

Smoking-Attributable Mortality: An Indicator for Prioritizing South Carolina Counties for Smoking Reduction

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Background

- Nearly 1 in 5 adults in South Carolina was a current smoker in 2015
- Smoking costs the state \$2.2 billion in annual health care expenditures
- Community interventions are a key component of effective tobacco control programs;
- Availability of local-level data to inform decision-making is limited
- In partnership with USC, DHEC recently developed county-level smoking prevalence estimates
- Smoking-Attributable Mortality (SAM) is a validated metric of the devastating effects of smoking

Methods

- We calculated Smoking-attributable fractions (SAF) and smoking-attributable mortalities (SAM):

$$SAF = [(p_0 + p_1(RR_1) + p_2(RR_2)) - 1] / [p_0 + p_1(RR_1) + p_2(RR_2)]$$

Where: p_0 = % of adult never smokers in study group; p_1 = % of adult current smokers; p_2 = % of adult former smokers; RR_1 = Relative risk of death for current smokers relative to never smokers; and RR_2 = Relative risk of death for former smokers relative to never smokers

$$SAM = \text{Number of disease-specific deaths} * SAF$$

- SAFs and SAMs calculated for each disease, sex and age group
- Data used:
 - 2005-2015 aggregate state and county-level deaths among adults for 21 conditions associated with smoking (Table 1), stratified by gender and age group
 - State and county-level prevalence of current smokers, former smokers, and never smokers
 - Gender-stratified RRs of death for current and former smokers relative to never smokers from each of the 21 underlying conditions (2014 Surgeon General's Report)
 - Total state and county adult population

Results

- 224631 deaths of SC residents from the 21 underlying conditions were recorded during 2005-2015
- 78186** deaths were estimated to be smoking-related, with an average yearly SAM of **7108** and an annual SAM rate of **192** per 100,000 adult people
- Cancer-related deaths were higher than cardiovascular disease and respiratory disease-related deaths (Fig 1)
- Men had higher counts of smoking-attributable deaths in contrast to women; they also had a larger number of cancers deaths whereas women died predominantly of cardiovascular diseases, and cancers (Fig. 1)
- Yearly SAM rates ranged from **119** (Richland County) to **365** per 100,000 adult people, with Union County having the highest rate, followed by Chester (**344**) and Colleton (**326**) counties (Fig. 2)
- Yearly SAM rate from cancers was highest in Colleton (**135**), followed by Union (**132**) and Chester (**129**) counties (Fig. 3)
- Yearly SAM rate from cardiovascular diseases was highest in Chester County (**143**), followed by Union County (**133**) (Fig. 4)
- Yearly SAM rate from respiratory diseases was largest in Union County (**99**) (Fig 5)

Table 1. Underlying conditions associated with smoking and their ICD codes

Disease Category	ICD-10 Codes	ICD-9 Codes
Malignant Neoplasms		
Lip, Oral Cavity, Pharynx	C00 – C14	140 – 149
Esophagus	C15	150
Stomach	C16	151
Pancreas	C25	157
Larynx	C32	161
Trachea, Lung, Bronchus	C33 – C34	162
Cervix Uteri	C53	180
Kidney and Renal Pelvis	C64 – C65	189
Urinary Bladder	C67	188
Acute Myeloid Leukemia	C92.0	205.0
Liver Cancer	C22	155
Colorectal Cancer	C18 – C20	153, 154.0, 154.1, 159.0
Cardiovascular Diseases		
Ischemic Heart Disease	I20 – I25	410 – 414, 429.2
Other Heart Disease	I00 – I09, I26 – I51	390 – 398, 415 – 417, 420 – 429.1, 429.3 – 429.9
Cerebrovascular Disease	I60 – I69	430 – 438
Atherosclerosis	I70	440
Aortic Aneurysm	I71	441
Other Arterial Disease	I72 – I78	442 – 448
Respiratory Diseases		
Pneumonia, Influenza	J10 – J18	480 – 487
Bronchitis, Emphysema	J40 – J42, J43	490 – 492
Chronic Airway Obstruction	J44	496

Fig 1. Total number of Smoking-Attributable Deaths in South Carolina (2005-2015), by gender and major disease category

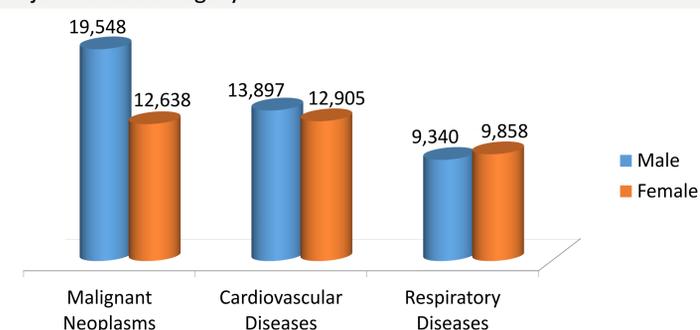


Fig 2. Average Rate of Annual Smoking Attributable Deaths, 2005-2015 (per 100,000 people)

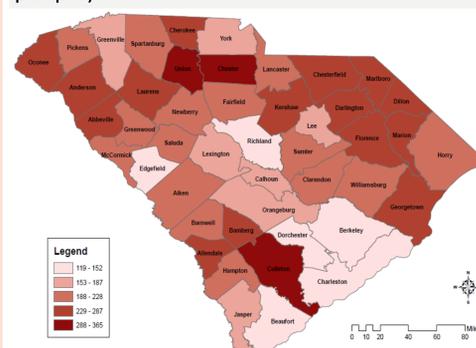


Fig 3. Average Rate of Annual Smoking Attributable Deaths from Cancer, 2005-2015 (per 100,000 people)

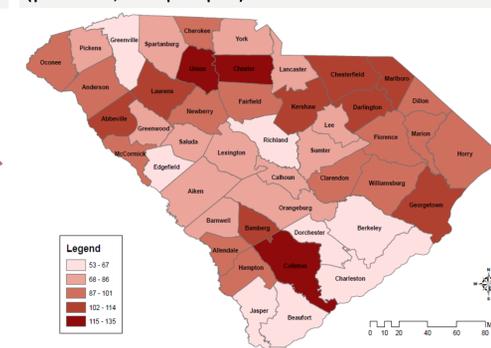


Fig 4. Average Rate of Annual Smoking Attributable Deaths from Cardiovascular Diseases, 2005-2015 (per 100,000 people)

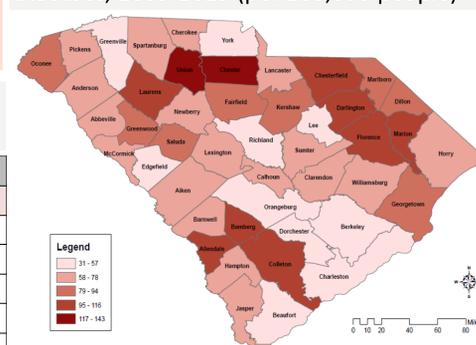
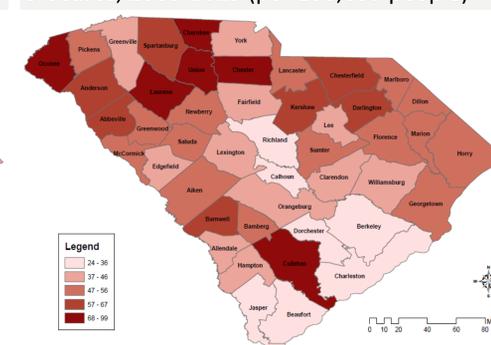


Fig 5. Average Rate of Annual Smoking Attributable Deaths from Respiratory Diseases, 2005-2015 (per 100,000 people)



Discussion

- The limitation of the attributable-fraction methodology is examining both exposure and outcomes within the same timeframe although it takes years/decades for smoking to have effects on health
- However, although most lifelong smokers have taken to smoking during their teen years, most of the deaths used to generate SAM estimates originated in the older age groups

Public health implications

- Findings provide state and local coalitions and partners with specific data to support tobacco prevention and control efforts
- Potential for greater collaboration with other DHEC divisions addressing cancer and cardiovascular diseases, particularly in targeting counties that have higher SAM rates
- Given the large number of smoking-related respiratory disease deaths, DHEC could consider creating a division that addresses risk factors for respiratory conditions