Chronic Disease Surveillance

TECHNICAL NOTES

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and Environmental Control

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A. OVERVIEW

Chronic diseases are among the leading causes of death and hospitalizations in South Carolina. The **Division of Chronic Disease Epidemiology** is responsible for analysis, interpretation and presentation of health data related to chronic diseases such as diabetes, heart disease, cancer, arthritis and asthma, and their risk factors.

This program supports the work of several chronic disease programs throughout the Bureau and the Agency by providing the following services:

- ➢ develop study designs, questionnaires, case definitions
- ➢ evaluate chronic disease programs
- ➢ locate or develop surveillance data systems, and analyze epidemiologic data sets
- ➢ provide state and national comparison data
- ➢ interpret South Carolina chronic disease and risk factor data
- ➢ conduct epidemiologic investigations and special studies of chronic diseases and chronic disease risk factors of public health importance
- ➢ monitor South Carolina chronic disease trends
- ➢ publish reports and web pages on chronic diseases and risk factors.

To accomplish its mission, the Office utilizes several data sources. The main data sources are described below.

B. DATA SOURCES

1. South Carolina Behavior Risk Factor Surveillance System[1]

Behavior Risk Factor Surveillance System is the world's largest random telephone survey of non-institutionalized population aged 18 or older that is used to track health risks in the United States. In 1981, the Centers for Disease Control and Prevention (CDC), in collaboration with selected states, initiated a telephone based behavioral risk factor surveillance system to monitor health risk behaviors. As of 1993, participation in the BRFSS has expanded to include all 50 States, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands. South Carolina began administering BRFSS since 1984.The basic philosophy is to collect data on actual behaviors, rather than on attitudes or knowledge, that would be especially useful for planning, initiating, supporting, and evaluating health promotion and disease prevention programs.

BRFSS Questionnaire:

The BRFSS questionnaire has three components. The core questions consisting of the (fixed core, rotating core and the emerging core), optional modules and state added questions. The core questions have to be asked by all the state health departments without any modification. States may use optional modules if they wish with or without modifying the questions. In addition the State may also include questions addressing local priorities.

The core questions are asked by all states without any changes as required by CDC. A part of core questions that are asked every year, called the fixed core, include questions on health status, health insurance, smoking, HIV/AIDS, demographics and diabetes. Some core questions are asked every other year and are called the rotating core. And each year a few questions related to emerging health problems are included in the core. Each year, CDC provides optional modules that are sets of questions on health topics such as diabetes, cardiovascular health, arthritis, folic acid, skin cancer etc. These modules must be asked without any changes for CDC to post the data on its web site and to use in the published reports.

Finally, states can develop their own questions and add to their questionnaires. Most commonly, optional modules, rotating and emerging core questions from previous years or current year optional modules with changes made by states are used as state added questions.

There are more than **432,000 interviews** (completed) each year in the US. South Carolina completed **12,948** in 2011. In 2011, there were 129 core, optional and state-added questions asked on the SC survey.

BRFSS Weighting:
BRFSS data are directly weighted for the probability of selection of a telephone number, the number of adults (18+ yrs.) in a household, and the number of phones in a household. Additional weights are developed for non-coverage, i.e. households with no telephones, and for differences between the sample characteristics and the state population characteristics. A final weight is assigned to each respondent so that the weighted proportion and weighted number of respondents by sex, age, and race matches the state population.

Changes in the 2011 Questionnaire:
Beginning in 2011, the Centers for Disease Control and Prevention made two major changes to the BRFSS Survey methodology. These are making survey cells to cell-phone numbers and adopting an advanced weighting method. These changes were designed to improve the accuracy of BRFSS estimates; however the results using these new methods are not comparable to BRFSS estimates from previous years[2].

The first change is including and then increasing the number of interview calls made to cell phone numbers. Adoption of cell phones (with no landline phone) has been particularly evident among younger adults and racial/ethnic minorities. Adding cell phone interviews improves the BRFSS coverage of these groups.

The second change is to replace the "post-stratification" weighting method with a more advanced method called "iterative proportional fitting," also called "raking." In addition to the standard demographic variables of age, gender, and race and ethnicity, raking uses variables such as education level, marital status, renter or owner status, and phone source.

As a result of these changes, the BRFSS will better represent lower-income and minority populations and provide more accurate prevalence estimates. **However, it will no longer be possible to compare results from 2011 or later BRFSS surveys to results from earlier years of BRFSS data.** It is also likely that prevalence estimates will be somewhat higher as a result of the change in methods for behaviors that are more common among younger adults and/or minorities.

Small Area Estimation Used Prior to 2011

Synthetic Estimation: SC BRFSS employs a stratified sampling design, over sampling on the eight public health regions in the state. The method used for obtaining public health district estimates cannot be used at the county level due to the issue of small sample size. An alternate method that can be used when there are small numbers is synthetic estimation. Synthetic estimation is good for local estimation for two reasons. First, it yields estimates that are more precise than those obtained from using information only from the sample located within the small area. Second, it permits estimates for domains in which a sample may provide so few observations that traditional methods cannot accurately estimate parameters of interest.

Example for Asthma County Fact Sheets
Synthetic estimates for local area prevalence estimates directly apply the BRFSS statewide estimates for each age-race-gender group to the proportionate size of that group within each county. For this particular analysis, 2010 population data was used. There are 6 age-race-gender groups. Statewide estimates for the demographic groups are found for the risk factor of interest. Then these prevalence estimates, along with their corresponding standard errors are entered into a second program that generates the county estimates. Note that this must be done separately for each level of the risk factor.

 The second step computes the county estimates by taking the statewide estimate for each of the age-race-sex groups and multiplying it by the proportion of the county population that is in that age-race-sex group. Then these products are summed to give the county estimate. This is done for each of the 46 counties in the state. Sample sizes for each county are generated, and when there are not enough data from a single county, adjacent county data is used. It is assumed that neighboring counties are similar in population and behavior.

Definitions of Frequently Used Risk Factors

Current Smoker: Respondents who smoked at least 100 cigarettes in their lifetime and currently smoke.
Binge Drinking: Having 5 or more drinks of alcohol on 1 occasion.
Diabetes: The percentage of adults who responded "yes" to the question, "Have you ever been told by a doctor that you have diabetes?"
Heavy Drinking: Having greater than 2 drinks per day for men, and 1 drink per day for women.

Less than 5-a-day: Respondents who report an average of fruit and vegetable consumption of less than 5 servings per day.
Meets Physical Activity Recommendation: Moderate physical activity for 30 or more minutes per day, five or more days per week or vigorous physical activity for 20 or more minutes per day, three or more days per week.

Moderate Physical Activity: Defined as 30 or more minutes per day for 5 or more days per week, or vigorous activity for 20 or more minutes per day on 3 or more days.
Overweight: $25 \leq BMI < 30$.
Obesity: $BMI \geq 30$.
Overweight or Obese: $BMI \geq 25$.
Sedentary: Adults who reported no physical activity or irregular activity in the past 30 days.
Vigorous Physical Activity: Defined as 20 or more minutes per day at least 3 or more times per week.

Starting with 2011 questionnaire:
Met guidelines for aerobic and muscle strengthening exercises: Defined as at least 150 minutes of aerobic physical activity and at least two muscle strengthening exercises per week.
Median daily servings of fruit: The median number of daily servings of fruits.
Median daily servings of vegetables: The median number of daily servings of vegetables including beans.

For more information on BRFSS and available data:
http://www.scdhec.gov/hs/epidata/brfss_index.htm#data

2. South Carolina Mortality Data:[3]

South Carolina vital statistics mortality data are a fundamental source of demographic, geographic, and cause-of-death information. The data are used to present the characteristics of those dying in South Carolina, to determine life expectancy, and to compare mortality trends with other states and the Unites States.

Death statistics are compiled from death certificates, which are filed by state law with the Office of Public Health Statistics and Information Services at the South Carolina Department of Health and Environmental Control continuously since 1915.

Cause of Death

Cause of death refers to the underlying cause of death. The underlying cause of death is defined as the disease or injury, which initiated the chain of events leading directly to death, or the circumstances of the accident or violence, which produced the fatal injury. Underlying causes of death in mortality data are established through a system known as

the International Classification of Diseases, 10th Revision (ICD-10) for deaths occurring in 1999 or later.

Allocations of Events by Residence or Occurrence

With respect to geographic allocation of vital events, the data may be compiled either by place of residence or by place of occurrence.

Residence Data are allocated in the place in South Carolina where the person normally resided regardless of where the event occurred. A cooperative system of interstate exchange of transcripts of birth and death records permits events occurring to South Carolina residents in other states to be included in the South Carolina residents tabulations. In these tabulations, births are allocated to the county of the mother's residence and deaths are allocated of the county of residence of the decedent. Since there is no interstate exchange of transcripts of marriage and divorce records, these statistics are limited to those events that occurred in South Carolina.

Occurrence Data are allocated in the place of South Carolina where the event occurred, regardless of the usual residence of the person involved. Both residence and occurrence data are useful for different purposes. Occurrence data represent the requirements for hospitals and other facilities. These types of data may help to determine such needs as maternity services, intensive care facilities for newborn babies, or emergency room facilities. Residence data are more properly utilized in measuring the fertility and the incidence of death in the population living in an area.

For mortality data for years 1990 – 1998:
http://scangis.dhec.sc.gov/scan/bdp/tables/deathtable.aspx

For mortality data for years 1999 – most available:
http://scangis.dhec.sc.gov/scan/bdp/tables/death2table.aspx

Rank of Leading Causes of Death
The rank is based on the number of deaths of each leading cause of death. This is the same methodology used by NCHS. The number of deaths is used as the ranking criteria because it most accurately reflects the frequency of cause-specific mortality.
See CDC NCHS National Vital Statistics Reports, Deaths: Leading Causes for 2006
http://www.cdc.gov/nchs/data/nvsr/nvsr58/nvsr58_14.pdf

When there is the same number of deaths for more than one leading cause. The ranks assigned will be the same. Consequently, the next rank in line will be incremented by the number of equal ranks. For example, if there are three leading causes of death with 4th rank, the next leading cause will be rank 7th.

Mortality Notes
Cerebrovascular Disease Deaths
Decrease in deaths classified as due to Cerebrovascular diseases (ICD-10 codes I60-I69)
starting in 2005 may partly reflect the change in standardized coding of some deaths from
Cerebrovascular disease to Mult-infarct dementia (ICD-10 code F01.1). See National
Vital Statistics Reports, Deaths: Final Data for 2005, Volume 56, Number 10
http://www.cdc.gov/nchs/data/nvsr/nvsr56/nvsr56_10.pdf

Unknown Race in 2008 Mortality
2008 race specific information for 0.5% of South Carolina's mortality records were
"unknown."

3. South Carolina Hospital Discharge Data:[4]

Hospital discharge data is collected by the SC Budget and Control Board Office of
Research and Statistics. It collects data from all civilian hospitals in South Carolina
excluding VA hospitals. The dataset is based on information collected on the UB82
billing form. In 2003, there were 551,809 records. International Classification of
Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes is used to define the
diagnoses and procedures in hospital discharge data.

Definition of Terms
The following definitions are from http://www.ors2.state.sc.us/termsdef.asp

Average Length of Stay
This is the total number of days spent in the hospital by a given set of patients, divided by
the number of discharges. The average length of stay affects charges because longer stays
generate higher charges. In addition, the average length of stay is a rough indicator of
hospital efficiency or program philosophy. For example, two hospitals may have
significantly different averages for psychiatric inpatient treatment. These differences may
indicate a facility's choice between extended hospital stays, which tend to have higher
charges, and alternatives, such as outpatient treatment, which tend to have lower charges.

Average (Mean) Charge
This is the sum of all charges for a set of hospitalizations, divided by the number of
discharges. For example, to determine the average charge for pneumonia patients, the
charges for all pneumonia patients are added together and divided by the number of
pneumonia patients. The average charge gives an approximation of what a typical patient
would be charged.

Case Definition
Defined as one patient visit, even though more than one procedure may be performed
during the same surgical episode. For instance, if a myringotomy is performed on both

ears during one visit, only one case will be counted, even though two procedures are performed.

Charges
The amount a facility bills for a patient's care is known as the charge. This may differ substantially from the amount that the facility collects for its services, as health care facilities frequently negotiate discounts with insurance companies or other large purchasers of health care services.

Diagnosis Related Group (DRG)
DRG is a patient classification system, defined by the federal Department of Health and Human Services. It provides a means of relating the type of patients a hospital treats to the costs incurred by the hospital. According to this classification system, patients who have similar diagnoses and undergo similar procedures are placed together in the same diagnosis-related group. DRG definitions may also take into account other patient characteristics, such as common sex, age, and discharge status. There are currently 492 DRGs in the federal classification system. DRGs are used by the Medicare program to reimburse hospitals at fixed amounts for all similar patients, regardless of the length of stay or actual cost incurred. The DRG system is also widely used in many types of health data analysis.

Example of Using DRG for Diabetes County Fact Sheets

Lower extremity amputation rate calculation:
Lower extremity amputations are captured using ICD9 procedure code 841. These may be further subdivided into below knee, which is 841.0-841.5, and above knee, which is 841.6-841.9. These are calculated only for the diabetes population, which is drawn using all primary and secondary ICD9 diagnosis codes of 250.
Lower extremity amputation rates may be calculated in two ways. One is a crude rate of amputations per diabetes hospitalization, with the following formula: number of amputations/number of diabetes hospitalizations * 1000 gives rate of amputations per 1000 diabetes hospitalizations.

Age-adjusted rates are calculated using the direct age-adjustment method:
1. Frequencies of amputations by age group are determined.
2. Age-specific rates are calculated using SC population estimates for a given year as the denominator
3. These age-specific rates are "standardized" using the US 2000 population, i.e. the rates are multiplied by the proportion of that specific age group to the US population. These proportions are then summed to get an age-adjusted rate.

Discharge
The term discharge is roughly synonymous with hospitalization. A patient becomes a discharge once he or she officially leaves the health care facility. The number of discharges from a hospital affects how a hospital is staffed, what types of services a hospital offers, and how well it competes in the broader health care system. To some

degree it also affects costs because, when viewed relative to the facility's capacity, the number of discharges is a partial indicator of efficiency. The number of discharges is used to calculate the average charge and the average length of stay at a facility.

Expected Payer
Each inpatient discharge record contains information about the expected payer for the hospitalization. A facility compiles information about expected payers from the bills it generates. Each bill indicates whom the facility expects to pay for the services; however, the bills are not always paid by the expected payer. Insurance may not cover a procedure. A person may not actually be covered by the indicated insurer. Therefore, the expected payer is to be viewed as a preliminary determination of who's paying the bill.

Hospital Charge
The amount a facility bills for a patient's care is known as the charge. This may differ substantially from the amount that the facility collects for its services, as health care facilities frequently negotiate discounts with insurance companies or other large purchasers of health care services.
Each inpatient discharge record contains the charge for the hospitalization, not the amount that was paid by the patient or insurer. The charge does not include the physician fees or emergency department fees, as physicians and emergency departments bill for their services separately.

Major Diagnostic Category (MDC)
A group of related DRGs, although the relationship between DRGs and MDCs is somewhat complex. There are 25 major diagnostic categories in all, most of them based on organ systems.
MDCs and DRGs were originally developed at the Yale University School of Organization and Management during the 1970s under contract to the Health Care Financing Administration. The creation of a clinically coherent set of major diagnostic categories was the first step in the process of creating diagnosis-related groups. Since its inception, the DRG system has undergone many revisions and two new MDCs have been added to the original 23. For more information, consult a printed reference.

Median Charge and Median Length of Stay
Charges and lengths of stay may also be presented as medians. The median represents the middle value of a distribution; half the values lie at or above the median, and half lie at or below it. If the median charge for pneumonia patients was $6,500, then half the patients were charged $6,500 or more and half were charged $6,500 or less. Averages (means) can be significantly affected by a few unusually low or high values ("outliers"). Medians, on the other hand, are not affected to such a degree by outliers. The median, which is also called the 50th percentile, may be more representative of the typical charge or length of stay than the mean.

Outlier
A patient record with an unusually high or low value, given the DRG. There are two ways that a record can become an outlier. First, the facility may identify a record as an

outlier when submitting its patient data. Second, severity analysis software may determine that the reported value is significantly greater or less than the norm, given the DRG.

Principal Diagnosis
The primary disease or condition for which the patient was hospitalized or treated, as indicated in the patient's discharge record. In our data products, all diagnoses are coded according to the ICD-9-CM scheme.
Although a facility may report up to nine diagnosis codes (and an additional E-code when appropriate) in each patient record, the current on-line data system currently contains only the principal diagnosis codes.

Principal Procedure
The primary surgical operation or procedure performed on a person during a patient visit, as indicated in the computerized surgery record. A facility may report up to six procedure codes in each patient record. However, the data system currently contains only the principal procedure codes.

Procedure
A surgical operation performed on a person during a patient visit, as classified according to the ICD-9-CM or CPT-4 coding schemes. A person may undergo more than one procedure during a single surgical operation. For example, a patient who had arthroscopy with tendon repair on one leg undergoes two separate procedures.

For hospital discharge data:
http://www.ors2.state.sc.us/inpatient.php

4. Emergency Room Data:

Information on each emergency room discharge is reported to the SC Budget and Control Board Office of Research and Statistics. The principal discharge diagnosis is the diagnosis primarily responsible for the admission. Rates of emergency room visits (or discharges) are calculated by dividing the number of discharges with a specific diagnosis by the total population, age-adjustment to the year 2000 US population.

For emergency room data:
http://www.ors2.state.sc.us/er.php

5. Population Data:

Population data is provided by SC Budget and Control Board Office of Research and Statistics. The Health and Demographic Statistical Section is the designated State Data Center for Census Information and acts as the coordinating unit for Census Information in the State. Census products include not only information from the decennial Censuses but also from the Economic and Government Censuses and the County Business Patterns.

For SC population reports:
http://www.ors2.state.sc.us/population/index.asp

For population data for years 1990 to most available:
http://scangis.dhec.sc.gov/scan/bdp/tables/populationtable.aspx

C. DEFINITIONS

Age adjustment[5]
The age distribution of a population changes over time and from place to place. Because some diseases like heart disease and stroke are more common in older people, comparing disease rates across populations or across periods of time can be misleading, if the age distributions of the populations being compared are different. Age adjustment is used to account for the changing age distribution of the population. It is used to compare risks of two or more populations at one point in time or one population at two or more points in time. Age-adjustment rates should be viewed as relative indexes rather than actual measures of risk. Age-adjustment rates are computed by the direct method by applying age-specific rates in a population of interest to a standardized age distribution, to eliminate differences in observed rates that result from age differences in population composition. Age-adjustment rates are calculated by the direct method as

$$\sum_{i=1}^{n} r_i \, x(p_i /P)$$

$$pi = \text{standard population in age group I}$$

$$P = \sum_{i=}^{n} p_i$$

Death rates are age-adjusted to the year 2000 U.S. standard population. Age-adjustment rates are calculated using age-specific death rates per 100,000 population. Adjustment is based on eleven age groups.

Table 1. Selected age distribution and age-adjustment weights based on the 2000-projected U.S. population for adjusting death rates and hospital discharge rates.

Age	US Population in thousands	Proportion distribution (Adjustment weight)
All ages	274,634	1.000000

Less Than 1	3,795	0.013827
1 to 4	15,192	0.055308
5 to 14	39,977	0.145565
15 to 24	38,077	0.138646
25 to 34	37,233	0.135573
35 to 44	44,659	0.162613
45 to 54	37,030	0.134834
55 to 64	23,961	0.087247
65 to 74	18,136	0.066037
75 to 84	12,315	0.044842
85 +	4,259	0.015508

Table 2. Selected age distribution and age-adjustment weights based on the 2000-projected U.S. population for adjusting hospital discharge rates.

Age	US Population in thousands	Proportion distribution (Adjustment weight)
All ages	274,634	1.000000
Less Than 1	3,795	0.013827
1 to 4	15,192	0.055317
5 to 9	19,920	0.072533
10 to 14	20,057	0.073032
15 to 19	19,820	0.072169
20 to 24	18,257	0.066478
25 to 29	17,722	0.064529
30 to 34	19,511	0.071044
35 to 39	22,180	0.080762
40 to 44	22,479	0.081851
45 to 49	19,806	0.072118
50 to 54	17,224	0.062716
55 to 59	13,307	0.048454
60 to 64	10,654	0.038793
65 to 69	9,410	0.034264
70 to 74	8,726	0.031773
75 to 79	7,415	0.026999
80 to 84	4,900	0.017842
85 +	4,259	0.015508

Table 3. Selected age-adjustment weights based for adjusting Behavior Risk Factor Surveillance System rates.

Age	US Population in thousands	Adjustment Weight

Ages18+	203,851	1.000000
18-24	26,258	0.128810
25-34	37,233	0.182648
35-44	44,659	0.219077
45-64	60,991	0.299194
65+	34,710	0.170271

Comparability Ratio (CR)[6]

About every 10-20 years the *International Classification of Diseases (ICD)* is revised to stay abreast of advances in medical science and changes in medical terminology. Each of these revisions produces breaks in the continuity of cause-of-death statistics. Discontinuities across revisions are due to changes in classification and rules for selecting underlying cause of death. Classification and rule changes impact cause-of-death trend data by shifting deaths away from some cause-of-death categories and into others. Comparability ratios measure the effect of changes in classification and coding rules. Comparability ratios are computed by the National Center for Health Statistics from the results of dual coding of certificates according to the old and the new procedures. For selected causes of death, the ICD-9 codes used to calculate death rates for 1980 through 1998 differ from the ICD-9 codes most nearly comparable with the corresponding ICD-10 cause-of-death categories. To address this source of discontinuity, mortality statistics before 1999 were recalculated, using the comparability ratios in the following table:

Table 4. Comparability Ratios of Certain Chronic Disease

Disease	Comparability Ratio
Cardiovascular Disease	0.9981
Coronary Heart Disease	0.9914
Stroke	1.0588
Diabetes	1.0082

For more information go to CDC NCHS:
http://www.cdc.gov/nchs/data/nvsr/nvsr49/nvsr49_02.pdf

International Classification of Diseases (ICD)

The ICD provides the ground rules for coding and classifying cause-of-death data for mortality and hospital discharge. Mortality data is coded by both ICD-9 and ICD-10 classification of disease. Hospital discharge data is coded by ICD-9 classification of disease.

 The following table displays the ICD codes used for the chronic diseases and leading causes of death.

Table 5. ICD-9 and ICD-10 Codes for Classifying Causes of Death

Disease	ICD-9	ICD-10
Accidents	E800-E949	V01-X59,Y85-Y86
Alzheimer's Disease	331	G30
Asthma	493	J45-J46
Cancer	140-208	C00-C97
Breast	174	C50
Cervical	180	C53
Colorectal	153-154	C18-C21
Lung	162	C33-C34
Prostate	185	C61
Skin	172-173	C43
Cardiovascular Disease	390-448	I00-I78
Chronic Obstructive Pulmonary Disease	490-496	J40-J44
Coronary Heart Disease	402,410-414,429.2	I11,I20-I25
Diabetes	250	E10-E14
Diseases of the Heart	390-398,402,404,410-429	I00-I09,I11,I13,I20-I51
Hypertension	401-405	I10, I12
Influenza and Pneumonia	480-487	J10-J18
Nephritis, nephritic syndrome and nephrosis	580-589	N00-N07,N17-N19,N25-N27
Septicemia	038	A40-A41
Stroke	430-438	I60-I69

For more information go to WHO:
http://www.who.int/classifications/apps/icd/icd10online/

NOTES FOR COUNTY CHRONIC DISEASE FACT SHEETS:
Heart Disease – Starting with 2003, the ICD-9 codes used for "Diseases of the Heart" were 390-398, 402, 404, 410-429. Years prior to 2003 used ICD-9 codes for Coronary Heart Disease 410-414, 402, 429.2.
Lung Cancer – Starting with 2006, the ICD-9 codes used all of 162 (including 162.0 Trachea).

Occurrence Data
Data allocated to the place in South Carolina where the event occurred, regardless of the usual residence of the person involved.

Percent Change
The percent change is calculated by dividing the percentage difference between the latest year and first year by the first year.

Prevalence
The prevalence is the number of cases of a disease. It is often expressed as a rate.

Regional classifications
South Carolina is divided into eight public health regions.
Region 1: Abbeville, Anderson, Edgefield, Greenwood, Laurens, McCormick, Oconee, Saluda.
Region 2: Cherokee, Greenville, Pickens, Spartanburg, Union.
Region 3: Chester, Fairfield, Lancaster, Lexington, Newberry, Richland, York.
Region 4: Chesterfield, Clarendon, Darlington, Dillon, Florence, Kershaw, Lee, Marion, Marlboro, Sumter.
Region 5: Aiken, Allendale, Bamberg, Barnwell, Calhoun, Orangeburg.
Region 6: Georgetown, Horry, Williamsburg.
Region 7: Berkeley, Charleston, Dorchester.
Region 8: Beaufort, Colleton, Hampton, Jasper.

Underlying Cause of Death
Disease or injury that initiated the sequence of morbid events leading directly to death. (International Classification of Disease)

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