and smoking are highly associated with each

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other.[2,15,16] Serious mental illness can be broadly defined as having at least one DSM-IV diagnosis and functional impairment in the past 12 months.[17] National surveys screen for serious mental illness using the Kessler six-item scale for non-specific serious psychological distress (SPD). High scores significantly predict DSM-IV diagnoses, such as bipolar disorder and major depressive disorder, with associated impairment.[17–19] Like diagnosable psychiatric disorders, SPD is highly associated with increased mortality and comorbidity with smoking.[20–22] Approximately 42% of adults with SPD are current smokers.[21] This is lower but on the same order of magnitude as smoking prevalence among those with bipolar disorder (46%) and schizophrenia (59%).[23] Overall adult smoking prevalence in the U.S. is less than 20%.[24]

Although tobacco use contributes to early death among those with psychiatric disorders, the extent to which smoking affects excess mortality, independent of mental illness, is unknown. Several mortality studies comparing populations with and without psychiatric disorders adjust for confounding due to smoking but are restricted to veterans,[25,26] California-based or non-U.S. patient populations,[6,27] and middle-aged or elderly individuals.[28–31] These studies show that psychiatric disorders increase mortality risk even after accounting for smoking, but have not quantified the specific contribution of smoking to mortality relative to mental illness.

This study uses nationally representative data to estimate:

1. the relative rates of death for smoking and SPD adjusting for covariates; and
2. the impact of smoking on all-cause mortality and life expectancy among people with and without SPD in the U.S.

Methods

Data Source and Measures

The National Health Interview Survey (NHIS) surveys the civilian, non-institutionalized U.S. population. Since 1997, NHIS has identified adults with SPD by asking respondents about the frequency over the past month with which they have felt:

1. *nervous*;
2. *hopeless*;
3. *restless or fidgety*;
4. *so sad or depressed that nothing could cheer them up*;
5. *that everything is an effort*; and
6. *worthless* (Kessler six-item scale).

Each item is scored 0–4 based on the response *none of the time*, *a little of the time*, *some of the time*, *most of the time*, or *all of the time*. Individuals with scores ≥ 13 are considered to have SPD. At this cut point, the measure has high specificity for identifying individuals with serious mental illness.[17]

Current smoking is defined as having smoked at least 100 cigarettes in one's lifetime, and currently smoking every day or some days.[32,33] Former smokers have smoked at least 100 cigarettes but do not currently smoke.

Mortality follow-up data are available for a subsample of NHIS participants linked to death certificate information through the National Death Index from the date of survey through 2011. Because NHIS only collects mortality data upon follow-up, all behavioral and demographic data are based on time of survey. Approximately 95% of participants in the sample were eligible for mortality linkage. Details on the mortality linkage data are available online.[34] NHIS data for 1997–2009 were pooled to generate a final sample of 328,110 individuals. Recommended procedures to adjust the sampling weights for the mortality follow-up and pooled sample were followed.[34] NHIS response rates ranged from 62.7% to 80.4% over the study period.

Statistical Analysis

Cox regression models were used to estimate mortality hazard ratios stratified by 10-year age groups. Individuals aged <25 years were excluded. Survival models related time to death in years, and adjusted for smoking status, gender, race/ethnicity, education, age at baseline (continuous variable), marital status, and alcohol consumption. Mortality hazard ratios were also estimated specifically for the SPD population, stratified by gender, and adjusting for the aforementioned variables and year of birth.

The proportional hazards assumption was assessed for each covariate through interaction terms with log of time in years. As baseline mortality rates for life table construction are not available by race/ethnicity or alcohol consumption, the NHIS cohort was not stratified beyond age group and gender. Given the known correlation between mental illness and tobacco use, interactions between smoking status and SPD were tested.

Mortality hazard ratios for current and former smoking were used to determine the smoking-attributable fraction (SAF) of preventable deaths among those with SPD, following the Centers for Disease Control and Prevention approach[35]:

$$SAF = \frac{p_{cs}(RR_{cs}-1)+p_{fs}(RR_{fs}-1)}{p_{cs}(RR_{cs}-1)+p_{fs}(RR_{fs}-1)+1},$$

where p_{cs} is the prevalence of current smoking in the population of interest, p_{fs} is the prevalence of former smoking, RR_{cs} is the relative risk of death for current smokers with SPD, and RR_{fs} is the relative risk of death for former smokers with SPD compared with never smokers with SPD.

To estimate the impact of smoking and mental illness comorbidity on life expectancy, life tables were developed by gender according to smoking and SPD status. Complete life tables were constructed according to the Human Mortality Database protocol.[36] The Cancer Intervention and Surveillance Modeling Network never smoker mortality rates were used as baseline rates,[37] and assumed to approximate the rates in never smokers without SPD. These data have been used in the development of multiple validated models of smoking, mortality, and lung cancer.[38–40] Baseline death rates were adjusted by applying the estimated age group–specific mortality hazard ratios for SPD, current smoking, and former smoking. For ages 0–25 years,

baseline death rates assume no change to mortality risk due to smoking or SPD status. Results based on the 2009 never-smoker death rates are shown here; results using the 1997–2008 Cancer Intervention and Surveillance Modeling Network death rates are available on request. All analyses were conducted in 2015.

Results

Table 1 presents study population characteristics according to SPD status. People with SPD comprised 3.1% of the population. From 1997 to 2011, 38,266 participants (9.5%) died at follow-up, including 15.4% of individuals with SPD and 9.2% of individuals without SPD. Average follow-up time was 8.2 years. Mean age at baseline was 49.5 years and 49.8 years for the SPD and non-SPD samples, respectively. Participants with SPD were significantly more likely to be smokers, less likely to have quit, less likely to be male, more likely to be black or Hispanic, less educated, less likely to be married, and more likely to be divorced or separated compared with those without SPD.

Table 2 presents all-cause mortality hazard ratios for current smoking, former smoking, and SPD by gender and age group adjusted for age, education, race/ethnicity, marital status, and alcohol consumption. Current smoking, former smoking, and SPD significantly increased risk of death for men and women across most age groups. Mortality risk for current smoking increased by age group and was highest for men aged 55–64 years and women aged 35–44 and 55–64 years. Relative risk for death among former smokers was also greatest among middle-aged groups, and declined for older age groups. When models distinguished between former smokers who quit $\leq$2 years ago from those who quit $\geq$2 years ago, relative risks for stable quitters were similar to estimates using a single former smoker category. Results for other risk factors are presented in Appendix Tables 1 and 2 (available online).

Interaction terms between former smoking and SPD were left out of the final models because of nonsignificance in earlier runs. The interaction term between current smoking and SPD was significant only for men aged $\geq$85 years. The large male aged $\geq$85 years interaction term and its low precision translated into inflated mortality estimates. To achieve more conservative and precise hazard ratios, this term was omitted from the final model used for life table construction.

The proportional hazards assumption was satisfied for most covariates included in the age-stratified models at the $p<0.05$ level. Models stratified by the remaining covariates did not noticeably affect estimates for current smoking, former smoking, or SPD.

Table 3 shows estimated mortality ratios among individuals with and without SPD by gender. Current smoking substantially increased risk of death for both men and women—approximately doubling the hazard relative to those with SPD who never smoked. Former smoking also increased the relative hazard rates, but was not statistically significant for men with SPD. Results for all covariates are available in Appendix Table 3 (available online).

Mortality hazard ratios were applied to estimate the SAF of deaths among people with SPD. This calculation was based on 46.2% smoking prevalence for SPD men (95% CI=44.3%, 48.1%) and 40.8% for women (95% CI=39.5%, 42.2%), and 25.9% former smoking prevalence among men (95% CI=24.2%, 27.6%) and 18.5% among women (95% CI=17.3%, 19.7%). Using CI limits for both hazard ratios and prevalence estimates, the SAF ranged from 16% to 53% among men and 18% to 41% among women. Based on point estimates, approximately 36% and 30% of all deaths among men and women with SPD were attributed to smoking.

For those without SPD, 23.6% of men (95% CI=23.3%, 24.0%) and 18.6% of women (95% CI=18.3%, 18.9%) were current smokers. Prevalence of former smoking was 28.9% among men (95% CI=28.6%, 29.3%) and 20.5% among women (95% CI=20.3%, 20.8%). The SAF of deaths among those without SPD was 28% (25%–31%) for men and 27% (25%–30%) for women.

The proportion of deaths in the sample due to heart diseases, cancers, and chronic lower respiratory diseases—all major conditions linked to smoking—was 54% (95% CI=53%, 55%) for men without SPD; 52% (95% CI=48%, 56%) for men with SPD; 48% (95% CI=47%, 49%) for women without SPD, and 42% (95% CI=39%, 45%) for women with SPD.

Figure 1 presents years of potential life lost at age 40 years compared with never smokers without SPD. Confidence bands represent reduced life expectancy using the 95% CIs for each hazard ratio applied to baseline never smoker death rates. Results at other ages are available in Appendix Table 4 (available online).

Current smokers with SPD lost 14.9 years of life expectancy (average across men and women; 95% CI=10.5, 18.9) compared with never smokers without SPD. Never smokers with SPD lost approximately 5.3 years (95% CI=2.6, 7.9). Thus, smoking may account for nearly two thirds of the overall difference in life expectancy between smokers with SPD and never smokers without SPD.

Among individuals with SPD, current smoking reduced life expectancy by approximately 9.6 years (95% CI=8.0, 11.0) compared with never smoking. Those with SPD who had quit smoking had 5.8 more years of life (95% CI=5.5, 5.9) compared with current smokers. However, confidence bands overlapped for

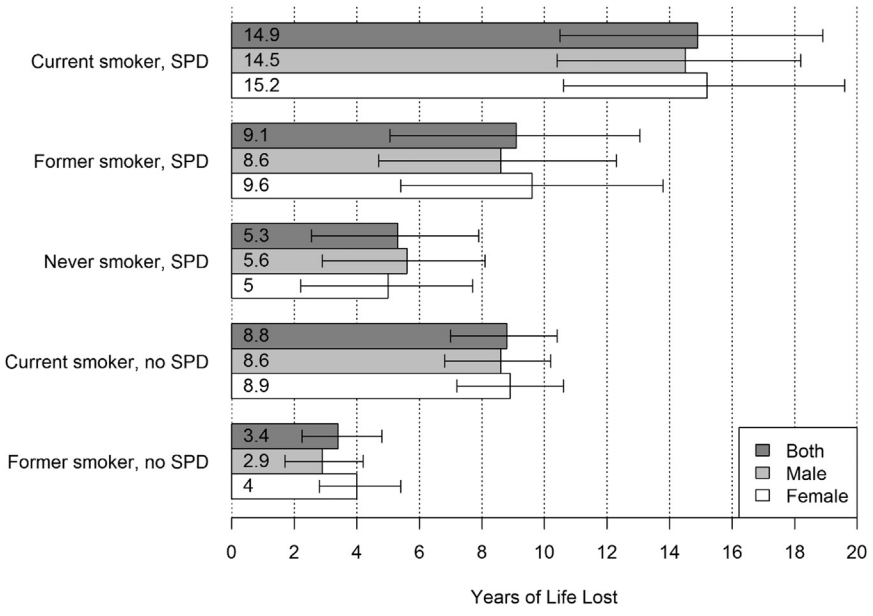

Figure 1. Life expectancy reduction at age 40 years by smoking and SPD status compared to never smoker without SPD, U.S. Adults, 2009.

Notes: Estimates represent the difference in life expectancy between each group and never smokers without SPD. Life expectancy in never smokers without SPD is 41.6 years for men and 43.7 for women at age 40. Confidence bars represent estimates using the lowest and highest hazard ratio estimates (95% CI) applied to the reference group's mortality rates.

SPD, serious psychological distress; Both, average across males and females.

former and current smokers with SPD. For the population without SPD, the life expectancy difference between smokers and never smokers was 8.8 years (95% CI=7.0, 10.4), and former smokers lived 5.4 years (95% CI=4.8, 5.6) longer than current smokers.

Discussion

This study adds to the literature by quantifying the potential contribution of smoking to reduced life expectancy among people with serious mental illness. The findings that mental illness and smoking both independently reduce life expectancy corroborate previous research.[1,41] Smoking may account for up to two thirds of the difference in life expectancy between current smokers with SPD and never smokers without SPD, independently contributing to as much as 9.6 years of potential life lost, compared with 5.3 years of life lost associated with SPD per se. The magnitudes of differences by smoking status are similar to those for the population without SPD. That approximately 33% of deaths among individuals with SPD is attributed to smoking is driven by the higher overall smoking rates in the SPD population. This is slightly larger than the SAF of deaths among people without SPD. The estimate is similar to those reported for United Kingdom patients with psychiatric disorders.[42] Approximately 47% of deaths in the SPD population were due to three leading tobacco-related conditions, consistent with earlier work that found half of total deaths among those with schizophrenia, bipolar disorder, and depression were due to smoking-related diseases.[27] A relatively smaller share of deaths in the SPD population are caused by these diseases, compared with those without SPD. This lower proportion may be a function of competing causes of death among the SPD population (e.g., suicides) and the shorter life expectancies of those with SPD, who die at earlier ages when chronic diseases are less prevalent. In general, results demonstrate that populations with and without serious mental illness experience substantial tobacco-related mortality burdens.

Limitations

This study design and data source prohibit causal claims about the underlying mechanisms that lead to premature death for smokers with serious mental illness; confounding variables beyond those included here may contribute to their dramatically reduced life expectancy. Yet, there is overwhelming evidence on the causal relationship between smoking and mortality.[43] Recent analyses suggest that U.S. smokers lose 10–20 years of life expectancy compared with never smokers.[40,41]

Screening for SPD does not capture all cases of adults with serious mental illness. The NHIS does not survey

Table 1. Sample Characteristics by SPD Status, U.S. Adults, 1997–2009

Characteristic	No SPD	SPD	*p*-value
No. of observations	311,551	11,563	
Average years of follow-up (SD)	8.19 (3.84)	7.85 (3.94)	
Deaths, *n* (%)	**35,117 (9.2)**	**2,013 (15.4)**	<0.001
Male, *n* (%)	**136,741 (48.1)**	**3,760 (37.0)**	<0.001
Smoking status, *n* (%)			
Never smoker	**169,934 (54.4)**	**4,369 (35.9)**	<0.001
Current smoker	**66,036 (21.0)**	**4,798 (42.8)**	<0.001
Former smoker	**74,040 (24.6)**	**2,335 (21.2)**	<0.001
Education, *n* (%)			
High school or less	**147,443 (45.1)**	**7,673 (65.8)**	<0.001
Some college	**83,841 (27.5)**	**2,781 (24.8)**	<0.001
College graduate	**78,471 (27.5)**	**1,031 (9.4)**	<0.001
Race/ethnicity, *n* (%)			
Hispanic	**49,433 (11.2)**	**2,359 (13.4)**	<0.001
White (Non-Hispanic)	**204,579 (73.0)**	**6,870 (68.9)**	<0.001
Black (Non-Hispanic)	**43,038 (10.8)**	**1,813 (12.6)**	<0.001
Other (Non-Hispanic)	14,158 (5.0)	514 (5.1)	0.786
Age group, years, *n* (%)			
25–34	**66,614 (21.4)**	**2,001 (17.4)**	<0.001
35–44	70,584 (23.5)	2,738 (24.4)	0.074
45–54	**61,282 (21.5)**	**2,992 (26.7)**	<0.001
55–64	**45,524 (15.0)**	**1,926 (16.7)**	<0.001
65–74	**35,341 (10.2)**	**969 (7.5)**	<0.001
75–84	**24,650 (6.6)**	**708 (5.3)**	<0.001
≥85	7,556 (1.9)	229 (1.9)	0.966
Birth cohort, *n* (%)			
1912–1929	**37,844 (9.6)**	**1,107 (8.1)**	<0.001
1930–1939	**34,433 (10.0)**	**1,040 (7.9)**	<0.001
1940–1949	**48,180 (15.6)**	**2,070 (17.5)**	<0.001
1950–1959	**64,679 (22.2)**	**3,022 (26.8)**	<0.001
1960–1969	70,521 (23.3)	2,637 (23.4)	0.765
1970–1984	**55,894 (19.3)**	**1,687 (16.2)**	<0.001
Marital status, *n* (%)			
Never married	**47,559 (11.6)**	**2,012 (14.4)**	<0.001
Currently married	**161,494 (64.2)**	**3,868 (45.8)**	<0.001
Cohabiting	**13,276 (5.2)**	**622 (7.2)**	<0.001

(continued on next page)

Table 1. Sample Characteristics by SPD Status, U.S. Adults, 1997–2009 *(continued)*

Characteristic	No SPD	SPD	*p*-value
Divorced or separated	**54,032 (11.7)**	**3,572 (23.1)**	<0.001
Widowed	**34,435 (7.2)**	**1,454 (9.4)**	<0.001
Current drinking status, *n* (%)			
Nondrinker	**50,433 (20.4)**	**2,957 (35.2)**	<0.001
Non-heavy drinker	**128,795 (55.4)**	**3,462 (40.3)**	<0.001
Heavy drinker, <3 times per week	**51,781 (22.9)**	**1,701 (20.8)**	<0.001
Heavy drinker, ≥3 times per week	**2,814 (1.2)**	**294 (3.6)**	<0.001

Note: Boldface indicates statistical significance ($p < 0.001$). Percentages represent weighted proportions, excludes individuals less than 25 years of age.
SPD, serious psychological distress.

homeless or institutionalized groups known to have higher prevalence of smoking and psychiatric disorders.[44–48] Thus, the analyses might misestimate the true impact of smoking and mental illness on mortality due to the exclusion of these groups, particularly those in psychiatric institutions. SPD has high specificity for screening diagnosable psychiatric disorders,[17] but given its lower sensitivity, individuals with serious mental illness may exist in the sample without SPD, potentially underestimating the effects of mental illness. Still, the measure is relevant to clinical practice as it identifies those with the greatest need for treatment. Only 32% of individuals with SPD report seeing a mental health professional in the past year.[21] This underscores the need to remove barriers to mental health care and the obligation of clinicians to address smoking for those patients who do interface with treatment settings.

Findings about the contribution of smoking to the excess mortality of people with SPD may also underestimate differences in life expectancy, given this study's use of baseline death rates for never smokers that include those with SPD who have never smoked. Although models did not adjust for the fact that individuals with SPD smoke more cigarettes per day than do smokers without SPD,[23,49] the estimated relative risks implicitly reflect these differences.

This study is also limited by the lack of data on mental health and smoking status for individuals over time. Baseline health and behavioral data may not reflect their status upon follow-up. If SPD is a transient state, this would overestimate its mortality risk, although many with serious psychiatric disorders experience chronic symptoms across the life course. With regard to smoking, 98% of smokers initiate cigarette use by age 25 years,[43] and because some smokers subsequently quit, decreasing their risk, actual differences in life expectancy are greater than shown here. Other longitudinal data sources may have more comprehensive information but are generally not representative of the U.S. population.

Life expectancy and smoking-attributable mortality may vary considerably by type of psychiatric disorder and level of disease severity. Future research should examine the impact of smoking on mortality for specific psychiatric disorders. Though much of mortality may be due to smoking, mental illness may account for considerable decreases in quality of life, which were not examined here.

This study is strengthened by its use of nationally representative data and the most historically comprehensive mental health measure available in the U.S., with screening for SPD since 1997. Although SPD is not a diagnostic measure, unpublished analyses using the National Health and Nutrition Examination Survey and the Patient Health Questionnaire, a validated screening tool for clinical depression, found smoking relative risk estimates consistent with those reported here.

A global meta-analysis estimated roughly a decade of potential life lost for individuals with psychiatric disorders.[1] The present study suggests that much of this life expectancy reduction may in fact be due to smoking. United Kingdom data have been used to calculate potential life years gained at the population level if people with psychiatric disorders quit smoking,[15] and smoking-attributable years of potential life lost for this entire population.[42] However, unlike the present study, these studies did not estimate the contribution of smoking to mortality at the individual level or its impact relative to mental illness.

Conclusions

The need to effectively address smoking among mentally ill populations is critical.[50–52] Global disparities in

Table 2. All-Cause Mortality Hazard Ratios by Age Group, U.S. Males and Females

	Age group (years)						
Variable	**25–34**	**35–44**	**45–54**	**55–64**	**65–74**	**75–84**	**85+**
Males							
No. of observations	24,841	27,763	24,484	17,648	12,183	7,161	1,708
Current smoker	**1.8***** (1.4, 2.4)	**1.6***** (1.4, 1.9)	**2.3***** (1.9, 2.6)	**2.8***** (2.4, 3.2)	**2.7***** (2.4, 3.1)	**2.1***** (1.8, 2.4)	1.3 (0.9, 1.9)
Former smoker	**1.5**** (1.0, 2.1)	1.1 (0.9, 1.4)	**1.2**** (1.0, 1.4)	**1.4***** (1.3, 1.7)	**1.5***** (1.3, 1.7)	**1.3***** (1.2, 1.4)	**1.2***** (1.1, 1.4)
SPD	**1.7*** (1.0, 3.0)	**2.1***** (1.6, 2.8)	**1.8***** (1.4, 2.2)	**1.5***** (1.2, 1.8)	**2.1***** (1.7, 2.6)	**1.5***** (1.2, 1.9)	**1.8**** (1.1, 2.9)
Females							
No. of observations	27,408	29,574	25,698	17,906	12,709	8,705	2,485
Current smoker	**1.4**** (1.0, 2.0)	**3.2***** (2.6, 4.0)	**2.5***** (2.1, 2.9)	**2.8***** (2.5, 3.3)	**2.8***** (2.5, 3.1)	**2.3***** (2.0, 2.6)	**1.3**** (1.0, 1.7)
Former smoker	0.9 (0.6, 1.5)	**1.3*** (1.0, 1.8)	**1.4***** (1.2, 1.7)	**1.7***** (1.5, 2.0)	**1.7***** (1.5, 1.8)	**1.6***** (1.5, 1.7)	**1.2**** (1.0, 1.3)
SPD	**3.6***** (2.3, 5.6)	**1.9***** (1.4, 2.6)	**2.1***** (1.7, 2.7)	**1.7***** (1.3, 2.1)	**1.7***** (1.3, 2.1)	**1.6***** (1.3, 2.0)	1.3 (0.9, 1.9)

Note: Boldface indicates statistical significance (*$p<0.1$; **$p<0.05$; ***$p<0.01$). Values are 95% CIs presented below hazard ratios; ages 85+ are top-coded. Hazard ratios are adjusted for age, education, race/ethnicity, marital status, and alcohol consumption. Full tables are available as supplementary material (Appendix Tables 1 and 2, available online).
SPD, serious psychological distress

smoking, mortality, and life expectancy outcomes by mental health status have persisted for decades. Although smoking rates have declined substantially for the general U.S. population, comparable declines have not been observed among those with mental illness.[53] People with mental illness continue to smoke at higher rates, with greater intensity, and with less success in quitting.[23] The fact that smoking and serious mental illness comorbidity reduce life expectancy by nearly 15 years is highly concerning, especially because the former can be avoided completely and the effects of the latter can be mitigated through prevention and treatment. National organizations' recommendations of providing smoking cessation treatment in mental health settings still have not been fully implemented.[51,54–56] Life expectancy is already reduced for individuals with psychiatric disorders, but helping people with mental illness quit smoking and preventing them from starting will substantially increase their life expectancy. Combined, these efforts could translate into major gains in population health.

Table 3. All-cause Mortality Hazard Ratios, U.S. Adults With and Without Serious Psychological Distress (SPD)

	SPD population		No SPD population	
Variable	**Males**	**Females**	**Males**	**Females**
No. of observations	3,045	5,269	112,743	119,216
Smoking status				
Current smoker	**2.1** (1.5, 2.9)	**1.9** (1.5, 2.4)	**2.3** (2.2, 2.4)	**2.5** (2.4, 2.7)
Former smoker	1.2 (0.9, 1.7)	**1.4** (1.1, 1.7)	**1.3** (1.2, 1.4)	**1.5** (1.4, 1.6)

Note: Boldface indicates statistical significance ($p<0.001$). Values are 95% CIs presented below hazard ratios. Never smoker reference groups were omitted from the table. Hazard ratios are adjusted for age, education, race/ethnicity, marital status, alcohol consumption, and year of birth. Full tables are available as supplementary material (Appendix Table 3, available online).

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Appendix

Supplementary data

Supplementary data associated with this article can be found at http://dx.doi.org/10.1016/j.amepre.2016.06.007.