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Preventable Cancers in Virginia

A Risk Assessment Report for Breast, Cervical, Colorectal, Lung, Melanoma and Prostate Cancers by Health District

Report Prepared By

Lynne Penberthy MD, MPH[1], Jim Ellis PhD[2], Jim Martin PhD[3],

John Eric Martin[3], Calvin Reynolds[4], Robert Magnotti[4]

For the

Comprehensive Cancer Prevention and Control Program,

Division of Chronic Disease Prevention and Control,

Virginia Department of Health

[1] Virginia Commonwealth University, Division of Quality Health Care/Massey Cancer Center
[2] Virginia Commonwealth University, Survey and Evaluation Research Laboratory
[3] Virginia Department of Health, Virginia Cancer Registry
[4] Virginia Department of Health, Virginia Center for Health Statistics

I. INTRODUCTION

Focus on cancer prevention activities has increased substantially over the past fifteen years. The Centers for Disease Control and Prevention (CDC) has initiated significant breast and cervical cancer prevention programs in each state. In addition, the CDC is currently in the process of funding additional programs to insure the availability of breast and cervical cancer prevention services within each state and has expanded their cancer prevention activities to include prostate, colorectal and skin cancer.

Given the limited resources that are available for cancer prevention activities, it is essential to identify the areas with the greatest need for cancer prevention services to optimize the allocation of these resources. Therefore, preventable cancer risk according to the geographic areas (defined by public health department jurisdiction) with the highest rates of preventable adverse outcomes related to cancer was evaluated and areas were identified and ranked according to specific need. The objectives of this project were as follows: 1) to combine commonly available data sets used for surveillance of chronic disease; 2) to identify the level of risk for each potentially preventable cancer; and 3) rank that risk relative to the thirty-five health districts in the Commonwealth of Virginia. These same data were used previously to measure risk based on 1995 cross-sectional data. Further, ongoing data collection of certain of these parameters (the percent of cancer that is diagnosed at an early stage, mortality rate, and cancer specific risk behaviors) can be used to longitudinally measure the effectiveness of cancer prevention activities in reducing the identified markers related to poor cancer prevention and control.

II. METHODS

The reports produced through this evaluation are an update of a series of reports that were produced in 1999-2000, based on 1995 cross-sectional data. The current set of reports is produced from the same three data sources as in the earlier reports: the Virginia Cancer Registry, the Virginia Center for Health Statistic's death certificate data, and the Behavioral Risk Factor Surveillance System survey results. However key differences in the data collection and data presentation over time do not permit direct comparability of all data from the prior report. These

differences are described in the following section.

The standard against which the VCR data was age adjusted in 1995 was the 1970 US standard population. At that time, both VCR and Health Statistics produced all age-adjusted rates using that standard. Current data are age-adjusted according to the standard 2000 US population. Therefore, the rates in this report are not directly comparable to earlier reports that used the standard 1970 US population for adjustment. The use of a different standard makes comparisons over time for incidence data inappropriate. In addition, there have been reporting differences over time for specific cancers. In situ cervical cancers are no longer required to be reported to the VCR. This may influence the incidence risk ranking over time, making data comparisons based on incidence data with the earlier period inappropriate. The time trend analysis evaluating early stage disease has been recalculated for cervical cancer, and data included in this report include only local stage disease. Finally, because the number of cases for melanoma and cervical cancers are frequently small in some health districts, incidence rates calculated based on a single year's data may be unstable. Therefore, in order to report incidence by health district and risk ranking, data were combined from several years to include sufficiently large sample sizes to provide a stable incidence estimate.

Differences in results that are related to the Virginia Health Statistics death certificate analysis are also related to the use of the 2000 versus 1970 population for age-adjustment. As for the VCR data, initial data mortality rates were based on a 1970 population age-adjustment. Data in the current report have been age-adjusted to the 2000 standard population. The data in the current report that provide mortality rates over time have been recalculated and age-adjusted to the 2000 standard population, so the numbers may be different than those reported in the previous report.

Differences in the current report that relate to the BRFSS data relate to the differences in the questions that are asked over time in that survey. The BRFSS did not ask all questions that are related to preventable cancer in each year. This permitted comparison over time based only on limited years of data. For example, the colorectal cancer screening questions were asked of sufficiently large numbers of individuals to provide stable comparisons only in 1991-93 and again in 1997-99. Therefore, only two points in time were available for assessing trends in this

health behavior.

The general purposes and limitations of each of the three data sources used in this report are discussed below. Four types of data on cancer from three sources were utilized. These include incidence, early detection rate (percent of local stage disease at diagnosis), mortality, and prevalence of cancer-specific health behavior risk factor. These data are routinely collected and reported to a state central health authority. A brief background on each data source and a description of the methods used for rate calculations including the rationale for use of these data sources are presented below.

A. Data Sources

1. Virginia Cancer Registry (VCR)

The VCR is a central cancer registry that has been in operation in the Commonwealth of Virginia since 1970. Until 1990, the registry was voluntary, but in 1990, reporting of all incident cancers became mandatory from hospitals and all laboratories. The VCR maintains data on all incident cancers, and in addition continues to maintain more detailed data from hospital registries that are certified by the American College of Surgeons (ACOS). Data captured as part of the mandatory reporting of all cancers include site, histology and demographics. There are biases related to incidence reporting of cancer. In health districts that have large health care providers in nearby states, many patients are diagnosed and treated outside Virginia. While data exchange agreements have been made with these states, there continue to be missed cases resulting from this. In addition, there is some bias in reporting according to whether or not the health district is represented by ACOS certified hospitals. In studies of VCR data, ACOS certification was one of the most important factors that predicted whether or not a cancer case was likely to be missed by the VCR. [1,2,3]

[1] Penberthy LT, McClish DK, Smith WR, Manning, CC, Retchin, SR, Pugh, A. "The Value of Medicare Inpatient and Outpatient Claims for Cancer Surveillance". Am J Epidemiol. 2003 Jul 1;158(1):27-34.

[2] McCLish, DK, Penberthy LT. "Using Medicare Data to Estimate the Number of Cases Missed by a Cancer Registry - A 3-Source Capture-Recapture Model" Medical Care *In Press* March 2004.

[3] Penberthy LT, McClish DK, Smith WR, Manning, CC, Retchin, SR, Pugh, A. "The Value of Medicare Inpatient and Outpatient Claims for Cancer Surveillance". Am J Epidemiol. 2003 Jul 1;158(1):27-34.

Incidence rates are defined as new cases of site specific cancers occurring per 100,000 population per year. For gender specific cancers (breast, cervical and prostate) these are presented per 100,000 female or males per year. The incidence rates provided in this document are age-adjusted for comparison purposes. All rates are adjusted to the 2000 total U.S. standard population. Incidence was ranked from lowest to highest for each of the 35 health districts in Virginia.

Stage of disease at presentation is a potentially important predictor of short-term cancer risk. Cancer stage has been identified as the most important predictor of mortality. Evaluating the distribution in stage at presentation over time may provide indicators of the utilization of secondary prevention measures such as mammography. The proportion of early stage disease was based on cases that were local for breast, colorectal, cervical, prostate and melanoma and were ranked from highest to lowest across the 35 health districts in Virginia. Those health districts with a high rank (or high risk) had the smallest proportion of in situ or local stage disease.

2. Vital Statistics

Health Statistics in Virginia has maintained reporting on births and deaths since 1913. Certificates are filed with the Division of Vital Records and data are tabulated by the Center for Health Statistics. Mortality statistics are based on resident deaths and deaths of Virginia residents that occurred outside the state. Residence is defined as the city or county where the deceased resided at the time of death. Prior to 1990, racial characteristics as tabulated by vital statistics were defined according to "white" and "nonwhite". Since 1991, racial categories include "white", "black", and "other".

Underlying cause of death by which all deaths are categorized may be defined as either (a) the disease or injury which initiated the train of morbid events leading directly to death or (b) the circumstances of the accident or violence which produced the fatal injury. These are coded according to the ICD-9 CM coding scheme. Limitations of this system relate to limitations in the coding scheme and in the accuracy of form completion.

The method of applying only mortality rates by geographic area to assign rank for cancer risk has been used previously. Mortality is the most powerful indicator of overall disease burden. Mortality rates may reflect both the proportion of advanced disease at diagnosis and possible differences in treatment. Mortality may be the most important component in determining preventable cancer risk, as it is the ultimate outcome that cancer prevention activities address. Nevertheless, an assessment of the need for cancer prevention services should not be limited to measures of mortality alone because of the long duration of follow up required to assess an impact on mortality. In addition, mortality rates can be influenced by treatment patterns that may provide inaccurate estimates of the impact of prevention activities. Therefore, using mortality combined with intermediate outcome measures, such as stage at presentation and direct assessment of the use of cancer prevention services, will provide a more complete and current assessment of the need for cancer prevention services.

The biases that exist for reporting cancer incidence also affect the reported mortality rates. As mentioned previously, there are problems both in accuracy of reporting within the state as well as in identifying cancer deaths for individuals treated out-of-state. A drawback of death certificate data is that the cause of death is sometimes reported as the end event (i.e. cardiac/respiratory arrest) rather than the underlying cause of death, which in this case, may be complications of a particular cancer. Bias may also exist in the reporting practices of one or a few physicians from rural areas resulting in mortality data that do not truly reflect the underlying cause of death.[4]

Death rates are calculated by cause per 100,000 estimated population. In this report, mortality rates are presented as age-adjusted to the 2000 U.S. standard population. Mortality rates were then ranked from low to high for each of the 35 health districts in Virginia. A rank of 1 indicates the lowest cancer specific mortality rate among the health districts.

Denominators

Population denominators used for calculating rates for incidence and mortality were

[4] Percy C, Stanek E., and Gloeckler L."Accuracy of cancer death certifications and its effect on cancer mortality statistics." AJPH 71: 242-50; (1981).

obtained from the 2000 Census by age, race and sex specific categories. All age-adjustments used the direct method of standardization (or adjustment) and used the age distribution for the population as of 2000.

3. Behavioral Risk Factor Surveillance System (BRFSS)

The Behavioral Risk Factor Surveillance System is an annual cross-sectional telephone survey supported by the Centers for Disease Control and Prevention and established in 1981. There are three components to the BRFSS: a core set of questions asked by all states, a set of questions developed at CDC and asked at the state's discretion, and questions developed by the individual state to meet specific data needs. Currently all states participate in this annual survey. Completed interviews in Virginia residents are compiled by CDC and the resulting sample is weighted according to current population statistics in Virginia to increase representativeness.

The survey is designed to collect information from a randomly selected sample in each state on state specific prevalence of behaviors associated with risk for the leading causes of death in civilian, non-institutionalized adults over the age of 18. Residents without telephones are not eligible for participation in this survey, and therefore the results may underrepresent certain subgroups of the population. The survey's core set of questions is asked annually, while additional questions targeted at specific conditions are asked in certain years. The non-core questions relevant to this report include the reported use of mammography and Pap smears. Many behaviors, such as smoking prevalence, are monitored every year in the standard core questionnaire. Other behaviors, such as colorectal cancer screening utilization, are asked only in certain years. For our purposes survey data were combined in three periods from 1991-1993, 1994-96 and 1997-99 to provide a minimum of 100 respondents in each of the 35 health districts in Virginia. The results from the combined years permitted an evaluation of the trends in risk factor prevalence over time. The following specific risk factors were assessed from the BRFSS data:

1) Proportion of women age 40 and older receiving a mammogram in the prior year.
2) The proportion of current smokers.
3) The proportion of women who received a pap smear in the previous year.
4) The proportion of persons receiving any colorectal cancer screening including either

Stool Hemocccult and/or an endoscopic screening examination in the prior year.

The prevalence of the above behaviors was determined for each of the health districts based on the percent of individuals in the appropriate category who responded "yes" to the survey question. The percents were then ranked from 1 to 35. Since smoking increases the risk of lung cancer, a higher prevalence of smoking is associated with increased risk. Therefore the rankings were from low to high correlating with the percent smoking. For mammography, Pap and colorectal cancer screening, the higher the prevalence of screening, the lower the risk of the specific cancer. Therefore ranking was done inversely. That is a high percent mammography was associated with a low risk score or rank.

Although the survey does not measure an individual's risk for later development of cancer, it does provide an indicator of what will likely be future trends in specific cancer incidence or mortality for that population. No other method is currently available in Virginia for evaluating cancer risk based on health behaviors.

There are several limitations associated with using data from the BRFSS. First, it is not generalizable to the entire population. Data are collected by telephone survey, which is likely to underrepresent individuals of lower socioeconomic status who do not have telephones and to underrepresent families in whom both adult partners work. Telephone surveys tend to over represent the young, better-educated, whites and those with higher incomes.[5]

This survey was designed to provide data to calculate overall state-specific prevalence. Typically, an annual sample is not large enough to permit analysis of smaller geographic units such as counties for a single year. However, by combining data collected from multiple consecutive years of the survey, samples can achieve adequate size to permit analysis at the health district level. In Virginia, the health district may consist of several counties, a county and city combination, or a single county or city, dependent on the population. The sample size recommended as necessary for evaluating BRFSS data at a smaller level was a minimum of 50

[5] Gentry EM; Kalsbeek WD; Hogelin GC; Jones JT; Gaines KL; Forman MR; Marks JS, Trowbridge FL "The behavioral risk factor surveys: II. Design, methods, and estimates from combined state data." Am J Prev Med 1985 Nov-Dec;1(6):9-14

persons per unit (that is 50 persons completed the survey for each health district.)[6] For the geographic unit chosen (health district) there were at least 100 persons per unit. The number of persons eligible to respond to specific questions, such as women over age 40 who have ever had a mammogram, varied and in several cases may have been less than 50 for certain health districts. Estimated BRFSS prevalence rates for these districts may be less stable (less precise) than for health districts with more than 50 respondents for that question.

B. *Methods for Combining Data for Assessing Risk*

The methods used in this report are based on comparing morbidity and mortality rates and risk factor prevalence across geographic areas to create a system on which to rank preventable cancer risk for health districts. These rankings may be used for further study and for planning intervention for problem areas. The actual method used for comparing geographic areas is based on a prior report from the American Public Health Association. This APHA report was produced to assess the current status of public health in the United States and to create a methodological tool for evaluation and planning at the state level. The method involved applying quartile ranking to the 50 states and the District of Columbia for five health determinants, as documented in *America's Public Health Report Card: A State-by-State Report on the Health of the Public* (1992). This method received criticism for its equal treatment of disparate measures[7], attaching equal weight to public health measures of divergent importance, such as fluoridated drinking water and percent of the population that smokes. Nevertheless, it provides an effective mechanism for comparing differences in health status. Ranking reflects where a particular group (health district) is in relationship to others. Grouping by quartile puts like scores together. Because there are limitations to each of the three commonly available measures of cancer risk, the health status indicators used in this study were assigned equal weights. Using these equally weighted rank scores, either singly or combined, assists in identifying areas with higher combined cancer incidence, mortality and risk factor prevalence that can then be targeted for

[6] Verbal Comm. Paul Seigel MD, MPH. CDC, National Center for Disease Prevention & Health Promotion, Office of Surveillance & Analysis Behavioral Risk Factor Branch**.**

[7] Gellert GA; Maxwell M "What does America's public health report card reflect?" Am J Public Health 1993 Sep;83(9):1348-9

prevention activities. These risk rankings across health districts can then be used to identify and target regions with the greatest need for cancer prevention services.

This methodology has been applied to assess composite and quartile risk for six cancers for which there are potential prevention activities that may reduce incidence (primary) or mortality (secondary). The 35 health districts in Virginia were ranked according to the specific cancer risk measures described above (incidence, percent local disease, mortality and behavioral risk factor). The five major preventable cancers (lung, breast, cervical, colorectal, and melanoma) plus prostate cancer (for which prevention measures have not been adequately assessed) were evaluated individually utilizing risk factor prevalence, age-adjusted incidence, percent early-stage disease at diagnosis, and age-adjusted mortality rates as criteria for risk. This technique is then used to stratify health districts in risk quartiles from lowest risk (quartile 1) to highest risk (quartile 4). The results of ranking were individually evaluated for each health district and cancer site. Specific recommendations were made based on the concurrent data and on trends over time for early detection rates (percent local or regional stage at diagnosis), mortality and risk factor prevalence.