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## **The Potential Impact of Widespread Cessation Treatment for Smokers With Depression**

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**Introduction:** Experts recommend integrating smoking cessation treatments within U.S. mental health settings, but the population health benefits of doing so have not been estimated. This study simulates the impact of widespread cessation treatment for patients with depression under best-case treatment and maximum potential cessation scenarios.

**Methods:** Cessation interventions were simulated for U.S. adult smokers seeing a health professional for depression from 2020 to 2100. Interventions included: (1) Any Treatment (behavioral counseling, pharmacological, combination) and (2) Pharmacological Treatment (including counseling), combined with increased mental health service utilization respectively. These were compared to a maximum potential cessation scenario where all patients with major depression quit smoking. Analyses were conducted in 2016–2020.

**Results:** Widespread uptake of Any Treatment among patients with depression would avert 32,000 deaths and result in 138,000 life years gained by 2100; Any Treatment combined with 100% mental health service utilization would result in 53,000 and 231,000, respectively. Pharmacological Treatment would avert 125,000 deaths, with 540,000 life years gained. Pharmacological Treatment combined with 100% mental health service utilization would see 203,000 deaths averted and 887,000 life years gained. Health gains under best-case treatment scenarios represent modest fractions of those projected under maximum potential cessation scenarios at current mental health service utilization levels (835,000 deaths averted, 3.73 million life years gained), and at 100% utilization (1.11 million deaths averted, 5.07 million life years gained).

**Conclusions:** Providing smoking-cessation treatment to patients with depression and increasing mental health service utilization would reduce the toll of tobacco on this population. These gains would be considerably larger if cessation treatments were more effective.

## INTRODUCTION

Tobacco use disparities by mental health status are longstanding.<sup>1-6</sup> People with depression make up 7.1% of the U.S. population (17.3 million adults) and experience a disproportionate burden of tobacco-related disease and death, reflecting their higher smoking rates, and strong associations between smoking and subsequent depression and vice versa.<sup>7,8</sup> National experts recommend cessation treatments for patients with mental health conditions such as depression.<sup>4</sup> To date, mental health settings have not adequately integrated cessation treatment into standard care: Among U.S. public and private mental health service facilities, 37.6% reported offering cessation counseling, with 25.2% offering nicotine replacement therapy (NRT).<sup>9</sup> Smoking cessation interventions, especially pharmacotherapies, increase cessation among patients with depression.<sup>10</sup> Cessation itself reduces depression, and increases psychological quality of life.<sup>11</sup> However, interventions implemented in mental health settings would not reach comorbid smokers who do not use mental health services. Increased use of mental health care combined with widespread integrated cessation treatment thus could lead to greater health gains for smokers with depression. No study has estimated these gains.

Although RCTs can assess short-term health outcomes associated with treatment interventions, simulation models can project them across longer time horizons and at the population level. Models can identify conditions favoring the greatest health gains, and guide decision making for policymakers and practitioners. Many tobacco models evaluate general population interventions, but none has evaluated the impact of interventions for people with comorbid mental health conditions.<sup>12</sup>

Public health leaders have long called for smoking cessation treatment to become a routine part of mental health care,<sup>1–6</sup> expecting sizeable health gains and narrowed tobacco-related disparities for people with mental health conditions. This study estimates the public health impact of smoking cessation for adults with major depressive episodes by simulating best-case treatment scenarios. It considers effects of widespread cessation treatment interventions independently and combined with increases in mental health service utilization. Finally, it compares the impact of those interventions with mortality outcomes under a maximum potential cessation scenario, where all patients with major depressive episodes (MDEs) who smoke quit.

## **METHODS**

This study used adult (age  $\geq 18$  years) data from the 2005–2018 National Surveys on Drug Use and Health (NSDUH), the most comprehensive U.S. survey on smoking and depression.<sup>13</sup> The cross-sectional survey covers the civilian non-institutionalized population and samples 36,000–44,000 adults annually. Participants receive a \$30 incentive and are identified through a multistage area probability sample within each state. Weights are based on the product of the inverse of selection probabilities at each level (state, state sampling region, census tract, census block, area segment, dwelling unit) and adjust for nonresponse.<sup>14</sup>

An MDE lasts  $\geq 2$  weeks, during which the respondent self-reports  $\geq 5$  of 9 symptoms, including depressed mood, loss of interest in activities, changes in weight or appetite, problems with sleep, psychomotor agitation or retardation, fatigue, feelings of worthlessness, inability to concentrate, or thoughts of death or suicide.<sup>15</sup> NSDUH questions used wording based on the DSM-IV (2005–2016) and the DSM-5 (2017–2018).<sup>16,17</sup> The change from DSM-IV to DSM-5 had minimal

impact on prevalence estimates, as the NSDUH has never excluded episodes caused by bereavement.<sup>18</sup> This measure includes MDEs caused by other illness, substance use, or medications. Individuals with current MDE report an episode within the past year. Those with former MDE have a lifetime history of an MDE, but no episode within the past year. This study corrected for recall error among people with lifetime histories of MDEs using calibrated probabilities of under-reporting.<sup>19,20</sup> People with never MDE have no lifetime history of MDEs.

Current smokers smoked  $\geq 100$  cigarettes in their lifetimes, and report any smoking within the past year. This includes people who quit smoking  $< 1$  year ago, but risk relapse. The broader definition results in higher prevalence estimates compared with standard survey definitions, but allows the model to simulate quitting without relapse. Former smokers smoked  $\geq 100$  cigarettes in their lifetimes, but quit (no smoking within the past year). Never smokers smoked  $< 100$  cigarettes in their lifetimes. Smoking definitions align model inputs with survey data.<sup>20</sup>

### **Model Overview**

This study used a validated model of smoking and depression to simulate the impact of cessation interventions for adult smokers with MDEs.<sup>19,21</sup> The model includes separate compartments for individuals by age, smoking, and MDE status (Figure 1). Table 1 describes model inputs and parameters. Individuals start in a never smoker and never MDE state at birth. They transition among compartments, from never MDE to current MDE to former MDE, based on previously calibrated probabilities of incidence, recovery, and recurrence.<sup>19</sup> MDE prevalence increased significantly among young adults starting in 2016; increased incidence probabilities from 2016 to 2018 are applied and held constant thereafter. Never smokers become current smokers, who can become former smokers, based on annual smoking initiation and cessation probabilities

developed by the Cancer Intervention and Surveillance Modeling Network.<sup>22</sup> As these inputs use 1965–2018 National Health Interview Surveys, these are calibrated to match NSDUH data using age-specific scaling factors. Underlying initiation and cessation probabilities are held constant at 2018 levels through 2100. The model reflects interactions between smoking and depression, such as the increased likelihood of MDE incidence among smokers. Individuals exit the model at age 99 years or death. Cancer Intervention and Surveillance Modeling Network–generated mortality probabilities are specific by age, gender, birth cohort, and smoking status.

### **Mental Health Service Utilization**

Mental health services and providers are heterogeneous. Sites for smoking cessation interventions for MDE patients also vary. For this study, mental health service utilization was defined as the proportion of smokers with MDEs who reported talking with a health professional about their depression within the past year (Table 1, Appendix Figure 1). Health professionals include: a general practitioner or family doctor, other medical doctor, psychologist, psychiatrist or psychotherapist, social worker, counselor, other mental health professional, nurse, occupational therapist, or other health professional.<sup>23</sup> These utilization levels are applied to smokers with current MDE (*l* in Figure 1) and held constant.

### **Cessation Treatment**

Treatment effects are from a meta-analysis of RCTs of cessation interventions for adult smokers with current depression that considered interventions in primary care, mental health outpatient, home visit, or hospital settings, evaluating abstinence as 7-day point prevalence at a 6- or 12-month follow-up period.<sup>10</sup> Meta-analyses of effects on depression could not be performed owing to data heterogeneity, so the model focuses on interventions' relevant smoking outcomes.

Cessation interventions included cognitive behavioral therapy, NRT, exercise and counseling, telephone counseling, health education, and bupropion, among others. These cessation interventions—behavioral counseling, pharmacological treatment, or a combination—are referred to as Any Treatment. The combined probability of cessation increased by 13.7% across 16 interventions compared with no treatment; the pooled effect was attenuated because several behavioral-based interventions used standard cessation care as the control (no placebo), resulting in lower effects. Pharmacological Treatment interventions that provided patients with varenicline, NRT, or bupropion—in addition to counseling—had a greater cessation impact (58.8% increase) compared with placebo.

Cessation increases are applied to underlying quit probabilities among smokers in contact with health professionals for depression. All patients who smoke aged  $\geq 18$  years receive and use cessation treatment in the simulation annually starting in 2020. Eight initial best-case treatment scenarios are evaluated with: (1) Any Treatment or (2) Pharmacological Treatment. These are combined with: (1) no change in mental health service utilization levels, (2) 10% relative increase in utilization, (3) 20% relative increase in utilization, and (4) 100% utilization across the population. In these simulations, “integrated cessation treatment” refers to cessation treatment that is only provided in mental health settings; therefore, increases in mental health service utilization directly increase cessation treatment uptake. To estimate the upper bound of health gains from integrated cessation treatment, hypothetical interventions with higher annual quit rates (increased by 100%, 150%, and 200%) are evaluated. These hypothetical scenarios offer a comprehensive view of intervention strategies, including ones in which future cessation



treatments become more effective. To assess the full impact of best practices, the baseline scenario assumes zero cessation treatment in mental health settings.

Each treatment scenario is compared to a maximum potential cessation (MPC) scenario where 100% of adult smokers using mental health services for depression quit, starting in 2020. This approach recognizes that after cessation, former smokers remain at higher mortality risk compared with never smokers, and these premature deaths cannot be avoided.<sup>24</sup> The MPC scenario represents an aspirational standard to compare real-world or hypothetical interventions against. All analyses were conducted in R, version 3.6.3 from 2016 to 2020.

### **Population Health Outcomes**

Interventions directly impact the number of smokers with current MDE, and indirectly impact those with former MDE and recall error by changing the number of people in those compartments. Mortality outcomes are therefore evaluated for the entire affected population, including smokers with current MDE, former MDE, and recall error. The total number of smoking-attributable deaths (SADs) in the lifetime MDE population is summed by:<sup>25</sup>

$$SAD = \sum_{a,g} P \left( prev_{cs} \times (\mu_{cs} - \mu_{ns}) + prev_{fs} \times (\mu_{fs} - \mu_{ns}) \right),$$

where  $\mu$  represents mortality rates for current and former smokers,  $prev$  represents prevalence of current and former smoking, and  $P$  corresponds to total population size by age  $a$  and gender  $g$ .

The difference between this value and the baseline scenario equals the number of estimated premature deaths avoided under each intervention scenario. To calculate life years gained (LYG), the life expectancy ( $e$ ) difference between current and former smokers is applied to each

SAD averted:

$$LYG = \sum_{a,g} (e_{fs} - e_{cs}) \times SAD \text{ averted}$$

## RESULTS

Figure 2 compares NSDUH smoking prevalence estimates among adults with current MDE to model estimates from 2005 to 2018, and provides model projections under integrated cessation treatment scenarios through 2100. Smoking prevalence for women and men with MDEs dropped from 40.4% (95% CI=37.0, 43.9) and 42.9% (95% CI=37.8, 48.1) in 2005 to 29.8% (95% CI=27.1, 32.6) and 34.6% (95% CI=30.7, 38.6), respectively, by 2018. For women (men) with MDEs, the calibrated model shows similar declines from 39.4% to 29.3% (46.4% to 34.3%). Under baseline conditions, the model projects decreases to 17.8% (23.7%) by 2100.

Assuming no mental health service utilization changes, if women (men) with MDEs received Any Treatment, smoking prevalence would decrease to 17.5% (23.4%) by 2100. Under the Pharmacological Treatment scenario, prevalence decreases to 16.4% (22.4%) assuming no changes in mental health service utilization. If treatment options were more effective, the model projects larger declines in smoking prevalence for people with MDEs by 2100: If cessation increases by 200%, prevalence drops to 14.2% (20.1%). Under the MPC scenario, where all women (men) with MDEs using integrated cessation treatment through mental health services completely quit smoking, prevalence would drop to 6.8% (11.7%) (Appendix Tables 1–3).

Table 2 shows SADs avoided and LYG associated with each intervention scenario from 2020 to 2100 for the total affected population (Appendix Tables 4–6). Men experience larger overall SADs avoided and LYG compared with women. Assuming no change in mental health service utilization, the MPC scenario achieves 835,000 SADs avoided and 3.73 million LYG, men and women combined. This increases to 887,000 (3.97 million) and 935,000 (4.20 million) SADs avoided (LYG) when the proportion of smokers with MDE using integrated cessation treatment increases by 10% and 20%. If all smokers with MDE use integrated cessation treatment and quit smoking, this would avert 1.11 million SADs and lead to 5.07 million LYG.

Any Treatment with no change in mental health service utilization achieves approximately 4% of MPC gains (32,000 SADs avoided, 138,000 LYGs), only increasing to approximately 5% when integrated cessation treatment covers 100% of the population (53,000 SADs avoided, 231,000 LYG). Pharmacological Treatment would realize approximately 15% of the MPC (125,000 SADs avoided, 540,000 LYG) alone. If combined with 10% relative increases in utilization, an additional 12,000 SADs would be avoided and 53,000 LYG; with a 20% utilization increase, an additional 25,000 SADs avoided and 105,000 LYG. Pharmacological Treatment at 100% utilization would achieve at most 18% of the MPC scenario health gains (203,000 SADs avoided, 887,000 LYG).

If a future treatment doubled smoking cessation rates while maintaining mental health service utilization at current levels, by 2100, a total of 196,000 SADs would be avoided and 847,000 LYG—23% of the MPC. Combining integrated cessation treatment with 100% mental health service utilization would achieve 28% (314,000 SADs avoided, 1.38 million LYG) of the MPC.

A treatment that leads to a 150% increase in cessation achieves >30% of the MPC at baseline utilization, and up to 38% at maximum utilization levels. A treatment that increases cessation by 200% and maximizes utilization would achieve 45% of the MPC mortality benefits by 2100 (509,000 SADs avoided, 2.25 million LYG).

## **DISCUSSION**

This is the first study to evaluate the potential population health benefit of widespread smoking cessation treatment for people with MDEs. It quantifies missed opportunities for smokers with MDEs when they do not access cessation treatment. The model furthermore captures indirect health benefits to the population with MDE histories. Although women have higher depression rates than men, men could benefit more from interventions given their higher smoking and lower mental health service use. Under a best-case treatment scenario, pharmacological cessation treatment among patients with MDEs could avert 125,000 premature deaths with 540,000 LYG by 2100. When mental health settings integrate cessation treatment, higher utilization of mental health services leads to further health gains.

Health gains could be even larger if cessation treatments were more effective, especially if used by more of the affected population. Lower-than-average cessation rates among people with MDEs<sup>7,21,26</sup> mean that every effort should be made to improve the effectiveness and reach of cessation interventions so that larger shares of the projected benefits under the MPC scenario can be realized.

This study uses generous assumptions, with no barriers to cessation treatment and 100% annual uptake. The baseline scenario assumes limited existing integration of cessation treatment in mental health services at baseline, further inflating health gains. Underlying cessation probabilities in the model are calibrated to the NSDUH 2005–2018 data, and thus indirectly reflect existing treatment during this time period. Cessation treatment integration with mental health care has likely improved in recent years; the results can therefore be taken as upper-bound estimates if best practices reach their full potential. Because this potentially overestimates projected health benefits of widespread cessation treatments, the analysis lends salience to findings in relation to the MPC scenario.

Underlying smoking initiation and cessation are modeled as constant from 2018 onward. If smoking initiation rates continue declining and cessation rates increase under the status quo, this would dampen the projected impact of interventions. The model's former smoker mortality rates represent the average probability of death among all former smokers, including those who quit long ago. This reduces their underlying mortality rate and translates into larger estimated treatment benefits than would be expected otherwise. Former smokers are those who quit at least 1 year ago, but some relapse can still occur after 1 year of abstinence.<sup>27,28</sup>

Young adult MDE incidence probabilities are held constant from 2016 onwards, given the short time period during which incidence increased. If MDE incidence rises, people with MDEs would comprise even larger segments of the population, leading to greater numbers of people affected by interventions. Population mental health has deteriorated during the coronavirus disease 2019 (COVID-19) pandemic, especially among young adults.<sup>29,30</sup> In the COVID-19 era, widespread

mental health service utilization and smoking cessation services could prevent even larger numbers of deaths. Research on the relationship among COVID-19, mental health, and smoking behaviors is needed.

This model does not account for population heterogeneity and complex treatment needs of people with multiple behavioral health conditions (e.g., comorbid tobacco and alcohol use disorder). Cessation treatment options vary across healthcare contexts and need adaptation by setting (inpatient versus outpatient). Smokers with serious mental illness may have complicated healthcare profiles that differ from patients included in RCTs. Treatment effect estimates from RCTs may not generalize to smokers with depression in real-world settings. Efficacy studies overestimate “real-world” effectiveness of interventions. This study also did not consider synergistic effects between mental health services and cessation interventions, nor the quality or heterogeneity of mental health treatments.

Recent studies suggest some types of e-cigarettes could be at least as or more effective at helping smokers quit than conventional cessation methods such as NRT,<sup>31</sup> including for smokers with mental health conditions.<sup>32,33</sup> More smokers report trying to quit using e-cigarettes compared with U.S. Food and Drug Administration–approved pharmacotherapies.<sup>34</sup> If e-cigarettes can increase the odds of smokers with MDEs quitting, this could decrease their burden of smoking and related health harms.

Cessation interventions to help smokers with MDEs quit do not address smoking initiation. From a modeling perspective, even if individuals flow out of the current smoker compartment at a

faster rate owing to cessation treatments, the inflow does not stop. Efforts to reduce mortality for people with depression must also prevent smoking initiation among young people with depressive symptoms, an understudied area. Tobacco cessation and mental health treatment should become integrated<sup>4</sup>; so too should tobacco prevention and mental health promotion.<sup>35</sup> Like smoking, depression begins during adolescence and young adulthood.<sup>36–39</sup> Their co-occurrence increases the potential benefits of prevention efforts that address both mental health and tobacco use simultaneously. Future smoking interventions could explicitly address poor mental health and refer patients to mental health resources.

## **CONCLUSIONS**

Providers across mental health settings should provide pharmacotherapy with counseling to patients who smoke in accordance with best practices.<sup>40</sup> As the model suggests, even under less-than-optimal treatment conditions, intervention would still reduce smoking-related harms at the patient level. The estimated mortality benefits prove relatively modest, but other benefits including improved quality of life and increased productivity remain unquantified. These results should not dissuade decision makers from promoting cost-effective smoking cessation treatments for people with mental health conditions.<sup>41–43</sup> Public health leaders have long called for integration of smoking cessation treatment into standard care for patients with mental health conditions.<sup>1–6</sup> Barriers to widespread cessation treatment for people with mental health conditions must be eliminated. Given the investment required to provide comprehensive treatment and broaden access to mental health services, this strategy should be complemented with tobacco control policies, including smoke-free air laws and raising cigarette taxes—effective for people with mental health conditions.<sup>44,45</sup>

As people with mental health conditions comprise a larger proportion of the remaining U.S. smoking population,<sup>46</sup> tobacco control and mental health professionals must address the important challenge of improving prevention and treatment for comorbid smokers. The task ahead calls for multiple strategies pursued in tandem.



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## LIST OF FIGURES

**Figure 1.** Model Diagram of Major Depressive Episodes, Smoking, and Cessation Treatment.

*Notes:* MDE = major depressive episode;  $l$  = level of mental health service utilization among adult smokers with current MDE; integrated cessation treatment (dashed arrow) = cessation treatment intervention among the proportion ( $l$ ) of smokers with current MDE using mental health services; underreporting probabilities correct for recall error among people with former MDE.<sup>20</sup>

**Figure 2.** Smoking Prevalence Among U.S. Adults with Current Major Depressive Episodes by Cessation Treatment Scenario, 2020–2100.

*Notes:* National Surveys on Drug Use and Health 2005-2018; Current smoking = smoked at least 100 cigarettes in lifetime and smoking at all within the past year; Any Tx = any type of cessation treatment including behavioral, pharmacological, or a combination (13.7% increase)<sup>10</sup>; Pharm Tx = pharmacological cessation treatment (58.8% increase);<sup>10</sup> 100%, 150%, 200% increase = baseline smoking cessation probabilities are increased by 100%, 150%, and 200% respectively; Maximum Potential Cessation scenario assumes all smokers using mental health services for depression completely quit smoking starting in 2020.

**Table 1.** Description of Model Inputs and Parameters

Input/parameter	Description and sources														
Births	<ul style="list-style-type: none"> <li>• Census Bureau population projections from 2017–2060.</li> <li>• Births from 2060 are assumed constant through 2100.</li> </ul>														
MDE incidence	<ul style="list-style-type: none"> <li>• Calibrated annual age and gender-specific probabilities of a first onset MDE based on the NSDUH.<sup>20</sup> Zero probability of MDEs for ages 0–12 years.</li> <li>• Incidence increased for ages 18–25 years by 3.35X and 2.38X for men and women in 2016; constant thereafter.</li> <li>• Increased risk of MDE among current and former smokers calibrated to NSDUH data.<sup>21</sup></li> </ul>														
MDE recurrence	<ul style="list-style-type: none"> <li>• Annual probability of recurrence calculated from 45% cumulative recurrence after first MDE over 10 years in the Baltimore-ECA cohort study.<sup>47</sup></li> <li>• Recurrence probabilities assumed constant by age and gender.</li> <li>• Probabilities for MDE recurrence among current smokers calibrated to NSDUH data.<sup>21</sup></li> </ul>														
MDE recovery	<ul style="list-style-type: none"> <li>• Annual probability of recovery calculated from 85% cumulative recovery from first MDE over 10 years in the Baltimore-ECA cohort study.<sup>47</sup></li> <li>• Recovery probabilities assumed constant by age and gender.</li> <li>• Probabilities of recovery among current and former smokers calibrated to NSDUH data.<sup>21</sup></li> <li>• Annual probability of underreporting among those with histories of MDE by age group and gender based on prior simulation study.<sup>19</sup></li> </ul>														
Smoking initiation	<ul style="list-style-type: none"> <li>• Annual CISNET smoking initiation probabilities by age, gender, and birth-cohort generated using NHIS 1965–2018.<sup>22</sup></li> <li>• Increased probability of initiation among people with current MDE.<sup>21</sup></li> <li>• Calibrated to NSDUH data and assumed constant from 2018–2100.</li> </ul>														
Smoking cessation	<ul style="list-style-type: none"> <li>• Annual CISNET smoking cessation probabilities by age, gender, and birth-cohort generated using NHIS 1965–2018.<sup>22</sup></li> <li>• Lower odds of cessation among smokers with current MDE calibrated to NSDUH data.<sup>21</sup></li> <li>• Calibrated to NSDUH data and assumed constant from 2018–2100.</li> </ul>														
Mortality	<ul style="list-style-type: none"> <li>• All-cause mortality rates by age, birth-cohort, and gender for never smokers, current smokers, and former smokers developed by the CISNET lung consortium, with projections generated using the Lee-Carter approach. Former smoker mortality rates do not distinguish by time since quit.</li> <li>• Increased mortality risk among people with lifetime history of MD calibrated to NSDUH data.<sup>19,21</sup></li> </ul>														
Mental health service utilization	<ul style="list-style-type: none"> <li>• Proportion of adult smokers with MDEs who self-report seeing a health professional for their depression by age group and gender based on pooled 2010–2018 NSDUH data.</li> </ul> <table border="1" data-bbox="548 1864 1344 1900"> <thead> <tr> <th data-bbox="548 1864 678 1900">Age</th> <th data-bbox="678 1864 784 1900">18-25</th> <th data-bbox="784 1864 898 1900">26-34</th> <th data-bbox="898 1864 1011 1900">35-49</th> <th data-bbox="1011 1864 1125 1900">50-64</th> <th data-bbox="1125 1864 1239 1900">65+</th> <th data-bbox="1239 1864 1344 1900">Total</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Age	18-25	26-34	35-49	50-64	65+	Total							
Age	18-25	26-34	35-49	50-64	65+	Total									

		Men	37.5%	44.8%	54.1%	66.1%	59.0%	51.3%
		Women	49.6%	62.3%	70.7%	73.3%	67.6%	65.8%
	<ul style="list-style-type: none"> <li>Assumed constant over time.</li> </ul>							
Integrated cessation treatment	<ul style="list-style-type: none"> <li>Meta-analysis of smoking cessation interventions for smokers with current major depression, with long-term abstinence measured <math>\geq 6</math> months.<sup>10</sup></li> <li>Any treatment (13.7% cessation increase) includes psychological, pharmacological, or combined interventions.</li> <li>Pharmacological treatment (58.8% cessation increase) includes counseling.</li> <li>Relative percentage increases (100%, 150%, 200%) are applied to the underlying calibrated smoking cessation probabilities by age and gender among the proportion of smokers with MDEs using mental health services.</li> </ul>							

MDE, major depressive episode; NSDUH, National Survey on Drug Use and Health; Baltimore-ECA, Baltimore Epidemiological Catchment Area; CISNET, Cancer Intervention and Surveillance Modeling Network; NHIS, National Health Interview Survey.

**Table 2.** Mortality Outcomes Under Intervention Scenarios for U.S. Adults with MDEs, 2020–2100

Mental health service utilization <sup>a</sup>	Integrated cessation treatment <sup>b</sup> (% of MPC)					
	Any Tx	Pharm Tx	100% <sup>b</sup> increase	150% increase	200% increase	MPC <sup>c</sup>
Smoking-attributable deaths avoided, 2020–2100						
Women						
No change from baseline	16,507 (4.1)	63,885 (16.0)	99,527 (25.0)	135,269 (34.0)	164,653 (41.3)	398,333
Increase by 10%	18,142 (4.3)	70,021 (16.6)	108,841 (25.8)	147,559 (35.0)	179,212 (42.5)	422,092
Increase by 20%	19,774 (4.5)	76,114 (17.1)	118,044 (26.6)	159,638 (36.0)	193,449 (43.6)	443,816
100%	24,205 (4.9)	92,331 (18.8)	142,143 (28.9)	190,703 (38.8)	229,480 (46.7)	491,307
Men						
No change from baseline	15,731 (3.6)	61,485 (14.1)	96,548 (22.1)	132,323 (30.3)	162,243 (37.1)	436,981
Increase by 10%	17,294 (3.7)	67,466 (14.5)	105,772 (22.7)	144,705 (31.1)	177,134 (38.1)	465,389
Increase by 20%	18,855 (3.8)	73,418 (14.9)	114,920 (23.4)	156,940 (31.9)	191,795 (39.0)	491,682
100%	28,926 (4.7)	111,075 (18.0)	171,837 (27.8)	231,632 (37.5)	279,756 (45.2)	618,307
Life-years gained, 2020–2100						
Women						
No change from baseline	67,003 (4.0)	260,237 (15.5)	406,602 (24.2)	554,329 (33.0)	676,572 (40.2)	1,682,312
Increase by 10%	73,644 (4.1)	285,322 (16.0)	444,873 (24.9)	605,120 (33.9)	737,048 (41.2)	1,787,406
Increase by 20%	80,275 (4.3)	310,243 (16.5)	482,727 (25.6)	655,112 (34.8)	796,301 (42.3)	1,884,292
100%	98,137 (4.7)	376,097 (18)	581,174 (27.7)	782,857 (37.4)	945,345 (45.1)	2,094,456
Men						
No change from baseline	71,412 (3.5)	280,026 (13.7)	440,882 (21.5)	605,968 (29.6)	744,847 (36.4)	2,047,083
Increase by 10%	78,509 (3.6)	307,338 (14.1)	483,187 (22.1)	663,040 (30.3)	813,788 (37.2)	2,186,660
Increase by 20%	85,601 (3.7)	334,533 (14.4)	525,183 (22.7)	719,501 (31.1)	881,772 (38.1)	2,316,973
100%	132,462 (4.5)	511,034 (17.2)	793,606 (26.7)	1,074,186 (36.1)	1,302,089 (43.8)	2,973,172

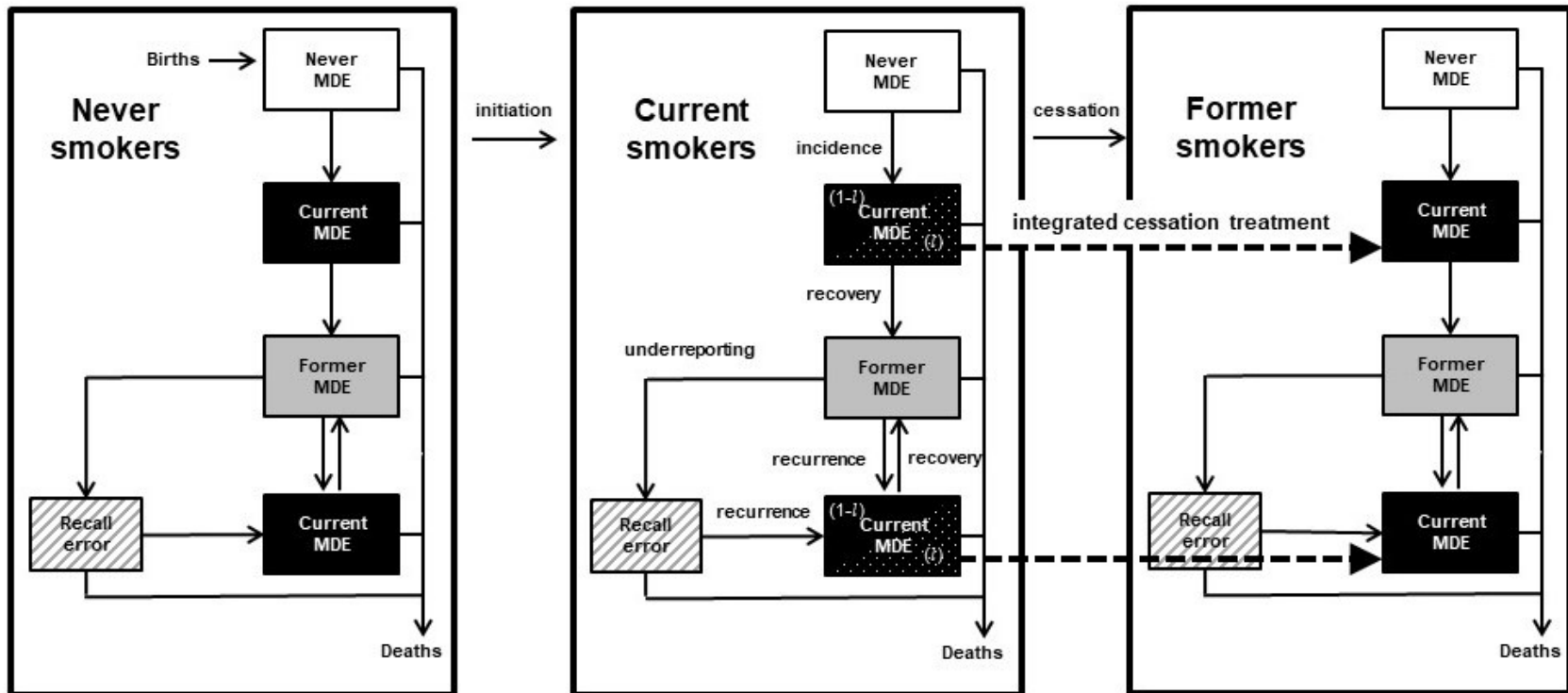
*Notes:* Estimates are for the entire population directly or indirectly affected by the intervention, including people with current MDE, former MDE, and recall error. Breakdown by MDE subgroup can be found in Appendix Tables 4–6.

<sup>a</sup>Baseline levels based on proportion of smokers with current MDEs who report seeing a health professional for their depression in the National Surveys on Drug Use and Health.

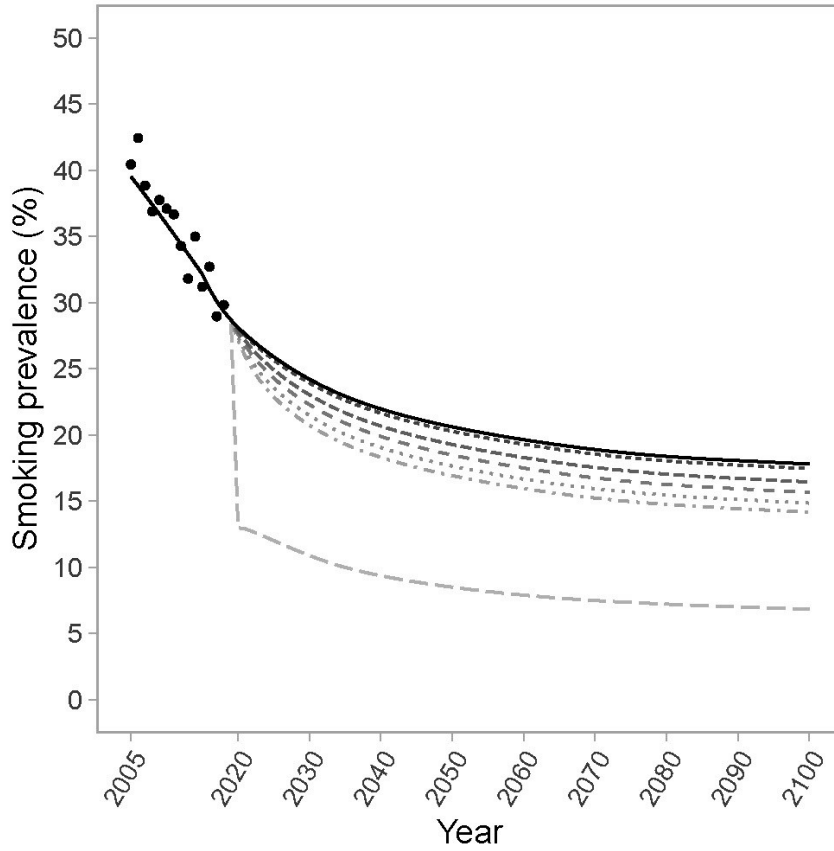
<sup>b</sup>Increased quitting under hypothetical cessation treatment interventions; Any Tx = any type of cessation treatment including behavioral, pharmacological, or a combination (13.7% increase); Pharm Tx = pharmacological cessation treatment (58.8% increase).<sup>10</sup>

<sup>c</sup>MPC = maximum potential cessation scenario which assumes 100% of smokers using mental health services quit starting in 2020.

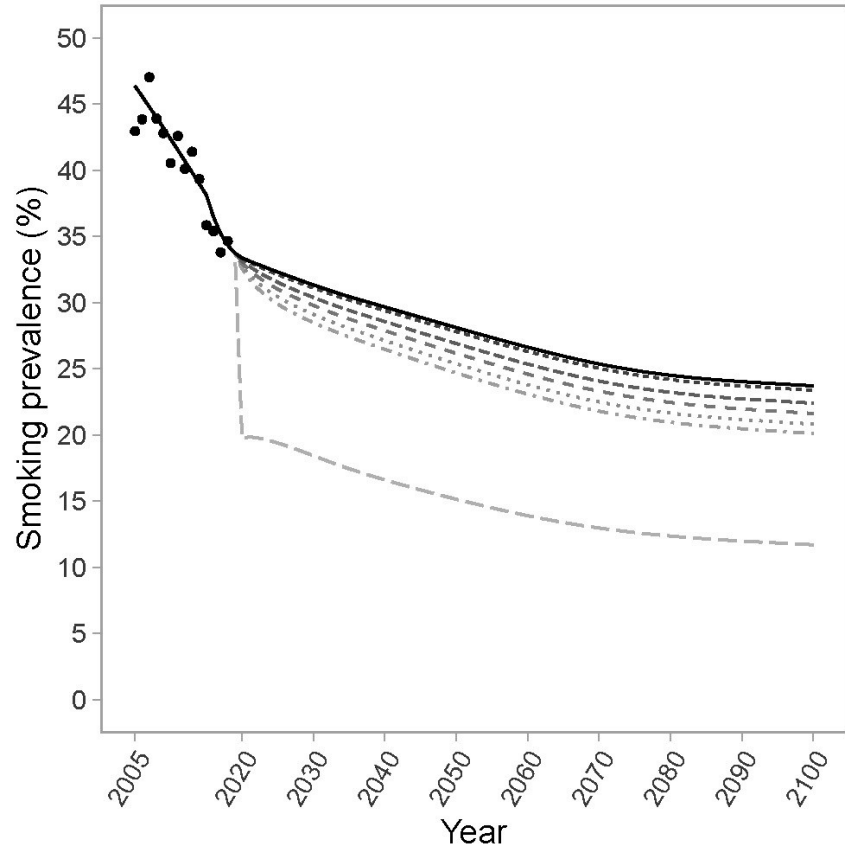
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A) Women with Major Depressive Episodes



B) Men with Major Depressive Episodes



- National Survey on Drug Use and Health
- Baseline
- Pharm Tx
- ..... 150% increase
- - - Maximum Potential Cessation
- ..... Any Tx
- - - 100% increase
- ..... 200% increase

## APPENDIX

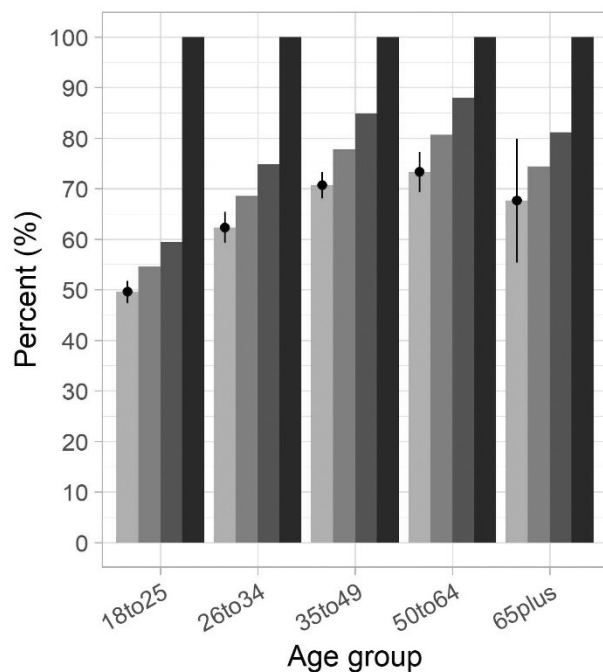
### MENTAL HEALTH SERVICE UTILIZATION

Beginning in 2010, the NSDUH began asking whether adults saw a health professional for their depression, where a health professional includes: a general practitioner or family doctor, other medical doctor, psychologist, psychiatrist or psychotherapist, social worker, counselor, other mental health professional, nurse, occupational therapist, or other health professional. As no visible trends were apparent from 2010–2018, data are pooled across these years for mental health service utilization patterns by age groups. NSDUH finds that 51.3% of men and 65.8% of women smokers with MDEs used mental health services; younger adults were less likely to do so than older adults.

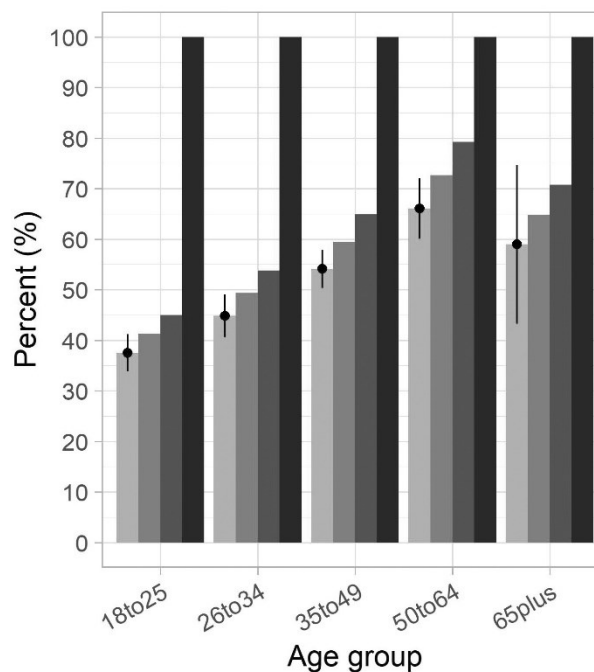
The NSDUH estimates are not identical to the estimates initially supplied to the model in the Baseline scenario. Because of the continuous out-flow of individuals from compartments, the final proportions of smokers seeing health professionals are effectively lower than the initial values supplied to the model. To ensure that the model's rates match those of survey estimates, the set of initial values necessary to accomplish this are re-estimated. The model is re-calibrated to integrate the mental health service utilization parameters by minimizing the sum of squared differences between the model output and NSDUH estimates. Appendix Figure 1 compares the NSDUH data with the model's calibrated final effective proportions in the Baseline scenario. Initial values that translate into 10% and 20% relative increases in the level of mental health service utilization across each age group are similarly estimated.

**Appendix Figure 1.** Mental Health Service Utilization Scenarios Among Smokers with Current MDE.

**A. Women with MDEs**



**B. Men with MDEs**



◆ NSDUH    Baseline    Increase by 10%    Increase by 20%    100%

*Notes:* Black dots represent the percent of smokers with current MDE who report that they saw a health professional for their MDE within the past year in the NSDUH 2010–2018; vertical black lines are their corresponding 95% CIs. Bars represented calibrated model estimates of mental health service utilization among smokers with MDEs by scenario: baseline, relative 10% increase in utilization, relative 20% increase in utilization, and 100% complete utilization scenarios.

NSDUH, National Survey of Drug Use and Health; MDE, major depressive episode.



**Appendix Table 1.** Smoking Prevalence Under Intervention Scenarios for U.S. Adults with Current MDE, 2020–2100

Mental health service utilization <sup>b</sup>	Women with MDEs				Men with MDEs			
	No change from baseline	Increase by 10%	Increase by 20%	100%	No change from baseline	Increase by 10%	Increase by 20%	100%
Integrated cessation treatment <sup>a</sup>								
Any Tx								
2020	28.0	28.0	28.0	28.0	33.3	33.3	33.3	33.3
2040	21.6	21.6	21.6	21.4	29.4	29.4	29.3	29.1
2060	19.3	19.3	19.2	19.1	26.3	26.3	26.2	26.0
2080	18.0	18.0	18.0	17.8	24.2	24.1	24.1	23.8
2100	17.5	17.4	17.4	17.2	23.4	23.3	23.3	23.0
Pharm Tx								
2020	27.8	27.8	27.8	27.7	33.1	33.1	33.1	32.9
2040	20.7	20.5	20.4	19.9	28.6	28.4	28.3	27.3
2060	18.3	18.2	18.0	17.4	25.4	25.2	25.1	24.0
2080	17.0	16.9	16.8	16.2	23.2	23.1	23.0	21.9
2100	16.4	16.3	16.2	15.6	22.4	22.3	22.1	21.0
100% increase								
2020	27.6	27.6	27.5	27.4	33.0	32.9	32.9	32.6
2040	19.9	19.7	19.5	18.6	27.9	27.7	27.5	25.9
2060	17.5	17.3	17.1	16.2	24.6	24.4	24.2	22.4
2080	16.3	16.1	15.9	15.0	22.5	22.3	22.1	20.3
2100	15.7	15.5	15.3	14.4	21.6	21.4	21.2	19.5
150% increase								
2020	27.4	27.3	27.2	27.0	32.8	32.7	32.7	32.2
2040	19.0	18.8	18.5	17.3	27.1	26.9	26.6	24.3
2060	16.7	16.4	16.1	14.8	23.8	23.5	23.2	20.8
2080	15.4	15.2	14.9	13.7	21.7	21.4	21.1	18.8
2100	14.9	14.6	14.3	13.1	20.8	20.5	20.3	17.9
200% increase								
2020	27.1	27.0	26.9	26.6	32.6	32.5	32.4	31.8
2040	18.3	18.0	17.6	16.1	26.5	26.2	25.8	22.9
2060	15.9	15.6	15.3	13.7	23.1	22.7	22.4	19.4
2080	14.8	14.4	14.1	12.6	21.0	20.6	20.3	17.4
2100	14.2	13.8	13.5	12.1	20.1	19.8	19.5	16.6

MPC <sup>c</sup>									
2020	13.0	11.5	10.0	4.5	19.7	18.4	17.1	6.0	
2040	9.4	8.3	7.4	2.3	16.6	15.5	14.4	3.2	
2060	7.9	7.0	6.2	1.8	13.9	12.9	11.9	2.5	
2080	7.2	6.4	5.7	1.7	12.4	11.4	10.5	2.2	
2100	6.8	6.1	5.4	1.6	11.7	10.8	9.9	2.0	

*Notes:* 2020 vs 2100 prevalence under the Baseline scenario: 28.1% vs 17.8% for women and 33.4% vs 23.7% for men with current MDEs. Current smoking = smoking at least 100 cigarettes in lifetime and smoking at all within the past year.

<sup>a</sup>Increased quitting under interventions; Any Tx = any type of cessation treatment (13.7% increase); Pharm Tx = pharmacological cessation treatment (58.8% increase).<sup>1</sup>

<sup>b</sup>Appendix Figure 1.

<sup>c</sup>MPC = Maximum Potential Cessation where 100% of smokers with current MDEs using mental health services quit smoking starting in 2020.

MDE, major depressive episode.

**Appendix Table 2.** Smoking Prevalence Under Intervention Scenarios for U.S. Adults with Former MDE, 2020–2100

Mental health service utilization <sup>b</sup>	Women with MDEs				Men with MDEs			
	No change from baseline	Increase by 10%	Increase by 20%	100%	No change from baseline	Increase by 10%	Increase by 20%	100%
Integrated cessation treatment <sup>a</sup>								
Any Tx								
2020	10.0	10.0	10.0	10.0	13.5	13.5	13.5	13.5
2040	7.3	7.3	7.3	7.2	12.0	12.0	12.0	11.9
2060	6.2	6.2	6.1	6.1	9.8	9.8	9.8	9.7
2080	5.5	5.5	5.5	5.4	8.4	8.4	8.4	8.3
2100	5.2	5.2	5.2	5.1	7.9	7.9	7.9	7.8
Pharm Tx								
2020	10.0	10.0	10.0	10.0	13.5	13.5	13.5	13.5
2040	7.0	7.0	7.0	6.8	11.7	11.7	11.7	11.3
2060	5.9	5.9	5.8	5.7	9.5	9.5	9.5	9.1
2080	5.2	5.2	5.2	5.0	8.2	8.1	8.1	7.8
2100	4.9	4.9	4.9	4.7	7.6	7.6	7.6	7.3
100% increase								
2020	10.0	10.0	10.0	10.0	13.5	13.5	13.5	13.5
2040	6.8	6.8	6.7	6.5	11.5	11.5	11.4	10.9
2060	5.7	5.6	5.6	5.3	9.3	9.2	9.2	8.6
2080	5.0	5.0	4.9	4.7	8.0	7.9	7.9	7.4
2100	4.7	4.7	4.6	4.4	7.4	7.4	7.3	6.9
150% increase								
2020	10.0	10.0	10.0	10.0	13.5	13.5	13.5	13.5
2040	6.6	6.5	6.4	6.1	11.3	11.2	11.1	10.4
2060	5.5	5.4	5.3	4.9	9.1	9.0	8.9	8.2
2080	4.8	4.8	4.7	4.4	7.7	7.7	7.6	6.9
2100	4.5	4.5	4.4	4.1	7.2	7.2	7.1	6.5
200% increase								
2020	10.0	10.0	10.0	10.0	13.5	13.5	13.5	13.5

2040	6.4	6.3	6.2	5.8	11.1	11.0	10.9	10.0
2060	5.3	5.2	5.1	4.6	8.9	8.8	8.7	7.7
2080	4.7	4.6	4.5	4.1	7.6	7.5	7.4	6.6
2100	4.4	4.3	4.2	3.8	7.1	7.0	6.9	6.1
MPC								
2020	10.0	10.0	10.0	10.0	13.5	13.5	13.5	13.5
2040	3.6	3.3	3.0	1.4	7.7	7.3	7.0	3.0
2060	2.9	2.7	2.4	1.1	5.9	5.6	5.3	2.2
2080	2.6	2.3	2.1	1.0	5.0	4.7	4.5	1.8
2100	2.4	2.2	2.0	0.9	4.6	4.4	4.1	1.7

*Notes:* 2020 vs 2100 prevalence under the Baseline scenario: 10.0% vs 5.3% for women and 13.5% vs 8.0% for men with former MDE. Current smoking = smoking at least 100 cigarettes in lifetime and smoking at all within the past year.

<sup>a</sup>Increased quitting under interventions; Any Tx = any type of cessation treatment (13.7% increase); Pharm Tx = pharmacological cessation treatment (58.8% increase).<sup>1</sup>

<sup>b</sup>Appendix Figure 1.

<sup>c</sup>MPC = Maximum Potential Cessation where 100% of smokers with current MDEs using mental health services quit smoking starting in 2020.

MDE, major depressive episode.

**Appendix Table 3.** Smoking Prevalence Under Intervention Scenarios for U.S. Adults with Recall Error, 2020–2100

Mental health service utilization <sup>b</sup>	Women with recall error (former MDE)				Men with recall error (former MDE)			
	No change from baseline	Increase by 10%	Increase by 20%	100%	No change from baseline	Increase by 10%	Increase by 20%	100%
Integrated cessation treatment <sup>a</sup>								
Any Tx								
2020	20.0	20.0	20.0	20.0	23.3	23.3	23.3	23.3
2040	12.4	12.4	12.3	12.3	16.1	16.1	16.0	15.9
2060	10.1	10.1	10.1	10.0	13.6	13.6	13.6	13.5
2080	9.0	8.9	8.9	8.9	11.7	11.7	11.7	11.6
2100	8.6	8.6	8.6	8.5	11.3	11.3	11.3	11.2
Pharm Tx								
2020	20.0	20.0	20.0	20.0	23.3	23.3	23.3	23.3
2040	12.0	11.9	11.9	11.7	15.7	15.7	15.6	15.3
2060	9.7	9.6	9.5	9.3	13.2	13.2	13.1	12.6
2080	8.5	8.4	8.4	8.1	11.3	11.2	11.2	10.7
2100	8.1	8.1	8.0	7.8	10.9	10.8	10.7	10.2
100% increase								
2020	20.0	20.0	20.0	20.0	23.3	23.3	23.3	23.3
2040	11.7	11.6	11.5	11.2	15.4	15.4	15.3	14.7
2060	9.3	9.2	9.1	8.7	12.9	12.8	12.7	11.9
2080	8.1	8.0	7.9	7.5	10.9	10.8	10.8	9.9
2100	7.8	7.7	7.6	7.2	10.5	10.4	10.3	9.5
150% increase								
2020	20.0	20.0	20.0	20.0	23.3	23.3	23.3	23.3
2040	11.3	11.2	11.1	10.6	15.1	15.0	14.9	14.0
2060	8.9	8.8	8.6	8.0	12.5	12.4	12.3	11.1
2080	7.7	7.6	7.5	6.9	10.6	10.4	10.3	9.2
2100	7.4	7.3	7.1	6.6	10.1	10.0	9.9	8.8
200% increase								
2020	20.0	20.0	20.0	20.0	23.3	23.3	23.3	23.3
2040	11.0	10.8	10.7	10.1	14.8	14.7	14.6	13.5
2060	8.6	8.4	8.2	7.5	12.2	12.0	11.9	10.5
2080	7.4	7.3	7.1	6.4	10.2	10.1	9.9	8.6
2100	7.1	6.9	6.8	6.1	9.8	9.6	9.5	8.1

MPC									
2020	20.0	20.0	20.0	20.0	23.3	23.3	23.3	23.3	23.3
2040	6.5	6.0	5.5	3.1	10.2	9.7	9.2	4.2	4.2
2060	4.5	4.0	3.6	1.3	7.7	7.2	6.8	2.1	2.1
2080	3.8	3.4	3.0	1.0	6.2	5.8	5.4	1.6	1.6
2100	3.5	3.2	2.8	0.9	5.9	5.5	5.1	1.5	1.5

*Notes:* 2020 vs 2100 prevalence under the Baseline scenario: 20.0% vs 8.8% for women and 23.3% vs 11.5% for men with recall error. Current smoking = smoking at least 100 cigarettes in lifetime and smoking at all within the past year.

<sup>a</sup>Increased quitting under interventions; Any Tx = any type of cessation treatment (13.7% increase); Pharm Tx = pharmacological cessation treatment (58.8% increase).<sup>1</sup>

<sup>b</sup>Appendix Figure 1.

<sup>c</sup>MPC = Maximum Potential Cessation scenario where 100% of smokers using mental health services quit smoking starting in 2020.

MDE, major depressive episode.

**Appendix Table 4.** Mortality Outcomes Under Intervention Scenarios Among Adults with Current MDE, 2020–2100

Mental health service utilization <sup>a</sup>	Integrated cessation treatment <sup>b</sup> (% of MPC)					MPC <sup>c</sup>
	Any Tx	Pharm Tx	100% <sup>b</sup> increase	150% increase	200% increase	
Smoking-attributable deaths avoided, 2020–2100						
Women with current MDE						
No change from baseline	7,352 (4.4)	28,289 (16.9)	43,872 (26.2)	59,339 (35.4)	71,930 (42.9)	167,595
Increase by 10%	8,079 (4.6)	30,991 (17.5)	47,939 (27.1)	64,658 (36.5)	78,180 (44.2)	177,035
Increase by 20%	8,804 (4.7)	33,671 (18.1)	51,951 (28.0)	69,872 (37.6)	84,272 (45.4)	185,595
100%	10,635 (5.3)	40,256 (20.0)	61,590 (30.6)	82,092 (40.7)	98,232 (48.7)	201,525
Men with current MDE						
No change from baseline	7,799 (3.8)	30,329 (14.8)	47,428 (23.1)	64,707 (31.6)	79,013 (38.6)	204,897
Increase by 10%	8,573 (3.9)	33,270 (15.3)	51,933 (23.9)	70,710 (32.5)	86,184 (39.7)	217,295
Increase by 20%	9,346 (4.1)	36,194 (15.8)	56,396 (24.7)	76,631 (33.5)	93,228 (40.8)	228,613
100%	13,849 (5.2)	52,749 (19.6)	81,045 (30.2)	108,414 (40.4)	130,034 (48.4)	268,481
Life-years gained, 2020- 2100						
Women with current MDE						
No change from baseline	30,133 (4.2)	116,397 (16.3)	181,066 (25.3)	245,710 (34.3)	298,701 (41.7)	715,982
Increase by 10%	33,116 (4.4)	127,559 (16.8)	197,965 (26.1)	267,951 (35.3)	324,987 (42.8)	758,629
Increase by 20%	36,094 (4.5)	138,639 (17.4)	214,655 (26.9)	289,792 (36.3)	350,667 (44.0)	797,683
100%	43,475 (5.0)	165,389 (19.0)	254,070 (29.2)	340,122 (39.1)	408,540 (47.0)	868,994
Men with current MDE						
No change from baseline	35,140 (3.7)	137,053 (14.6)	214,813 (22.9)	293,794 (31.3)	359,525 (38.3)	939,850
Increase by 10%	38,630 (3.9)	150,374 (15.0)	235,307 (23.5)	321,229 (32.1)	392,430 (39.2)	999,927
Increase by 20%	42,116 (4.0)	163,630 (15.5)	255,628 (24.2)	348,325 (33.0)	424,809 (40.3)	1,055,335
100%	62,914 (5.0)	240,635 (19.1)	370,986 (29.4)	498,106 (39.5)	599,371 (47.5)	1,260,887

<sup>a</sup>Baseline levels based on the proportion of smokers with current MDEs who report seeing a health professional for their depression in the National Surveys on Drug Use and Health.

<sup>b</sup>Increased quitting under hypothetical cessation treatment interventions; Any Tx = any type of cessation treatment including behavioral, pharmacological, or a combination (13.7% increase); Pharm Tx = pharmacological cessation treatment (58.8% increase).<sup>1</sup>

<sup>c</sup>MPC = Maximum Potential Cessation scenario which assumes 100% of smokers receiving mental health services quit starting in 2020.

MDE, major depressive episode.

**Appendix Table 5.** Mortality Outcomes Under Intervention Scenarios Among Adults with Former MDE, 2020–2100

Mental health service utilization <sup>a</sup>	Integrated cessation treatment <sup>b</sup> (% of MPC)					MPC <sup>c</sup>
	Any Tx	Pharm Tx	100% <sup>b</sup> increase	150% increase	200% increase	
Smoking-attributable deaths avoided, 2020–2100						
Women with former MDE						
No change from baseline	2,468 (4.0)	9,603 (15.5)	15,023 (24.3)	20,505 (33.1)	25,046 (40.4)	61,950
Increase by 10%	2,713 (4.1)	10,531 (16.0)	16,443 (25.0)	22,394 (34.0)	27,300 (41.5)	65,798
Increase by 20%	2,957 (4.3)	11,454 (16.5)	17,849 (25.7)	24,256 (35.0)	29,512 (42.6)	69,334
100%	3,638 (4.8)	13,970 (18.3)	21,615 (28.3)	29,143 (38.1)	35,208 (46.1)	76,427
Men with former MDE						
No change from baseline	3,132 (3.5)	12,313 (13.7)	19,421 (21.6)	26,742 (29.8)	32,918 (36.6)	89,876
Increase by 10%	3,444 (3.6)	13,517 (14.1)	21,293 (22.2)	29,276 (30.5)	35,988 (37.4)	96,102
Increase by 20%	3,755 (3.7)	14,717 (14.4)	23,153 (22.7)	31,786 (31.2)	39,021 (38.3)	101,924
100%	5,933 (4.5)	22,964 (17.5)	35,748 (27.2)	48,498 (36.9)	58,889 (44.8)	131,306
Life-years gained, 2020–2100						
Women with former MDE						
No change from baseline	10,936 (3.9)	42,682 (15.0)	66,934 (23.6)	91,590 (32.3)	112,127 (39.5)	283,898
Increase by 10%	12,022 (4.0)	46,819 (15.5)	73,290 (24.3)	100,087 (33.1)	122,304 (40.5)	302,200
Increase by 20%	13,106 (4.1)	50,933 (16.0)	79,586 (24.9)	108,468 (34.0)	132,303 (41.5)	319,129
100%	16,103 (4.6)	62,072 (17.6)	96,334 (27.3)	130,314 (36.9)	157,886 (44.7)	352,916
Men with former MDE						
No change from baseline	15,206 (3.4)	59,923 (13.4)	94,711 (21.2)	130,697 (29.2)	161,190 (36.0)	447,427
Increase by 10%	16,719 (3.5)	65,795 (13.7)	103,867 (21.7)	143,137 (29.9)	176,312 (36.8)	479,362
Increase by 20%	18,231 (3.6)	71,645 (14.1)	112,969 (22.2)	155,470 (30.5)	191,262 (37.5)	509,388
100%	28,986 (4.4)	112,586 (16.9)	175,762 (26.4)	239,185 (35.9)	291,221 (43.7)	665,952

<sup>a</sup>Baseline levels based on the proportion of smokers with current MDEs who report seeing a health professional for their depression in the National Surveys on Drug Use and Health.

<sup>b</sup>Increased quitting under hypothetical cessation treatment interventions; Any Tx = any type of cessation treatment including behavioral, pharmacological, or a combination (13.7% increase); Pharm Tx = pharmacological cessation treatment (58.8% increase).<sup>1</sup>

<sup>c</sup>MPC = Maximum Potential Cessation scenario which assumes 100% of smokers receiving mental health services quit starting in 2020.

MDE, major depressive episode.



**Appendix Table 6.** Mortality Outcomes Under Intervention Scenarios for Adults with Recall Error, 2020–2100

Mental health service utilization <sup>a</sup>	Integrated cessation treatment <sup>b</sup> (% of MPC)					MPC <sup>c</sup>
	Any Tx	Pharm Tx	100% <sup>b</sup> increase	150% increase	200% increase	
Smoking-attributable deaths avoided, 2020–2100						
Women with recall error						
No change from baseline	2,468 (4)	9,603 (15.5)	15,023 (24.3)	20,505 (33.1)	25,046 (40.4)	61,950
Increase by 10%	2,713 (4.1)	10,531 (16)	16,443 (25)	22,394 (34)	27,300 (41.5)	65,798
Increase by 20%	2,957 (4.3)	11,454 (16.5)	17,849 (25.7)	24,256 (35)	29,512 (42.6)	69,334
100%	3,638 (4.8)	13,970 (18.3)	21,615 (28.3)	29,143 (38.1)	35,208 (46.1)	76,427
Men with recall error						
No change from baseline	3,132 (3.5)	12,313 (13.7)	19,421 (21.6)	26,742 (29.8)	32,918 (36.6)	89,876
Increase by 10%	3,444 (3.6)	13,517 (14.1)	21,293 (22.2)	29,276 (30.5)	35,988 (37.4)	96,102
Increase by 20%	3,755 (3.7)	14,717 (14.4)	23,153 (22.7)	31,786 (31.2)	39,021 (38.3)	101,924
100%	5,933 (4.5)	22,964 (17.5)	35,748 (27.2)	48,498 (36.9)	58,889 (44.8)	131,306
Life-years gained, 2020–2100						
Women with recall error						
No change from baseline	10,936 (3.9)	42,682 (15)	66,934 (23.6)	91,590 (32.3)	112,127 (39.5)	283,898
Increase by 10%	12,022 (4)	46,819 (15.5)	73,290 (24.3)	100,087 (33.1)	122,304 (40.5)	302,200
Increase by 20%	13,106 (4.1)	50,933 (16)	79,586 (24.9)	108,468 (34)	132,303 (41.5)	319,129
100%	16,103 (4.6)	62,072 (17.6)	96,334 (27.3)	130,314 (36.9)	157,886 (44.7)	352,916
Men with recall error						
No change from baseline	15,206 (3.4)	59,923 (13.4)	94,711 (21.2)	130,697 (29.2)	161,190 (36)	447,427
Increase by 10%	16,719 (3.5)	65,795 (13.7)	103,867 (21.7)	143,137 (29.9)	176,312 (36.8)	479,362
Increase by 20%	18,231 (3.6)	71,645 (14.1)	112,969 (22.2)	155,470 (30.5)	191,262 (37.5)	509,388
100%	28,986 (4.4)	112,586 (16.9)	175,762 (26.4)	239,185 (35.9)	291,221 (43.7)	665,952

<sup>a</sup>Baseline levels based on the proportion of smokers with current MDEs who report seeing a health professional for their depression in the National Surveys on Drug Use and Health.

<sup>b</sup>Increased quitting under hypothetical cessation treatment interventions; Any Tx = any type of cessation treatment including behavioral, pharmacological, or a combination (13.7% increase); Pharm Tx = pharmacological cessation treatment (58.8% increase).<sup>1</sup>

<sup>c</sup>MPC = Maximum Potential Cessation scenario which assumes 100% of smokers receiving mental health services quit starting in 2020.

MDE, major depressive episode.

## APPENDIX REFERENCES

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