(Bryce Hannibal): Thanks for joining us today. I hope everybody's having a great day so far.

Today we are pleased to hear from Joseph Lariscy. Before I turn this over to him, I do want to state that you can - our participants can enter questions into the chat section. And if you decide to do that, please select all panelists.

Also, as this is going forward, you know, I'd like to just remind everyone that if you are interested in presenting some of your RDC research, feel free to reach out to me and we'd be more than happy to get that set up. So today, as I said, Joseph Lariscy will present to us his - his talk is titled Cigarette Smoking and All-Cause and Cause-Specific Adult Mortality in the United States.

Joseph is an Associate Professor of Sociology at the University of Memphis. And his research focuses on racial, ethnic, and geographic disparities in mortality among United States adults. So without any further ado, Joseph the time is yours.

Joseph Lariscy: Great. Thanks, Bryce. So today's talk is over cigarette smoking and cause-specific mortality in the United States. For starting the talk I do want to acknowledge two co-authors. So this talk is based off of a paper. My co-authors on that paper, are Bob Hummer from the University of North Carolina, and Rick Rogers from the University of Colorado.
And then this work has been supported by center grants to the University of North Carolina and the University of Colorado. And also - this was also supported by a training grant when I was a Post Doc at the Duke Population Research Institute. Also, other acknowledgements are, this work was completed in a - in Federal Statistical Research Data Centers. So specifically, I completed this work in the Triangle RDC in Durham, North Carolina, and in the Missouri RDIC in Columbia, Missouri.

And an important disclaimer is that the findings are those of the authors and do not reflect the views of the US Census Bureau or the National Center for Health Statistics. Okay. So the objective of my current study is to examine specific causes of death that are attributable to smoking. So cigarette smoking is of critical importance to population health researchers, because smoking is the leading preventable cause of death in the United States.

So for at least 80 years researchers have recognized the elevated risk of death that's associated with cigarette smoking. (Raymond Pearl) published a prominent article in Science back in 1938, where he highlighted significant impairment of survivorship among smokers. And then his work led to additional work that was published in medical journals through the 1950s and 1960s that identified cases of lung cancer among smokers.

And then that research culminated in the first Surgeon General's report on smoking and mortality in 1964. And that report stated that lung cancer and bronchitis are causally linked to smoking. And there have been subsequent Surgeon General reports that expanded that list of causes of death to include cancers in other organs, heart diseases, and other respiratory diseases.

So the Surgeon General's report and other research, have led to substantial reductions in smoking and smoking-related mortality. However, about 50
years after that first report, smoking is still the leading cause of premature death in the United States. And despite decades of research, there is still some uncertainty regarding the actual number and percentage of deaths that are due to smoking.

And then there's also uncertainty about what are the causes of death that are caused by smoking? So in thinking about which causes of death or causally linked to smoking, the Surgeon General reports have developed these four different levels for inferring causality from the available evidence. So there's this group one - so for this group the evidence is sufficient to infer a causal relationship.

So these causes include cancers of the lung, the larynx, esophagus, cancers of the other organs, chronic obstructive pulmonary diseases like emphysema, some heart diseases, stroke, and other causes of death. So then there's the second group. So for the second group, the evidence is suggestive, but not considered sufficient to infer a causal relationship, so that means that some studies have found a statistical relationship between smoking and these causes of death.

And there seems to be a biologically plausible pathway by which the carcinogens and the other toxic substances in cigarette smoke, can harm those parts of the body. So the Surgeon General's office has just said the evidence isn't quite yet sufficient to conclude that these causes of death are causally linked to smoking.

And then there are groups three and four. Group three says the evidence is inadequate. There's just not much research on those causes of death. And then calls for - there's some research saying there's no link between smoking to these causes of death. So in my talk today I'll really focus on these first two
classes. So Category 1 I'll call the established causes, and Category 2 I'll call additional causes.

So some of the best evidence that's come out regarding these additional causes, are published by (Carter) and colleagues in 2015 in an article in the New England Journal of Medicine. So they examined the 21 established causes, the Class 1 causes that are recognized by the Surgeon General as attributable to smoking.

But then they also examined 14 additional causes. And they found statistically higher risk of death among smokers, compared with nonsmokers for those 14 additional causes. So this paper was really important and really influential, but they didn't have a couple of key issues. So the data they were using was not nationally representative.

So they use The Cancer Prevention Study 2, and then four other cohort studies to produce a data set that was big, was large enough for them to examine some of these rare causes of death. Other data contained a really low percentage of racial and ethnic minority members. And it also had a very high percent of highly educated individuals.

So this reason why it wasn't really representative of the US population. Also, they weren't able to control for some key confounders. So they did control for some variables, but they didn't control for body mass index or health insurance. And some health behaviors clustered together so that the effects of smoking on mortality risk, really must be observed net of diet and physical activity and some other covariates that are related to smoking and to mortality.

And then also Carter colleagues took more of a medical approach. And they were really focused on the biological pathways of how carcinogens and other
toxic substances actually reach and damage parts of the body. Whereas for me as a demographer, I'm really interested in taking a more population health approach that I think will shed light on how smoking affects mortality.

So the two main approaches that researchers use in studying smoking-related mortality - so one approach - it really has kind of two different variants, involves indirect approaches. So indirect approaches rely on lung cancer death rates as a proxy to measure accumulated damage of smoking. And lung cancer death rates are really a valid proxy for measuring smoking-related mortality because lung cancer is - because nearly all lung cancer deaths are due to smoking, and lung cancer deaths are pretty rare among never-smokers.

And so the association between the lung cancer death rate and death rates from other causes, are used to produce estimates of smoking-attributable mortality. So the indirect approach works great when you have information on causes of death, but maybe you don't have individual reports of smoking.

And there are some issues with this indirect approach. So they're really - the indirect approaches are - have tremendous scientific and policy relevance. But the indirect approaches don't perform very well at the youngest ages or the oldest ages. So they have issues at younger ages because there's a time lag between when smokers actually establish their smoking habits and when smoking manifests in psychological damage.

So the indirect approach really works well from ages 50 forward. But then the indirect methods have issues at older ages, because a lot of older adults are suffering from multiple comorbid conditions. And so alternatively, direct methods can be used. So with direct method, this approach measures smoking status in surveys. And then those survey respondents are followed up over
time, leads to death certificates, to see whether smokers have a higher risk of
death during follow up, compared to nonsmokers.

And ideally, such survey data would cover the full range of adult ages and can
be generalized to the US population. And so this direct approach allows
researchers also to examine heterogeneity among smokers. So it seems to be
the case that heavy smokers tend to have a higher risk of death because of
kind of a dose-response relationship.

So high smoking leads to higher risk of death; lower smoking can increase
death but by not quite as much. And then also smoking cessation tends to
confer some survival advantages, so that former smokers - especially former
smokers who quit smoking in early adulthood versus those who quit more
recently, may not have as much of a kind of advantage in terms of their
survival.

And so today there have been some previous studies who have used the direct
approach. But generally, they've done so with all causes combined or just a
few causes that are most closely linked to smoking, such as lung cancer and
respiratory diseases. Or they use kind of crude cause of death categories, not
really examining very specific causes of death.

So with my project, I'm using the direct approach, and I'm drawing on data
that is a really large data set and is detailed enough to allow me to examine
smoking-related mortality from very specific causes of death that fall into that
established cause category, but then also the additional cause category.

So my specific aims are that first, I want to estimate relative risk ratios among
current smokers and former smokers, both at the never-smokers, for causes
that have been established by the Surgeon General as being related to
smoking, as well as the additional causes where the evidence is suggestive but not sufficient to say there's a causal relationship.

And so I use a high quality data set that's nationally representative of the US adult population. And I also controlled for a lot of demographic and behavioral confounders of the smoking mortality relationship. Second, I disaggregate smokers by smoking intensity. And I disaggregate former smokers by how long since they quit smoking and then compare their mortality risk with that of never-smokers.

And the third, I produced some new estimates of the number and the percentage of US adult deaths that are attributable to smoking. And I incorporate both causes that are established as being related to smoking and then the additional causes where the evidence is suggestive but not sufficient. So the methods for this project - so I use a restricted-use special request file of that 1990-2011 National Interview Survey Linked Mortality Files.

So this data set is comprised of NHIS survey data from 1990-2009. And then those survey respondents are linked to the National Death Index through 2011. And so smoking is not measured in the core NHIS questionnaire that's administered every year. And so officially, smoking is measured in some supplements in earlier years.

So in 1990-1995, NHIS included supplements that were interested in health promotion and disease prevention, or cancer control, or progress toward the healthy people through delta objectives, where smoking was assessed. And then for the years 1997 forward, NHIS has the sample adult profiles. So the sample adult files include one randomly selected adult from each household, who completes the core questionnaire, but also completes additional questions about health behaviors.
And so I limited my sample to ages 35 and older, since these are the ages at which smoking habits have had time to lead to negative health conditions. So it seems to be a lag of a few decades between when smokers start smoking and then when that leads to smoking-attributable morbidity and mortality. So in this project I adjust for age, race/ethnicity, education, marital status, region of the country, body mass index, and health insurance coverage.

And so by combining about 20 different years in NHIS and having 21 year of mortality follow up, I have a very large number of deaths. So I have about 59000 deaths. And then there are over 4 million person years in this data. So I needed a very large number of deaths because I'm examining some very rare causes of death. So by pulling 20 years of data I have enough statistical power to estimate death rates for some causes of deaths that are rare, but may still be linked to smoking.

Okay. So this is the part where I really highlight how great it is to work in the RDC. So suppose I wanted to do this project just with the public use NHIS linked mortality file data. It wouldn't have been possible because so for some earlier years of the NHIS mixed mortality file, there is evidence about specific causes of death, but only about 113 cause categories, which is enough for some of the causes of death, but not for all of them.

Now the problem really starts in the year 2007 and forward because for these years cause of death is only available in ten very broad categories, which is important to protect the identity of the respondents, but at the same time makes it really difficult to examine these very specific causes of death. So the public use data categorizes causes of death in somewhat crude categories.
And then also for some rare causes of death, the cause of death is procured or imputed to protect the identity of some individuals, reduce risk of disclosure, but can make it difficult to do this kind of research, where you're interested in very specific causes of death. We're interested in very specific causes of death.

So my solution was to go into the - go into an FSRDC where I was able to gain access to restricted use data that includes the exact ICD-9 and ICD-10 cause of death codes, which allowed me to exactly replicate the cause of death coding scheme used by (Carter) and colleagues, in their New England Journal of Medicine article.

So I mentioned that in the most recent years, 2007 forward, cause of death is only reported in ten categories in the public use data. And so you can see here category number 2, malignant neoplasm, that's cancer. I couldn't even examine lung cancer, pharyngeal, esophageal cancer, they're - all cancers are combined.

All respiratory diseases are combined. All heart diseases are combined. So this project just would not have been done in the - with the public use data. So by going into the FSRDC I got these exact ICD-9 and ICD-10 codes, which allowed me to examine very specific causes of death. So the causes of death are listed here.

So in this left column are the 21 established causes. So they include cancers of several organs that come in direct contact with cigarette smoke, like the lungs, the esophagus, the larynx, lip and oral cavity. But what's interesting is that smoking elevates mortality risk from heart disease, respiratory diseases, cancers throughout the body, because the carcinogenic and other toxic
substances in cigarette smoking, get carry and store it throughout the body. It can cause damage over time.

So the established causes on the left, these are the causes where the Surgeon General says the evidence is sufficient to say there's a causal relationship between smoking and these causes of death. So on the right column are the 14 additional causes. So the evidence so far linking these causes to death, is considered suggestive, but not yet sufficient, to definitively say that there - that these causes are related to smoking.

So they include infections, breast and prostate cancer, hypertensive heart disease, liver cirrhosis, renal failure, and some other causes of death. And so the prospect of breast cancer and prostate cancer - for breast cancer among women, prostate cancer among men, the prospect of these causes of death being causally related to smoking is really important, because for men and women the number one cause of cancer deaths is lung cancer.

But among women, the number two cause of cancer death is breast cancer. Among men, the number two cause of cancer death is prostate cancer. So if these two causes of death - breast cancer and prostate cancer, are in fact linked to smoking, then that can really elevate the number of deaths that we consider caused by smoking.

And then there are some causes of death, some ill-defined causes such as cancers of unknown sites, and then also additional rare causes combined, unknown causes. So some portion of these deaths from these ill-defined categories are probably - are actually due to smoking-attributed causes. But are not identified as such on the death certificate.
And I do want to make another quick note about how these surveys - so doing the direct method I have surveyed the survey data that's connected, that's linked to the National Death Index. And I want to point out another opportunity for people who are thinking of projects that they can start in an FSRDC.

So NHIS respondents are probabilistically linked to a death certificate in the National Death Index. This means that NCHS doesn't try to re-contact these respondents or contact the next of kin to do active follow up. Instead, they use probabilistic or passive follow up. So whenever the survey is being administered to respondents they're asked whether they are willing to, you know, have their information matched.

And then NCHS interviewers collect 13 pieces of personally identifiable information or PII, in in both sources. So in the surveys - this isn't available in the survey, but NCHS collects information from survey respondents, things like Social Security number, first name, last name, race, state, they live in, marital status, gender.

And then that same information also shows up on the death certificate. And so if information is listed perfectly and completely on both sources, it's very easy to match the survey respondents to their death information. But in many cases, PII is missing or incorrect in the National Interview Survey or in the National Death Index.

And so, NCHS has developed two variables that they call match class and match score, that they use to assess the strength of matches. And these variables aren't available in public use data, but they are available in the restricted use data, now RDCs. And I've actually used these match quality variables in the past, and using this information in the RDC, our data show
that match quality is a little bit lower among racial, ethnic, minority, and foreign-born adults, compared with whites and US-born adults.

So this is an important caveat when thinking about the strengths of the NHIS data linked to the National Death Index. But then also, you know, many of you guys know if you're interested in working in an RDC doing this kind of mortality research, that you can gain access to these variables that measure quality of the linkage. And that you can also - there are ways I've done like these simulations.

You know, if you changed the kind of mass criteria to see does that elevate the risk of one group compared to another group? And then also just to describe my analytic approach - so I used Poisson regression models to estimate cause-specific relative risk ratios for current smokers and former smokers, compared with never-smokers.

I then disaggregate current smokers by their smoking intensity, how many cigarettes they smoke per day. And then I disaggregate former smokers by the time since they quit smoking. Some of the additional causes are, in fact, related to smoking. I would expect to see kind of a gradient between smoking and mortality risk that would mirror the pattern for the established causes.

That is, I would expect to see higher mortality among heavy smokers than among light smokers. And I would expect to see higher mortality among former smokers who quit recently, compared to those who quite longer ago. And then I'd decompose the smoker disadvantage in mortality by the established and additional causes. And I'll say more about that in just a moment.
And then I also calculated the number of excess deaths that are due to smoking. Okay. So my first set of results - I looked at the - I counted the all-cause mortality risk. So before, looking at specific causes of death, just all causes of death combined, is there a higher risk among smokers compared to never-smokers?

And I found that yes, there is a higher risk of death. So the risk of - so these are risk ratios for - first, for current smokers compared to never-smokers and then also former smokers compared to never-smokers. And I find a higher risk of death among current smokers, about double the risk of death during follow up among smokers compared to nonsmokers.

And then I found that among former smokers, the risk of death during follow up is 30% to 40% higher among former smokers compared to never-smokers. And each of these all-risk ratios are statistically significant. So it's interesting to find that the risk ratios are pretty similar among men and among women. Right?

So next, I looked at those specific - I looked at the established causes of death. And so drawing your attention to some of the most interesting patterns, is that I find elevated mortality risk among current smokers for the causes of death that have been established as attributable to smoking. So risk ratio is for lung cancer, laryngeal cancer, COPD, or chronic obstructive pulmonary diseases, you know, are quite high.

So some of these risk ratios are 17 or exceeds 17, for current smokers compared with never-smokers. In addition, I find that the relative risk ratio of death due to ischemic heart disease is, you know, is over two for current smokers compared to never-smokers. So the largest risk ratios are for some of
the established causes like lung cancer, laryngeal cancer or COPD, or with some risk ratios that are even greater than ten.

So it's important to note that risk ratios are smaller for some heart disease or for some cancers other than of the lung. Yet these heart diseases and some of these other cancers are still responsible for a very large number of total deaths. So next, I look at some of the additional causes of death. So these are the causes where the evidence so far is suggested but not sufficient.

And so here I find that, you know, beyond those established causes, I also find statistically higher risk of death among smokers compared with never-smokers, among these additional causes, even when I controlled for a host of demographic and behavioral confounders. So, for example, I find that among female and male current smokers, risk ratio of death due to hypertensive heart disease, or 85% higher among women and 75% higher among men, for smokers compared to never-smokers.

And then it was also interesting to see that for breast cancer and for prostate cancer, there's a significantly higher risk of death during follow up, among women and among men, for current smokers compared with never-smokers. And so my next step was to examine - was to disaggregate smokers by their smoking intensity.

So I (unintelligible) and I'm measuring smoking intensity by how many cigarettes they smoke per day. And I use cut points that sort of align with packs of cigarettes. So greater than or equal to 40 is about - they're - usually a pack of cigarette contains 40 cigarettes. So greater than or equal to 40 cigarettes per day is about a two-pack a day habit. And then I also look at 20 to 39, 10 to 19, and then also people who are kind of light to intermittent smokers who only smoke - who smoke less than 10 cigarettes per day.
And so when I compare current smokers of different smoking intensities, to never-smokers, I find a greater risk of death for several, but not all of these additional causes. So the highest mortality risk is exhibited for the heaviest smokers. And generally, for many of the causes of death, risk of death is elevated, is significantly higher than one among even the lightest smokers, to kind of provide evidence that there's probably no healthy level of smoking. Even those who are very light, intermittent, social smokers still may have an elevated risk of death from these causes.

And so death during follow up is even elevated among the lightest smokers, those who smoke less than 10 cigarettes per day, for eight of the 14 additional causes. So next, looking at the former smokers. So for former smokers, I break them out into did they smoke very recently, so just in the past five years, and then also have a couple of more categories that just focus on a couple of different groups.

And then at the other extreme end are those who quit smoking more than 30 years ago. And so I find here that - I find that relative risk ratios end to be highest among those who quit recently, and the lowest among those who took the longest duration since they quit. So some - what's interesting with those, the recent quitters, is some former smokers who quit recently, may have only quit after the onset of smoking-attributable mortality.

So for - or the onset of morbidity with the smoking. So some individuals may have had a lung removed or had a tracheotomy or some other - or have had had a cancer scare or a heart attack that was linked to their smoking. And that's the reason that they quit. Which quitting at any age can provide some benefits. But at that point, for some individuals, you know, the damage is already done. They're already suffering from smoking-related diseases.
And then at the other end, for those who quit smoking more than three decades ago, almost every cause, their risk of death doesn't differ from that of never-smokers. And what's interesting is that for all of these other respiratory diseases, that there is a significantly higher risk of death among former smokers compared to never-smokers, even if they quit smoking three decades ago.

So my next step was to decompose smoker disadvantage and mortality by cause of death. So I'll take just one moment. I noticed that someone did fill out - someone did ask a question in the chat. There are a couple of different - a couple of questions in the chat that we can cover in the Q&A. But one kind of quick question. So one of the causes - one of the additional causes is cirrhosis, and so I wasn't able to control for alcohol use throughout the entire study because alcohol use wasn't asked in every one of those supplements.

But when I limited my data to years 1997, forward (unintelligible) analysis to control for drinking, I did find the risk of death was still elevated among smokers than nonsmokers, even when I control for smoking or when I limited the sample just to nondrinkers. So that was definitely something we kept in mind. So some of these causes clearly have other risk factors and cirrhosis is one that stands out.

Well, cirrhosis is really heavily linked to drinking and then also to the - some forms of hepatitis. All right. So my next step is to decompose the smoker disadvantage and mortality by cause of death. And so this requires a little bit of explanation of the demographic methods. And so with this formula, so in (XCS) is just say okay, I'm going to look at the mortality rates for age group X, for cause C among smokers, and see how much higher is risk of death
that's caused among smokers, compared to the risk of death among nonsmokers.

So this is just taking the mortality risk for each cause among smokers and then subtracting the mortality risk among nonsmokers. So this is in the numerator. It's by each cause of death. And then I divide by the mortality risk among all smokers, minus the mortality risk among never-smokers. And this will be expressed as the percentage of smoker disadvantaged in mortality that's due to each one of these individual causes.

So I have that in - so I have the percentages for each individual cause in the paper that was published in Demography. But, you know, for this talk I'll just focus on these established causes together, the additional causes, and then some other causes. And what's interesting is that I find that percentages of smoking-attributable mortality among women, 81% is due to established causes, 15% is due to additional causes.

Some similar values among men. I find percentages among men are 80% of the smoker disadvantages due to the established cause, 14% is due to the additional causes. And so when I looked at the individual causes of death, I found that none of the additional causes account for much of the difference individually.

But when I aggregated the additional cause of death together, 14%, 15% of the non-negligible amount of the mortality burden due to smoking. So what was interesting is that looking at the established and additional causes, they didn't account for 100% of the smoker disadvantage. And I find that 4% or 5% of the smoker disadvantage, persists among men and women.
So this remaining percentage could mean that there are some other causes of death that haven't even been identified yet. So maybe some of these category 3 causes of death where no - there just really isn't enough evidence to even see them as additional causes. It could also be the case that maybe there are some risk factors that I wasn't able to control for throughout, that may be linked both to smoking and to mortality.

Alright. So finally, I calculated the excess number of deaths due to smoking. And so here I'm presenting it in a figure that's kind of like a population pyramid that would be familiar to anyone who's, you know, taken a demography course. But rather than looking at your population size, this is just the number of deaths in each age group. And I have women listed on the left side, men listed on the right side.

So you can see that more men die from smoking compared to women. And so the coloring of each part of the bar shows kind of the darkest gray or the established causes of deaths among current nonsmokers; lighter gray is the number of deaths among established causes of death, among former smokers; and then we see the stripe and black cap on each end where the striped and black parts, indicate deaths that are due to smoking from the additional causes.

And so I found that there were 417,525 deaths due to the established causes. And then about 64,000 deaths per year in the US, are due to additional causes. So adding together the deaths due to established causes and additional causes, I came up with a value of 481,887 total deaths in the US each year, that are attributable to smoking.

Alright. So to summarize my results, I found - kind of my four main findings are that first, I found substantially higher mortality among smokers than among never-smokers from the causes that are established as related to
smoking and modestly but still significantly, higher mortality risk among smokers and those causes, that emerging evidence suggests that they were in fact due to smoking.

So the Center for Diseases established as caused by smoking certainly have higher relative risk ratios. Although these additional diseases are associated with smoking are still important, they contribute additional risk of death, some of them are relatively common. And I think these additional causes should be considered in former studies - in future studies, that examine risks associated with smoking.

The second I disaggregated current smokers by the number of cigarettes they smoked, and former smokers by cessation, and I found that mortality risk tends to be higher among heavy smokers and recent quitters than among light smokers and those who quit smoking long ago.

And so in this case, they there can be gradients toward the additional causes of death or quite similar to the established causes in providing additional evidence that these additional causes are likely causally linked to smoking. So my third key finding is that when I decomposed - so when I decomposed and examined the smoker disadvantage of mortality, I found that those additional causes account for 15% and 14% of the smoking-attributable death among US women and men, respectively.

And then when I estimated excess deaths, excess number of deaths due to smoking, I found that smoking accounts for about 481,000 deaths per year. And this estimate is somewhat higher than the CDC official estimate that's at about 437,000 deaths per year. And I think my - so about - so close to over 40,000 additional deaths that I found, I believe it's because I did examine the established causes as well as the additional causes of death.
So some key limitations to keep in mind for the study - so first, a smoking-related cause of death may be listed as a contributing factor, but not an underlying cause of death. And for this project, I was only considering underlying cause of death. So on death certificates, the underlying cause of death is a single cause that is - initiates the sequence of morbid events that result in death.

So - and then usually on a death certificate, several other contributing factors can be listed. So smoking is identified as a contributing cause of death on the death certificate and not the under - but the one underlying cause, this death is not considered as attributable to smoking in this project. So an analysis that does consider total mention of smoking-attributable causes, could potentially expand the number of deaths caused by smoking that have a higher number than I found in this project.

And so another plug to the RDC is that even though I didn't request information on the contributing causes, researchers can gain access to those - the underlying cause and all the contributing causes and analyze that data in the RDC. So I would not adjust for alcohol use throughout because alcohol use is kind of sporadically measured in those earlier supplements.

And then alcohol use is pretty consistently measured in years 1997 forward. So when I was (unintelligible) in 1997 forward, it did reduce my sample by a lot and kind of reduced my statistical power. But for most of the additional causes, I did still find a significantly higher risk of death among smokers compared to never-smokers.

So I only examined mortality attributable to active or firsthand cigarette smoking and the CDC has found that, you know, there is a mortality risk
among people who don't smoke but are exposed to secondhand smoke. And the CDC estimates that there are about 41,000 deaths per year due to secondhand smoke exposure.

So if I included those - I wasn't able to consider secondhand smoke in this project, but, you know, including those 41,000 additional deaths, will put the number at over 500,000 deaths per year that are due to smoking. And then I think I saw a question in the chat, you know, during the Q&A I'll go through those chat questions, but there are other forms of tobacco and nicotine use that I wasn't able to consider.

I was just looking at cigarette smoking. And, you know, it's possible that - and it's likely that, you know, maybe (hookah) use or cigar use can elevate risk of death. And then so things like vaping or eCigarette use is relatively new. And so it may take a little bit of time before we really start to see those behaviors leading to death and to smoking. But there is some evidence suggesting that vaping, eCigarettes can have a negative impact on health, especially among adolescents and young adults who are using these products.

So to conclude, I find that smoking continues to be the leading cause of preventable death in the United States, and by a larger magnitude than previously reported. And I find more evidence kind of adding to evidence that's been put forth by (Carter) and colleagues, and by other researchers, finding those additional causes of death, may be causally linked to smoking.

So given all the evidence, the Surgeon General really should consider upgrading the evidence of the additional causes from suggestive to sufficient, for inferring causal association. That these causes of death likely need to be reported in official reports of deaths that are due to smoking. Smoking is a
national tragedy that continues to kill nearly half a million Americans prematurely, every year.

And smoking kills millions more internationally. And so there's an urgent need for continued research on this topic and continued policymaking aimed at reducing and eliminating cigarette use. Indeed, US fares worse health and longevity compared to a lot of other high income, low mortality countries, in part because of higher smoking in the US.

And so this study demonstrates that smoking-attributable mortality really needs to remain a top health priority. And this study also makes several key contributions to further understanding this tragedy that has really ravaged US society for at least a century now. So I'll stop there and I'll - I include my contact information and acknowledge that there were some co-authors who helped me with this project.

And then also included with the disclaimer again, that everything expressed in this project are the views of me and my co-authors and don't reflect the views of the Census Bureau or the National Center for Health Statistics. And with that, I think Bryce may join us to come moderate the Q&A.

(Bryce Hannibal): Joseph, thank you so much. That was a great presentation. Lots of interesting information you found there. That was really interesting. We have a couple of questions, though I don't know if (Carol) wants to jump in to explain Q&A if people want to actually discuss.

Coordinator: Thank you. If you would like to ask a question, please unmute your phone, press star 1 and record your first and last name clearly when prompted, so I may introduce you. Again, that is star 1 to ask a question.
(Bryce Hannibal): So in the meantime, Joseph, I think there's one question maybe that you didn't address. I think - yes, I think there's only one. So can you talk more about the level of risk depending on race or ethnicity?

Joseph Lariscy: Right. So for this particular project, we controlled for race/ethnicity, but we didn't stratify by race and ethnicity. And there is some - like right now a really hot topic is whether menthol products should be banned. And menthol cigarettes, menthol cigars, tend to be more common and really directly marketed toward African-Americans.

But - so the tobacco companies are directly marketing to certain populations. And, you know, there are some things about menthol that there's evidence that, you know, could be related with kind of an increased risk of death and increased morbidity. But some research I've seen finds that the relationship between smoking and mortality tends to be pretty consistent.

I know that (Jessica Ho) and (Irma Evo) have a project, a paper in demography from 2013 where (Ho) and (Evo) were able to show that, you know, they were comparing Black and White adults, and finding that, you know, the risk ratios are pretty similar for - I think were the same for White and for Black men when they made this comparison.

(Bryce Hannibal): Okay. Thank you. Sorry. Alright. Are there any other questions from attendees?

Coordinator: I show no questions at this time. But again, if you would like to ask a question, please unmute your phone and press star 1.

(Bryce Hannibal): Looks like there are a couple popping up in the chat Joseph unsure if you see those?
Joseph Lariscy: Yes, sure. I can go ahead while we're waiting for folks to call in, I can go ahead and go through some of these questions. So I did see - so a couple of different questions - people asking about region and also about - I did see questions about like region of - how region of the country could matter and then also how like specific states and state policies can matter.

So great question. So we controlled for region, and it's a very broad sense as region which is just four categories. It'd be great to have - so one important, again to plug the RDC is that the public use data you can - you only have access to region of the country in four categories. So working the RDC you can have access to specific states.

And so - and there's a lot of research being done by (Jennifer Carat-Montes), (Iniga Chekhova), (Mark Hayward), (Stephen Wolfe). They have other colleagues who are looking specifically at state policies and state composition and how, you know states have a lot of policy regarding clean air laws and whether you can smoke, you know, in the workplace or in restaurants.

And also, you know, excise taxes on packs of cigarettes. And so to have information on - specifically on states, I think would really go a long way in kind of documenting why some regions of the country, specifically the Southeast and some parts of the Rust Belt, have very, you know, high risk of deaths, higher risk of death from the smoking-related causes.

Whereas if you look at some parts of New England, some Pacific or Mountain states, you see much lower levels of smoking in part because, you know, where people can smoke is really limited, and the cost of a pack of cigarettes in California and New York, is much higher than it is in Tennessee, Kentucky, and Mississippi.
So I see Ellen asked about what - is it possible to stratify by veterans? So I - veteran status is included in the public use National Interview Survey Data. So I didn't control for veteran status here, but it is the case that especially for, you know, for World War I, World War II veterans and Vietnam also, a pack of cigarettes was part of their rations.

That smoking was just kind of a culture of, you know, being in the military. And so for those who were veterans, you know, if they were - especially if they were serving in combat, smoking may have been a way they were kind of processing the trauma they were seeing. So there's research showing that pretty high levels of smoking among veterans.

And so it looks like Don, you sent ask about a copy of the presentation. So Bryce, I believe you mentioned that - and Lisa also mentioned that this video is being recorded and is going to be shared with the - on the Census Academy page on YouTube.

(Bryce Hannibal): Yes. And also the Census Bureau FSRDC Web site has a specific Web site for the presentation series with the past presentations that includes a link to the recorded presentation. And if you would like to see the slides you can email me or you can email Joseph directly. I’m sure that he'd be willing to share those.

Joseph Lariscy: Absolutely. Yes. And so I'd be happy to share slides with anyone who emails me. I have my email address listed there. And then also the work presented today was published in an article in Demography in 2018. That's - that has the - I think the article has the same title as today's talk. So there were some results I was able to share, you know, just through the time limitations. So there's more information available in that paper.
(Bryce Hannibal): Okay. Do we have any other questions waiting in the queue?

Joseph Lariscy: So we haven't had any audio questions yet but I see that there are still several chat questions we could go through.

Coordinator: And I have no questions over the phone at this time. But again, star 1 to ask a question.

Joseph Lariscy: Okay. I'll check the - go in the chat. I see there's a question from Katherine, asking is there any data regarding correlates with parental smoking and early smoking behavior within the parental home? Great question. So - and it kind of brings up the issue that with another limitation I didn't mention, but I really don't have a full kind of smoking biography for these individuals.

So I do - it'd be great if I had information on, you know, at what age do people start smoking, or when did they, you know, how did their smoking change over time? Maybe they just started smoking, like, kind of casually but then over time, they started smoking more. Maybe they tried to quit. And then we'd actually see when was the onset of smoking-related morbidity, and then when they ultimately died.

So I have pretty limited information on - so I only have information, this study on whether or not they smoked at the time of survey. And if they had quit at the time of survey, how long ago did they quit. So there's kind of missing information about sort of smoking throughout the life course, particularly kind of any peer influences or parental smoking.

Coordinator: And we did have a question that came up over the phone. Did you want to take that now?
Joseph Lariscy: Yes. Sure.

Coordinator: Okay. (Mark), your line is open.

(Mark): Hey, Joseph. Great talk. Can you hear me okay?

Joseph Lariscy: Yes.

(Mark): Okay. I was curious, given COVID and I've talked to reporters 1000 times about the quality of death reporting information on death certificates. I was wondering how you thought that the quality of the data and how it might vary by state, might factor into your results. So as an example, in the state of Texas and probably other places like throughout the south, we have very few medical examiners who are - those are people that are physicians who are qualified to do autopsies.

But we also have funeral directors and justices of the peace, who fill out the death certificate. So I was just curious how you - what kinds of side hypothesis or how you think about these differences in data quality. And I was also curious if you did a sensitivity analysis to drop certain of the regions of the country, whether you would get the same results or not, to get a sense of, you know, maybe data quality issues and how they factor in.

Joseph Lariscy: Right. Those are great questions. And I know that when the death certificate is being filled out sometimes there's, you know, there's like the officiant, the physician who was there at the time of death, you know, relaying information, you know, from the autopsy to the funeral director and they have a ton of information that can really evolve, formed in how they fill out the death certificate.
Sometimes it is an elected official who, you know, may be, you know, who may not be able to fill out the death certificate in quite as much detail, in which case, you know, what was the one underlying cause of death versus the contributing causes of death, you know, could be mixed up a little bit. So yes, so in this case we controlled for region, but we didn't, you know, maybe dropping out of the Southwest region may have a, you know, change the results a little bit.

But one important - one other interesting note is that so death certificates I think just as a couple of years ago, started including a question, was this death caused - did smoking contribute to this cause. And it's like a yes/no or uncertain boxes that can be checked. And I've talked to Bob Anderson at NCHS about this. And he said that that - that's kind of - the data right now is murky.

That oftentimes that box - those boxes go unchecked or just the uncertain box is checked. That's, you know, even if it's an underlying cause of - even if, you know, lung cancer or COPD is checked as the, you know, as the one underlying cause of death, I think it's pretty clear, but oftentimes it's unclear to the person filling out the death certificate, whether that cause was indeed related to smoking.

So it's cool that they added that item to the death certificate. But that item - there's a lot of missing...

(Mark): So you may have a lower bound as opposed to, you know, in terms of what goes on given death reported. There likely is underreporting of some of the causes that might end up in your tallies or should have been ended up in your tallies.
Joseph Lariscy: Right. Bryce, should I continue on with chat questions?

(Bryce Hannibal): Sure. I'm wondering if there are some that you see that I don't see. I see maybe one more. First, Mark, thank you for your question. That was...

Joseph Lariscy: Yes. Thanks, Mark. That was great.

(Bryce Hannibal): You defined the number of cigarettes smoked in a day. Is that how you quantified or conceptualized heavy versus light smokers?

Joseph Lariscy: Sure. I see Tariq and a few other panelists asked that question for a few other audience members. And so here - again, I'm kind of - I think in NHIS people ask how many days per week do you smoke, and then they were asked on those days, how many cigarettes do you smoke. And so it's possible that there are - some people view smoke, you know, there are people who smoke every single day. Some people maybe only smoke, you know, on weekends or something like that.

And so - and it's possible that people, you know, will vary their smoking level over time. So the way that I measured sort of heavy smokers versus light smokers, was the number of cigarettes they smoked on - how many cigarettes smoked on the days they smoked, which is pretty inexact but was sort of the best data we had available for this project.

And then the less than 10 - someone else asked about how I'd define light smoking. So I just used the less than 10 cigarettes per day on days smoked. And so that's about half a pack of cigarettes. So from zero cigarettes smoked per day, up to about 10. And then so it looks like Anne has a comment that could be helpful to other tobacco researchers.
She noted that some type of - some of the information that I've mentioned is - so in some of the variables that I may not have been able to access, is available in the Tobacco Use Supplements, to the Current Population Survey which will soon be available from a link to the National Death Index, as part of an interagency collaboration called The Tobacco Longitudinal Mortality Study.

So that sounds great. So and I have used the Tobacco Use Supplement Data to the Current Population today to plug another Census product. But the Current Population Survey, I think it's every two years, will do a tobacco use supplement where they'll ask very detailed information about smoking. And with that, data is being linked to the National Death Index will be a fantastic resource for those of us who are interested in smoking-related mortality.

And so Bryce, I'm seeing 1:00. Do we need to wrap up?

(Bryce Hannibal): I think - at this point I think we've addressed all the questions that I see. Do you see any that we haven't touched on?

Joseph Lariscy: I think I've been able to ask all the questions I'm seeing in the chat. If not, anyone is certainly welcome to email me directly to ask any questions that they have. Or if they're interested in receiving the manuscript of the Demography article, or if they'd like the slides, I'd be happy to share any of that with today's participants.

(Bryce Hannibal): Okay. Well, again, thank you, Joseph for the insightful presentation. It was wonderfully done. And also, thank you to everyone who joined. If you have any questions don't hesitate to reach out to me or to Joseph about the presentation. And I will be reaching out in the next several weeks about the
next presentation, as well as some information about the evolution of the FSRDC presentation series. So thank you all. Stay safe. And have a good afternoon.

Coordinator: And this concludes today's conference. Thank you for participating. You may disconnect at this time.

END