

Consequences of a match made in hell: the harm caused by menthol smoking to the African American population over 1980–2018

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ABSTRACT

Background For many years, national surveys have shown a consistently disproportionately high prevalence of menthol smokers among African Americans compared with the general population. However, to our knowledge, no prior study has quantified the harm that menthol smoking has caused on that population. In this work, we estimate the public health harm that menthol cigarettes have caused to the African American community over the last four decades.

Methods Using National Health Interview Survey data, we employed a well-established simulation model to reproduce the observed smoking trajectory over 1980–2018 in the African American population. Then, we repeat the experiment, removing the effects of menthol on the smoking initiation and cessation rates over that period, obtaining a new hypothetical smoking trajectory. Finally, we compared both scenarios to calculate the public health harm attributable to menthol cigarettes over 1980–2018.

Results Our results show that menthol cigarettes were responsible for 1.5 million new smokers, 157 000 smoking-related premature deaths and 1.5 million life-years lost among African Americans over 1980–2018. While African Americans constitute 12% of the total US population, these figures represent, respectively, a staggering 15%, 41% and 50% of the total menthol-related harm.

Discussion Our results show that menthol cigarettes disproportionately harmed African Americans significantly over the last 38 years and are responsible for exacerbating health disparities among that population. Removing menthol cigarettes from the market would benefit the overall US population but, particularly, the African American community.

BACKGROUND

For over 60 years, tobacco companies have targeted menthol cigarettes to the African American community through aggressive marketing and promotion.^{1–3} It is well known that a disproportionately high number of African Americans smoke menthol cigarettes. According to the 2018 National Survey on Drug Use and Health, 85% of African American smokers used menthol versus 39% of those in the general population. This is not a recent phenomenon. In 1980, for example, menthol prevalence among African American smokers was 66% vs 33% among the general population, according to the National Health Interview Survey (NHIS).

Several articles⁴ have addressed the prospective harm to the black community that could be

avoided if menthol cigarettes were banned from the market; and while other studies^{3 5–9} have addressed the historical causes that have made menthol the preferred choice of cigarette products among African Americans, to our knowledge, no prior study has quantified the health harm that menthol smoking has already inflicted on that population.

Following a recent study¹⁰ that calculated the health damage caused by menthol smoking on the entire US population over 1980–2018, the current work estimates the share of such harm borne by the African American community, and its disproportion compared with the total menthol toll in the USA. Our results may be helpful to the Food and Drug Administration as they continue evaluating the benefit of a menthol ban.

METHODS

We used the same simulation model and calibration process as in the Le-Mendez article¹⁰ with parameters specific to the African American population. The model formulation, definition of model parameters and how some parameters were calculated were thoroughly described in Le-Mendez's work.¹⁰ The African American-specific parameters were taken from several data sources described below and summarised in online supplemental table A1.

For our initial year (1980), we obtained the African American population by single year of age from the Centers for Disease Control and Prevention.¹¹ For subsequent years, we got the African American birth cohorts from 1981 through 2018 from the National Vital Statistics Reports.^{12 13} The overall age-specific death rates for the African American population, updated every 5 years, were extracted from the 1980–2018 US Life Tables.¹⁴ We used relative risks of mortality specific to the African American population, derived from Cancer Prevention Study II (CPS-II data; Relative risks for African American current and former smokers were derived from CPS-II data and provided by Dr Michael Thun from the American Cancer Society for the 2011 Tobacco Products Scientific Advisory Committee (TPSAC) Menthol Report. Available in online supplemental table A5) to calculate the death rates by age for never, current and former smokers following the same procedure described in Le-Mendez's article.¹⁰ Smoking prevalence for current and former smokers and the proportion of menthol use among smokers in 1980 were estimated using NHIS data. We calculated the overall smoking cessation rates for African Americans by adjusting the general population's overall smoking cessation rates presented in Le-Mendez's work¹⁰ with the ratio of cessation



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rates between the African American and general populations (0.66) reported in ref 15. Then, using the menthol cessation multiplier for African Americans estimated by Mills *et al*¹⁶ (0.47, 95% CI 0.24 to 0.91) and the proportion of menthol smokers among current African American smokers, we applied the same process used in ref 10 to compute the cessation rates for African American non-menthol and menthol smokers. The specific formulation and cessation values for 1980 are shown in the Supplement to ref 10 and online supplemental tables A2 and A3.

The annual adult smoking initiation rates for African Americans were computed by taking the average NHIS smoking prevalence among 18–24 year-olds, consistent with ref 10. The switching rates between menthol and non-menthol smokers were calculated as in the 2011 menthol report¹⁷ (2.29% switching to menthol and 1.08% to non-menthol cigarettes). An extensive sensitivity analysis (see online supplemental table A4) showed that these parameters exert little influence on the results. The ratio of yields from experimenter to smoker^{18 19} and menthol mortality multiplier for the African American population remains as in the Le-Mendez work,¹⁰ following their same arguments.

As in ref 10, we first used NHIS smoking prevalence data over 1980–2018 (when the NHIS survey was conducted) to calibrate the model. Then, we used the calibrated model to replicate African Americans' smoking prevalence trajectory during 1980–2018. Finally, to quantify the harmful effect of menthol use on the African American population, we repeated the previous step to generate an alternative smoking trajectory for African Americans during the same period, eliminating the effect of menthol since 1980. We achieved this by adjusting the smoking initiation and cessation rates to eliminate the effect of menthol on those parameters (see the Appendices to the 2011 TPSAC Menthol Report¹⁷ and the Le-Mendez paper¹⁰). Finally, we compared our results from both scenarios (with and without menthol cigarettes) to calculate the impact of menthol on smoking prevalence, life-years lost and smoking-related premature deaths. Additionally, we compared our results with those for the general population reported in Le-Mendez's work¹⁰ and calculated the disproportionate harm inflicted on the African American population due to menthol.

RESULTS

The simulated smoking prevalence for African Americans closely captures the NHIS reported smoking prevalence over 1980–2018 with pseudo- $R^2=0.95$ (pseudo- $R^2=1-[\text{Errors Sum of Squares}]/[\text{Total Sum of Squares}]$) (see online supplemental figure A1 and A2). Table 1 shows the harm attributable to menthol cigarettes for the general population (from Le-Mendez's work¹⁰), the African American population and the hypothetical low-menthol African American population. A complete sensitivity analysis on the values in table 1 is presented in online supplemental table A4.

The values in the first three columns of the table are self-explanatory; the numbers within parentheses show the percentages that those values represent, relative to those for the general population. The last column shows the average proportion

(over 1980–2018) of the corresponding population referred to on each row, relative to the entire US population. For example, the table shows that, among African Americans, menthol was responsible for 1.5 million extra smokers, 157 000 smoking-related premature deaths and 1.5 million excess life-years lost during 1980–2018, representing 15%, 41% and 50% of the total menthol toll, respectively. However, during the same period, African Americans constituted only around 12% of the overall US population.

The last row of the table shows a hypothetical African American population that exhibits the same menthol smoking-related parameters as the general population. We simulated this scenario by setting the values of menthol-affected parameters for the African American population to those of the general population. In this hypothetical group, the estimated menthol smoking excess initiation, premature deaths and life-years lost would have represented 13%, 16% and 21% of the overall menthol harm, respectively; much more in agreement with the proportional (relative to the entire US) size of this population (12%). It is worth noting, though, that the menthol death toll in the low-menthol population is still above its proportional share. This is due to the mortality rates among African American smokers, which are higher than in the general population.

DISCUSSION

Since the 1960s, the tobacco industry has targeted the African American community for the consumption of menthol cigarettes through aggressive marketing, including intense advertising and price discounts. Simultaneously, the industry supported numerous African American organisations to gain the trust of the African American community. Several publications^{3 9} describe the marketing efforts by the tobacco industry to establish a special connection between menthol cigarettes and the African American community. In a fascinating article entitled 'The African Americanization of menthol cigarette use in the United States',³ Gardiner recounts the long history of, and explains the facts behind, the relationship between African Americans and menthol cigarettes, and how those products became an integral part of the African American culture. In essence, the identification of African American smokers with menthol has been purposely orchestrated by the tobacco industry following their goal of maximising their profits.

Unfortunately, this marketing strategy turned out to be a huge success for the tobacco industry, but deadly for the black community. Besides creating a brand with which African Americans could identify and call their own, the industry exposed this population to a substance that amplifies the damaging effects of cigarette smoking. Menthol intensifies this harm by increasing the chances that individuals transition from experimentation to regular smoking,^{18 19} and by increasing dependency, which leads to delayed cessation.¹⁶ These effects increase the number of smokers and the amount of time they remain smoking.

Table 1 Excess smoking initiation, smoking-related deaths and life-years lost due to menthol cigarettes over 1980–2018 for the adult general, African American and hypothetical low-menthol African American population

	Cumulative excess smoking initiators (%)	Cumulative excess deaths (%)	Cumulative excess life-years lost (%)	Average percentage of population (%)
General population	10 137 808 (100)	377 528 (100)	2 951 533 (100)	100
African American population	1 508 913 (15)	156 471 (41)	1 476 198 (50)	12
Hypothetical low-menthol African American population	1 286 848 (13)	61 132 (16)	606 840 (21)	12

The negative impact of menthol cigarettes on the public's health is significant, as Le and Mendez described in ref 10. For African American smokers, though, the harm wrought by menthol smoking is much higher than that for the rest of the population. Despite having a similar overall smoking prevalence as the general population,²⁰ it is well known that African Americans suffer, proportionally or disproportionately, more serious smoking-attributable health consequences.²¹ Main probable causes for this phenomenon are the high overall mortality rates due to economic and social conditions and the high prevalence of menthol among African American smokers, which causes them to be more addicted and quit less. In fact, our results show that menthol was responsible for 157 000 smoking-related deaths among African Americans during 1980–2018, over two and a half times their proportional share of menthol deaths compared with the general population. And, what is even more depressing, 50% of all the life-years lost to menthol smoking during 1980–2018 occurred among African Americans. Additionally, our results (shown in online supplemental figure A1) also indicate that, without menthol, smoking prevalence among African Americans in 2018 would have been 8.3%, instead of the NHIS reported 14.9% (a 44% reduction). We note that our results may be considered conservative, since we do not take into account the future harm that menthol smoking over 1980–2018 will cause to the African American population.

Considering that cigarette smoking is the number one cause of preventable deaths in the USA, menthol in cigarettes is an important factor in creating and exacerbating health disparities in this country. Removing menthol cigarettes from the market will save thousands of African American lives per year and help reduce health disparities at a time when inequalities among minority and socioeconomically disadvantaged groups are increasingly salient.

What this paper adds

- ⇒ Menthol cigarettes have been disproportionately used among African Americans.
- ⇒ Menthol cigarettes exacerbate health inequalities for the African American community.
- ⇒ Removing menthol can have the double effects of saving lives and reducing inequalities.

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Contributors DM and TTTL conceptualised the project. TTTL calibrated the model and conducted all the analysis. DM supervised the work. Both authors contributed to the writing of the manuscript.

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**APPENDIX TO “THE CONSEQUENCES OF A MATCH MADE IN HELL:
THE HARM CAUSED BY MENTHOL SMOKING TO THE
AFRICAN AMERICAN POPULATION OVER 1980-2018”**

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Parameters	Min	Baseline	Max
Ratio of Yields from Experimenter to Smoker	1.02	1.8	3.16
Menthol Cessation Multiplier	0.24	0.47	0.91
Menthol Mortality Multiplier	0.8	1	1.2
Switch Rate from Menthol to Non-menthol	0.0081	0.0108	0.0135
Switch Rate from Non- menthol to Menthol	0.0171	0.0229	0.0286

Table A1: African Americans’ menthol specific parameters with their 95% confidence intervals (CIs) or $\pm 25\%$ of the parameters’ baseline values (for cases without reported CIs). Refer to [1] for a description of the Table. These values were used to perform the sensitivity analysis presented in Table A4.

	Overall Cessation Rates in 1980	
Age	General Population	African American Population
19-30	0.00209	0.00138
31-49	0.02147	0.01422
50+	0.05958	0.03945

Table A2: Overall cessation rates in 1980 for the general and African American populations. The cessation rates for African Americans were calculated by multiplying the overall cessation rates for the general population from [2] with the cessation ratio between the general and African American populations [3].

	Cessation rates	
Age	Non-menthol smokers	Menthol smokers
19	0.002772	0.001303
20-24	0.002641	0.001241
25-29	0.002547	0.001197
30	0.002282	0.001072
31-34	0.023439	0.011016
35-39	0.022525	0.010587
40-44	0.018814	0.008843
45-49	0.018684	0.008781
50-54	0.051365	0.024142
55-59	0.049663	0.023341
60-64	0.048492	0.022791
65-69	0.055294	0.025988
70-74	0.056493	0.026552
75+	0.039452	0.018542

Table A3: Non-menthol and menthol cessation rates in 1980 for the African American population which obtained by using Table A2 and the procedure described in [1].

Scenarios	Cumulative Excess Smoking Initiators	Cumulative Excess Deaths	Cumulative Excess Life Years Lost
1- Baseline Values	1,508,913 (100%)	156,471 (100%)	1,476,198 (100%)
2- Low Yield from Experimenter to Smoker (1.02)	57,776 (4%)	130,653 (83%)	1,297,598 (88%)
3- High Yield from Experimenter to Smoker (3.16)	2,547,500 (169%)	174,949 (112%)	1,604,025 (109%)
4- Low Menthol Cessation (0.34)	1,508,913 (100%)	248,005 (158%)	2,391,798 (162%)
5- High Menthol Cessation (0.99)	1,508,913 (100%)	45,676 (29%)	365,371 (25%)
6- Low Menthol Mortality Risk (0.8)	1,508,913 (100%)	-111,063 (-71%)	-2,696,493 (-183%)
7- High Menthol Mortality Risk (1.2)	1,508,913 (100%)	368,541 (236%)	4,819,130 (326%)
8- Low Switch Rate Menthol to Non-menthol (0.81%)	1,508,913 (100%)	160,777 (103%)	1,509,450 (102%)
9- High Switch Rate Menthol to Non-menthol (1.35%)	1,508,913 (100%)	152,369 (97%)	1,444,219 (98%)
10- Low Switch Rate Non-menthol to Menthol (1.71%)	1,508,913 (100%)	152,040 (97%)	1,436,741 (97%)
11- High Switch Rate Non-menthol to Menthol (2.86%)	1,508,913 (100%)	160,561 (103%)	1,513,064 (102%)

Table A4: Estimates of cumulative excess smoking initiation, smoking-related premature deaths and life-years lost due to menthol cigarettes over 1980-2018 for the Black American population.

Age	Relative Risk Former	Relative Risk Current
0-34	1	1
35-39	1.447	2.083
40-44	1.447	2.081
45-49	1.447	2.080
50-54	1.447	2.077
55-59	1.447	2.079
60-69	1.447	2.359
70-74	1.277	1.824
75-79	1.187	1.583
80-84	1.185	1.576
85+	1.182	1.561

Table A5: Relative risks for African American smokers (derived from CPS II data and provided by Dr. Michael Thun, from the American Cancer Society for the 2011 TPSAC Menthol Report.)

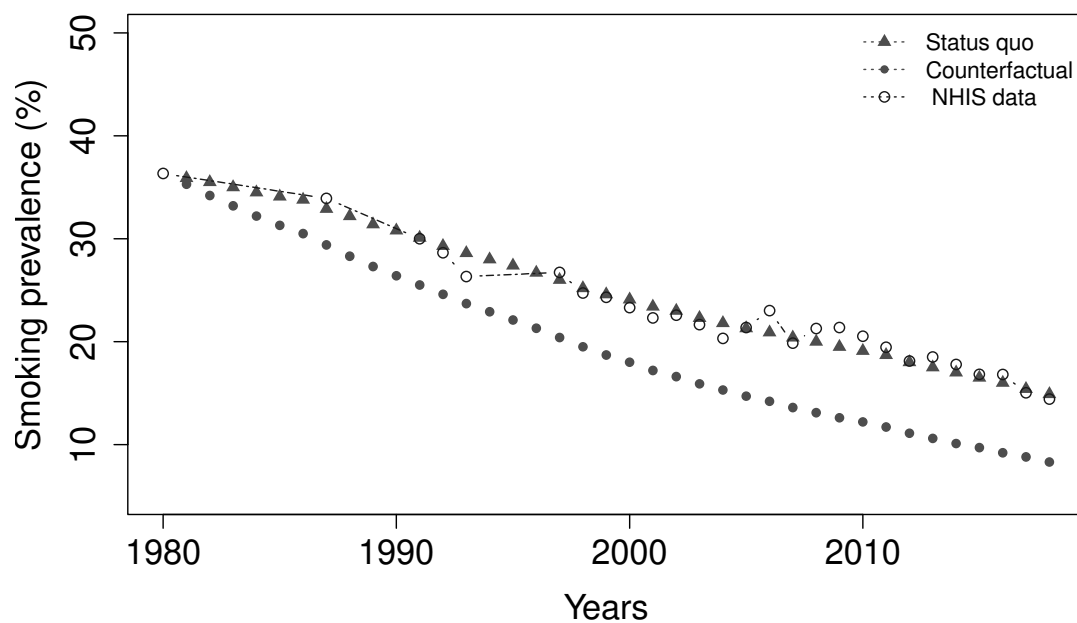


Figure A1: Simulated smoking prevalence under status quo ante and counterfactual scenarios and reported NHIS smoking prevalence over 1980–2018.

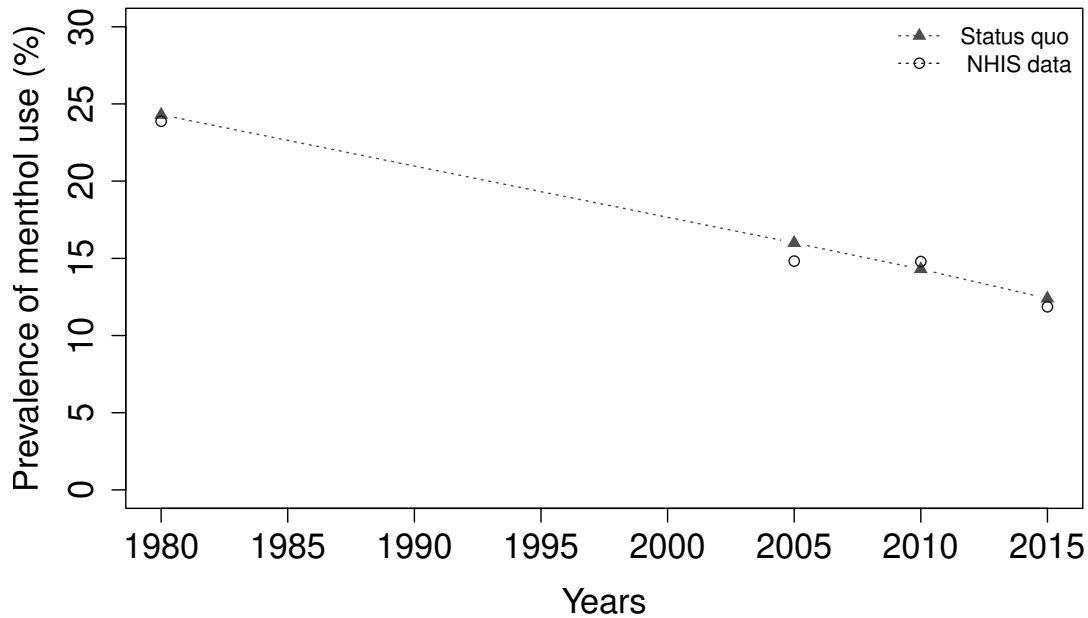


Figure A2: Simulated prevalence of menthol smoking under status quo ante and reported NHIS prevalence of menthol use over 1980–2018.

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