

Public Health Surveillance Data in North Carolina

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Data from a variety of sources comprise the public health surveillance system for North Carolina today. The purposes of public health surveillance go far beyond collecting data. Effective public health surveillance ensures that the data are used by health policy makers, state and local public health agencies, and health program managers for effective public health planning, resource allocation, and program evaluation. Surveillance is a core public health function. A number of the 10 national essential public health services involve using data and include the following: monitor health status to identify community health problems; diagnose health problems and health hazards in the community; inform and educate people about health issues; evaluate the effectiveness, accessibility, and quality of personal and population-based health services; and conduct research for new insights and innovative solutions to health problems.

The purpose of this article is to describe the major public health surveillance databases available in North Carolina and present some examples of how these data have been used for education, policy, planning, and evaluation. A number of these databases are housed in the State Center for Health Statistics (SCHS), which is located organizationally in the Chronic Disease and Injury Section of the North Carolina Division of Public Health. Until 1980, the SCHS was named the Public Health Statistics Branch and dealt mainly with vital records data such as births and deaths. It was renamed the State Center for Health Statistics, and its mandate was broadened to include responsibility for a wider range of databases. Even when the SCHS does not produce and house the data, it is responsible for accessing health data from a variety of sources and making it available for health policy and program planning. A number of these "outside" data sets are included in this inventory.

The State Center for Health Statistics consists of about 65

employees organized into the following 5 major work units: Statistical Services, Birth Defects Monitoring Program, Central Cancer Registry, Health and Spatial Analysis, and Operations/Quality Management. The State Center for Health Statistics serves the entire Division of Public Health and also some agencies in other areas of the North Carolina Department of Health and Human Services. In addition to providing data and technical support to health and human services programs, the SCHS produces a comprehensive set of health-related publications and answers thousands of requests for data from a variety of individuals from across the state and the nation. More information about the SCHS and its data products, publications, and services can be found at its Web site at <http://www.schs.state.nc.us/SCHS>.

The State Center for Health Statistics has a Health Data Query System (<http://www.schs.state.nc.us/SCHS/data/query.html>) that allows the user to generate custom designed, detailed data reports for deaths, births, birth defects, pregnancies, and population data. In addition, public use data files with individual birth, death, fetal death, and matched birth/infant records for the years 1968-2006 (with complete data file documentation) can be downloaded from the Odum Institute for Research in Social Science Web site (http://www.irss.unc.edu/odum/jsp/content_node.jsp?nodeid=10).

This article is not intended to provide a comprehensive inventory of health data available in North Carolina. We include databases that are (1) used extensively by public health programs for surveillance purposes; (2) statewide in coverage; and (3) regularly produced or updated as opposed to special or one-time data collection efforts. In general, we do not include health program databases that contain mainly patient and medical encounter information.

Some of the databases described here can be used only for statewide estimates (this includes most of the sample-based surveys) while many

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will support production of data at the county level. County-level data are used extensively for community health assessment and other local planning and evaluation efforts. (For information about the North Carolina Community Health Assessment Initiative, go to <http://www.schs.state.nc.us/SCHS/about/chai.html>.) Usually, data are tabulated by county of residence (regardless of the location of the event) so population-based rates can be produced. Even where the data represent a complete count of events (such as deaths), there may be substantial random error in rates based on small numbers of events. (See "Problems with Rates Based on Small Numbers" at <http://www.schs.state.nc.us/SCHS/pdf/primer12.pdf>.) Combining several years of data before producing rates or aggregating counties will stabilize the rates by reducing random variability due to small numbers.

MORTALITY DATA

Death Certificate Data

Vital records have been core data for public health surveillance since complete registration began for North Carolina in about 1918. North Carolina law requires that a death certificate be filed for each death that occurs in North Carolina. In addition, there is an interstate vital records exchange agreement where we receive death certificates for all North Carolina residents who died in other states. We combine these data to produce complete mortality data by county of residence. For most chronic diseases and for injuries, we do not have comprehensive morbidity data so death rates are often used to portray rates of chronic disease and injury in the state. *The Leading Causes of Death* publication of the SCHS shows numbers of deaths, unadjusted death rates, and age-adjusted death rates for 20 causes of death by county of residence.¹ For details about the rationale for and calculation of age-adjusted death rates, visit <http://www.schs.state.nc.us/SCHS/pdf/primer13.pdf>.

Medical Examiner Data

The Office of the Chief Medical Examiner (OCME) investigates all deaths due to injury and violence, those from suspicious or undetermined causes, and deaths not attended by a physician. The OCME collects additional information that is not available from the death certificate data system including alcohol and other toxicology test results and more detailed information on gun type for deaths involving firearms. Approximately 9000 of the 75 000 deaths in North Carolina each year are investigated by medical examiners. Limited medical examiner data can be found on the SCHS web site at <http://www.schs.state.nc.us/SCHS/data/medexam>. For additional information or further data, contact the OCME at (919) 966-2253.

North Carolina Violent Death Reporting System

The North Carolina Violent Death Reporting System (NC-VDRS) began collecting data in January 2004. The NC-VDRS provides detailed statistics about victims and suspects involved in incidents where intentional violence resulted in death (ie, homicide, suicide, legal intervention). Data also are collected for unintentional firearm deaths and deaths with

undetermined manner/intent. The NC-VDRS uses information from multiple data sources (eg, death certificates, law enforcement records, medical examiner reports) to provide a description of circumstances, demographics, relationships between victims and suspects, and weapons. Provisional counts and selected data from the NC-VDRS are typically available within 8 months of the calendar year in which the deaths occurred, and complete data are available within 18 months.

The National Violent Death Reporting System (NVDRS) Web site at <http://www.cdc.gov/ncipc/profiles/nvdrs/default.htm> provides information about the system, its goals, the data it collects, the states that are funded, and how to access NVDRS data. Requests for North Carolina data can be made to the North Carolina Injury and Violence Prevention Branch at (919) 707-5432.

BIRTH-RELATED DATA

Birth Certificate Data

North Carolina law requires that a certificate be filed for each live birth that occurs in North Carolina. In addition, there is an interstate vital records exchange agreement where we receive birth certificates for North Carolina residents who deliver in other states. We combine these data to produce complete natality data by county of residence. In addition to live births, data are collected for each fetal death (stillbirth) of 20 or more week's gestation. *The Basic Automated Birth Yearbook (BABY Book)*,¹ an annual publication of the SCHS, shows live birth numbers for the state and each county tabulated by a number of characteristics captured on the birth certificate: mother's age, mother's race, mother's education, smoking during pregnancy, month prenatal care began, number of prenatal care visits, birth weight, birth order, and medical conditions of the mother. The State Center for Health Statistics also annually publishes *North Carolina Vital Statistics, Volume 1*,¹ which contains selected live birth and fetal death measures for the state and each county. North Carolina live birth and fetal death data are submitted to the National Center for Health Statistics as part of the national vital statistics system.

Reported Pregnancies

The State Center for Health Statistics combines data on live births, spontaneous fetal deaths, and induced abortions to produce statistics on reported pregnancies in North Carolina.^{1,2} In 2006 there were 127 646 live births, 868 fetal deaths, and 29 430 induced abortions reported for North Carolina residents. Fetal deaths in North Carolina are reportable to the state only if they are 20 weeks or more in gestation, so our pregnancy statistics do not include spontaneous fetal deaths of less than 20 weeks gestation (ie, early stillbirths or miscarriages).

Birth Defects Data

The North Carolina Birth Defects Monitoring Program (BDMP)^{2,3} was formally established by the North Carolina General Assembly in 1995. The BDMP gathers data on infants who are born with serious congenital anomalies (birth defects)

diagnosed within the first year of life (approximately 4000-5000 infants per year). Data are collected by trained field staff who systematically review and abstract hospital medical records, supplemented by information from administrative health databases such as hospital discharge data, vital records, and other sources. This intensive method of case ascertainment provides the most complete, accurate, and timely data on the incidence of birth defects thereby enhancing its usefulness to public health programs. The program maintains a central registry with patient-identifying information which is considered confidential under state law.

HOSPITAL-RELATED DATA

Inpatient Hospital Discharge Data

Selected data are collected for each of the more than 1 million inpatient hospital discharges occurring each year in North Carolina. This database is owned by Thomson Healthcare, Inc, and the data are made available to the North Carolina Division of Public Health through a special legislative provision. The State Center for Health Statistics can provide these data to agencies in state government and county public health departments for purposes of improving public health. The State Center for Health Statistics has North Carolina hospital discharge data files for calendar years 1995-2005. Data items collected include age and gender of patient, dates of service, expected source of payment, county of residence, admission source, discharge status, principal and additional diagnoses, E codes, principal and additional procedures, and total billed charges. The Healthcare Cost and Utilization Project (HCUP)³ of the federal Agency for Healthcare Research and Quality provides national and state-specific data and reports including hospital discharge data for North Carolina. The HCUPnet section provides free or low-cost national, regional, and state-level inpatient hospital statistics.⁴

Ambulatory Surgery Data

The North Carolina Hospital Based and Freestanding Ambulatory Surgery Facilities database contains more than 1.5 million records per year for surgeries performed in an outpatient setting. Approximately 155 facilities in North Carolina are reporting information into this database. The State Center for Health Statistics has recently started receiving quarterly updates of the North Carolina ambulatory surgery data from Thomson Healthcare, Inc, under the same arrangements as for the hospital discharge data. The State Center for Health Statistics can provide these ambulatory surgery data to agencies in state government and county public health departments for purposes of improving public health. Data items received by the SCHS include age and gender of patient, dates of service, expected source of payment, county of residence, principal diagnosis, principal and additional procedures, total billed charges, and detailed charges.

Emergency Room Data

North Carolina is the first state in the nation to establish a comprehensive system for electronic reporting of data by hospital

emergency departments. Nearly all hospitals in the state with 24 hours a day 7 days a week emergency departments are reporting into the system and the goal is to have all hospitals reporting in the near future. One use of these data is for the North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) system.⁵ NC DETECT currently monitors real-time emergency department data and categorizes visits into syndromes in order to detect unexpected cases and outbreaks earlier in their course than traditional disease-based surveillance would allow.

Since data are collected for all types of visits, emergency department use for chronic disease, injury, or any other health condition can also be monitored. Selected North Carolina emergency department data may be accessed at the North Carolina Emergency Department Database Web site at <http://www.ncedd.org>.

The State Center for Health Statistics has recently started receiving quarterly updates of the North Carolina emergency department data from Thomson Healthcare, Inc, under the same arrangements as for the hospital discharge data. These data files are comprised of records for more than 3 million emergency room visits per year. Emergency room visits that result in an inpatient hospital admission are not included in the data files received by the SCHS since these visits can be counted from the inpatient hospital discharge data. The State Center for Health Statistics can provide these ER data to agencies in state government and county public health departments for purposes of improving public health. Data items received by the SCHS include age and gender of patient, dates of service, expected source of payment, county of residence, admission source, discharge status, principal diagnosis, principal procedure, and total billed charges.

POPULATION SURVEY DATA

Behavioral Risk Factor Surveillance System

The Behavioral Risk Factor Surveillance System (BRFSS) is a random telephone health survey of adults conducted in every state. It is sponsored by the Centers for Disease Control and Prevention (CDC).⁶ In North Carolina, survey estimates are available for the state, major regions, and about 25 single counties. The annual sample size is more than 15 000 adult respondents. The BRFSS⁷ collects data on many topics including perceived health status, health insurance coverage, physical activity, asthma, arthritis, smoking, disability, diabetes, overweight/obesity, and cancer screening. The BRFSS survey is revised each year and it includes so-called "core" questions from the CDC which are uniform across all states plus questions specific for North Carolina.

Child Health Assessment and Monitoring Program

The Child Health Assessment and Monitoring Program (CHAMP)⁸ is a North Carolina health survey of children ages 0 to 17 years. Data collection for CHAMP began in January 2005. Adult respondents to the BRFSS survey with children living in their households are invited to participate in the CHAMP survey. One child is randomly selected from the

household, and the adult most knowledgeable about the health of the selected child is interviewed in a follow-up survey. The CHAMP survey is revised each year to meet the child health surveillance needs of North Carolina. It is a state-level survey with more than 3000 annual respondents and does not provide county-specific information. Data topics include health care access, asthma, mental health, disability, nutrition, physical activity, overweight, tobacco, child safety, and injury.

Pregnancy Risk Assessment Monitoring System

The North Carolina Pregnancy Risk Assessment Monitoring System (PRAMS)⁹ is a survey of women who have recently had a baby. The survey is sponsored by the CDC¹⁰ and is currently conducted in 35 states. Birth certificates are selected at random and then a health survey is mailed to the mother; for those who do not respond by mail, attempts are made to complete the survey via telephone. Approximately 1500 PRAMS surveys are completed each year in North Carolina usually between 3 and 5 months after birth. Statewide data for 1997-2005 are available as well as some multiyear regional data. The PRAMS sample size is not large enough to produce county-level estimates. While the major purpose of PRAMS is to collect information about risk factors for poor birth outcomes (information not available on the birth certificate), there also are some topics pertaining to women's health and chronic disease before, during, and after pregnancy.

Youth Risk Behavior Survey

In the spring of every odd numbered year, the North Carolina Healthy Schools project conducts a statewide Youth Risk Behavior Survey (YRBS)¹¹ among middle school and high school students in North Carolina. The North Carolina YRBS helps assess behaviors in youth that impact their health now and in the future. Topics include violence, personal safety, physical activity, nutrition, mental health, tobacco, drugs and alcohol, and sexual behavior (for high school students only). Estimates are produced for the state as a whole and for major regions of the state. There is also a separate YRBS for the Charlotte area. The YRBS is funded by the CDC and North Carolina data are included as part of a national surveillance system.¹²

Youth Tobacco Survey

The North Carolina Youth Tobacco Survey (YTS)¹³ provides an important source of public health data for understanding the scope of the tobacco problem and measuring progress toward overall goals among youth. The 2005 North Carolina YTS is a comprehensive statewide representative sample of more than 6000 middle and high school students. Every other year a core set of CDC¹⁴ tobacco-related questions are asked. In addition, North Carolina adds state-specific questions. In 2005 the North Carolina Tobacco Prevention and Control Branch together with the NC Health and Wellness Trust Fund added questions regarding media, community participation, and secondhand smoke attitudes. The sampling design now generates large enough numbers to produce reliable regional estimates

(Mountains, Piedmont, and Coast). North Carolina submits data to the CDC as part of the national YTS sample.

OTHER STATEWIDE SURVEILLANCE SYSTEMS

Newborn Hearing Screening Surveillance System

A Web-based tracking and surveillance database called WCSWeb was developed collaboratively by the Early Hearing Detection and Intervention Program,¹⁵ the Sickle Cell Program, and the State Laboratory of Public Health. It contains data on all infants born in North Carolina since January 1, 2004 and on all infants born in North Carolina with suspected hearing loss since newborn hearing screening was mandated in 2000. Patient information is obtained by either direct data entry by hospital, clinical, or public health staff or transfer of newborn screening data from the State Laboratory of Public Health Laboratory Information Management System (LIMS). With the implementation of WCSWeb, the Early Hearing Detection and Intervention Program is able to provide statistical information on the effectiveness of birthing facility newborn hearing screening programs. In 2006 97% of nearly 130 000 babies in North Carolina who were eligible for newborn screening services received a screening which was reported into WCSWeb. Of these babies screened at birth, 4099 or 3.2% needed further follow-up. Of these 4099 babies, 430 had diagnostic evaluation results reported into WCSWeb and 202 were confirmed with a hearing loss. Regional consultants of the Division of Public Health are making a concerted effort to educate hospitals and physicians on the importance of providing prompt rescreening for infants who do not pass the newborn hearing screening and on the use of WCSWeb to report follow-up results.

Cancer Incidence Data

The North Carolina Central Cancer Registry (CCR)¹⁶ collects data on all new cases of cancer in North Carolina. The data are collected primarily from tumor registries in the larger facilities that submit data electronically and by CCR field staff who abstract cancer case data in smaller facilities. In addition to demographic and diagnostic information, data are collected about the first course of cancer treatment. This is one of the few complete morbidity reporting systems for chronic disease in North Carolina. North Carolina participates in the National Program of Cancer Registries¹⁷ and submits data regularly to the CDC as part of the national cancer incidence database.

North Carolina Nutrition and Physical Activity Surveillance System

The North Carolina Nutrition and Physical Activity Surveillance System (NC-NPASS)¹⁸ provides indicators of body mass index status among children such as overweight, underweight, and healthy weight for each county in North Carolina and for the state as a whole. In the future NC-NPASS will monitor trends in key nutrition and physical activity behaviors such as soft drink consumption, fruit and vegetable consumption, levels of physical activity, and television viewing.

The NC Nutrition and Physical Activity Surveillance System may not be representative of the population as a whole since it is comprised primarily of data about low-income children seen in the North Carolina public health-sponsored Women, Infants, and Children (WIC) program, child health clinics, and some school-based health centers. The information on older children (who are not eligible for WIC) is especially underrepresented since it comes from a very select population who receive health care from public health clinics. Information on weight status is available only for children ages 2-18 whose height and weight were measured during a health care visit.

Pregnancy Nutrition Surveillance System

The North Carolina Pregnancy Nutrition Surveillance System (PNSS)¹⁹ monitors the prevalence of nutrition problems and behavioral risk factors among women who are enrolled in public health programs. The NC Pregnancy Nutrition Surveillance System links data from the WIC program and public maternity clinics with birth certificates and fetal death records. The system collects prenatal and postpartum information about these women and outcome information about their infants. The majority of the women in the North Carolina PNSS participate in WIC during either the prenatal or postpartum period. The Centers for Disease Control and Prevention collects and analyzes data from the states for the national PNSS.²⁰

Pediatric Nutrition Surveillance System

The Pediatric Nutrition Surveillance System (PedNSS)¹⁹ is a child-based public health surveillance system that monitors the nutritional status of low-income children in WIC and other federally funded maternal and child health programs. Data on birth weight, short stature, underweight, overweight, anemia, and breastfeeding are collected for children ages 0-18 who visit public health clinics for routine care and nutrition services including education and supplemental food. Data are collected at the clinic level and then aggregated at the county and state levels. North Carolina data are sent to the CDC for incorporation into the national PedNSS data.²⁰

Communicable Disease Data

HIV and other communicable sexually transmitted diseases (STDs) pose public health risks and thus are made reportable to public health authorities in North Carolina. Most often the cases are reported by physicians to local health departments (as required by law) which then forward the reports to the Epidemiology Section of the North Carolina Division of Public Health. Medical facilities may also report cases, usually through the infection control staff. Persons making these reports are immune from liability for doing so. Laboratory reports are sent to the Epidemiology Section and act as a trigger for investigation and reporting of cases not already in the system. The data on reported cases are used to identify risks and vulnerable populations and to design control measures to limit the spread of these diseases through the HIV/STD Prevention and Care Branch.²¹ State- and county-level data are available through the General Communicable Disease Control

Branch.²² De-identified North Carolina data are submitted to the CDC as part of the national communicable disease and HIV/STD surveillance systems. North Carolina is developing a comprehensive electronic disease reporting system called the North Carolina Electronic Disease Surveillance System (NC EDSS) that will replace paper-based reporting of communicable and other diseases between local health departments and the Division of Public Health. Initial deployment of the NC EDSS started in 2007 for tuberculosis, and other diseases are being added.

OTHER HEALTH-RELATED DATA

Medicaid Data

Medicaid is a medical insurance program for low-income North Carolinians. Since the 1980s the State Center for Health Statistics has had a cooperative relationship with the Division of Medical Assistance^{23,24} (the state Medicaid agency) that involves sharing data for planning and evaluating public health programs. The North Carolina Medicaid Management Information System captures data on all payments for medical services for adults and children enrolled in Medicaid. This is one of the few data systems available to the North Carolina Division of Public Health that contains information on the complete range of medical services provided to a defined population: inpatient, outpatient, emergency room, physician, dental, home health, nursing home, prescription drug, and hospice services. There is also an enrollment file with information on the characteristics of the Medicaid enrollees. The State Center for Health Statistics strictly protects the confidentiality of these data and produces only aggregate data reports unless specifically authorized in writing by the Division of Medical Assistance to release individual-level data. The State Center for Health Statistics has a limited capacity to meet special Medicaid data needs of programs outside the North Carolina Division of Public Health.

Health Workforce Data

The North Carolina Health Professions Data System²⁵ of the Cecil G. Sheps Center for Health Services Research has detailed county-level health workforce data including physicians by specialty, dentists, nurses, and many other health provider types. The data system also presents state and county health manpower profiles and will accept special data requests. (See <http://www.shepscenter.unc.edu/hp>.)

Population Data

Population data²⁶ are not strictly health data, but population counts are important for assessing caseloads or persons at risk when planning for provision of health services. And population data are used extensively as denominators of health-related rates. The NC State Demographics unit produces population estimates and projections with age, race (White and minority), and gender detail for North Carolina and its 100 counties. In addition, the SCHS publishes reports showing annual state demographer population estimates by county, age, race, and gender.²⁷ Population estimates from the State Demographics

unit also are provided through the SCHS Health Data Query System² which also includes more detailed race and ethnicity breakdowns.

LINKING DATA

Linking the records in different data sets can increase the utility of the separate components. After linking, the variables of both data sets become available for joint analysis and cross tabulation. For example, each year the SCHS creates a composite linked birth file²⁸ which consists of the birth certificate records linked to several health program data files: Medicaid babies, Medicaid mothers, maternity care coordination, Medicaid costs, prenatal WIC, health department prenatal care, and child service coordination. This allows for the tabulation of birth certificate measures by participation in these health service programs.

The State Center for Health Statistics annually links all infant death certificates to the corresponding birth records. This matched file²⁹ allows analysis of infant mortality by characteristics that are available only on the birth certificate such as birth weight, mother's age, mother's education, mother's self-reported race, smoking during pregnancy, and prenatal care participation.

The State Center for Health Statistics has recently linked the NC-NPASS data described above for adolescents ages 12-18 to the Medicaid paid claims and enrollment data to analyze health care utilization and expenditures by body mass index categories.³⁰ The Medicaid data alone do not capture any information on body mass index. It was found that adolescents who are overweight and at risk for overweight have higher Medicaid expenditures and

that overweight adolescents had a significantly higher incidence of diabetes, asthma, and other respiratory conditions.

USING DATA FOR EDUCATION, POLICY, PLANNING, AND EVALUATION

These public health surveillance data are used extensively for education, policy, planning, and evaluation. A few selected examples include the use of PRAMS data to develop a statewide public education and awareness campaign to reduce the risk of Sudden Infant Death Syndrome (SIDS); the use of Medicaid data, live birth data, and PRAMS data as part of a North Carolina Medicaid Program and Division of Public Health application to the federal Centers for Medicare and Medicaid Services (CMS) to obtain a family planning waiver to extend Medicaid eligibility for family planning and sexually transmitted disease services for men and women up to 185% of the federal poverty level; use of birth defects data to obtain funding for programs to reduce birth defects through the intake of folic acid; and the use of BRFSS survey data by several community-based organizations and health departments to apply for grants, guide intervention strategies, and support policy changes for their initiatives. Data are of little value unless they are used, and use of data in turn provides incentives to increase the quality of the databases. North Carolina is fortunate to have such a wealth of state and local data sources. Additional and ongoing data collection will continue to provide the state with valuable measures for determining appropriate policy interventions for improving the health of individuals and communities. **NCMJ**

REFERENCES

- 1 Vital statistics data available from SCHS. North Carolina State Center for Health Statistics Web site. <http://www.schs.state.nc.us/SCHS/bdmp>. Updated February 9, 2006. Accessed February 27, 2008.
- 2 North Carolina Health Data Query System. North Carolina State Center for Health Statistics Web site. <http://www.schs.state.nc.us/SCHS/data/query.html>. Updated March 14, 2007. Accessed February 27, 2008.
- 3 Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality Web site. <http://www.hcup-us.ahrq.gov>. Accessed February 27, 2008.
- 4 Welcome to HCUPnet. Agency for Healthcare Research and Quality Web site. <http://hcupnet.ahrq.gov/>. Accessed February 27, 2008.
- 5 North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT) Web site. <http://www.ncdetect.org>. Accessed February 27, 2008.
- 6 Behavioral Risk Factor Surveillance System (BRFSS). National Center for Chronic Disease Prevention and Health Promotion. Centers for Disease Control and Prevention Web site. <http://www.cdc.gov/brfss>. Updated January 31, 2008. Accessed February 27, 2008.
- 7 Behavioral Risk Factor Surveillance System (BRFSS). North Carolina State Center for Health Statistics Web site. <http://www.schs.state.nc.us/SCHS/brfss>. Updated December 13, 2007. Accessed February 27, 2008.
- 8 Child Health Assessment and Monitoring Program (CHAMP). North Carolina State Center for Health Statistics Web site. <http://www.schs.state.nc.us/SCHS/champ>. Updated July 19, 2007. Accessed February 27, 2008.
- 9 North Carolina Pregnancy Risk Assessment Monitoring System (PRAMS). North Carolina State Center for Health Statistics Web site. <http://www.schs.state.nc.us/SCHS/prams>. Updated January 30, 2008. Accessed February 27, 2008.
- 10 Pregnancy Risk Assessment Monitoring System (PRAMS): Home. Centers for Disease Control and Prevention Web site. <http://www.cdc.gov/prams>. Updated June 22, 2007. Accessed February 27, 2008.
- 11 NC Youth Risk Behavior Survey (YRBS). NC Healthy Schools Web site. <http://www.nchealthyschools.org/data/yrbs/>. Accessed February 27, 2008.
- 12 Healthy Youth! Data & Statistics. YRBSS: Youth Risk Behavior Surveillance System. National Center for Chronic Disease Prevention and Health Promotion. Centers for Disease Control and Prevention Web site. <http://www.cdc.gov/HealthyYouth/yrbs/index.htm>. Updated June 6, 2007. Accessed February 27, 2008.
- 13 2005 NC Youth Tobacco Survey. Tobacco Prevention and Control Branch. NC Division of Public Health, Chronic Disease and Injury Section. <http://www.tobaccopreventionandcontrol.ncdhhs.gov/data/yts.htm>. Updated December 14, 2007. Accessed February 27, 2008.

- 14 Smoking & tobacco use. National Youth Tobacco Survey (NYTS). Centers for Disease Control and Prevention Web site. http://www.cdc.gov/tobacco/data_statistics/surveys/NYTS/index.htm. Updated February 28, 2007. Accessed February 27, 2008.
- 15 North Carolina Early Hearing Detection and Intervention Program. North Carolina Department of Health and Human Services Web site. <http://www.ncnewbornhearing.org>. Updated February 27, 2008. Accessed February 27, 2008.
- 16 Central Cancer Registry. North Carolina State Center for Health Statistics Web site. <http://www.schs.state.nc.us/SCHS/CCR>. Updated August 9, 2007. Accessed February 27, 2008.
- 17 National Program of Cancer Registries (NPCR). Centers for Disease Control and Prevention Web site. <http://apps.nccd.cdc.gov/uscs/>. Accessed February 27, 2008.
- 18 Data. Eat Smart Move More North Carolina Web site. <http://www.eatsmartmovemorenc.com/data/index.html>. Accessed February 27, 2008.
- 19 Surveillance data and statistics. North Carolina Nutrition Services Branch Web site. <http://www.nutritionnc.com/nutrsurv.htm>. Accessed February 27, 2008.
- 20 Pediatric and Pregnancy Nutrition Surveillance Systems. Centers for Disease Control and Prevention Web site. <http://www.cdc.gov/pednss>. Updated June 12, 2006. Accessed February 27, 2008.
- 21 HIV/STD prevention & care. NC Division of Public Health Web site. <http://www.epi.state.nc.us/epi/hiv/>. Updated January 17, 2008. Accessed February 27, 2008.
- 22 Communicable disease control. NC Division of Public Health Web site. <http://www.epi.state.nc.us/epi/gcdc.html>. Updated February 8, 2008. Accessed February 27, 2008.
- 23 North Carolina Medicaid. Division of Medical Assistance. NC Department of Health and Human Services Web site. <http://www.dhhs.state.nc.us/dma>. Updated February 26, 2008. Accessed February 27, 2008.
- 24 County specific snapshots for NC Medicaid services. Division of Medical Assistance. NC Department of Health and Human Services Web site. <http://www.dhhs.state.nc.us/dma/countyreports/countyreports.html>. Updated May 10, 2007. Accessed February 27, 2008.
- 25 North Carolina Health Professions Data System Web site. <http://www.shepscenter.unc.edu/hp/index.html>. Updated September 18, 2007. Accessed February 27, 2008.
- 26 State demographics. North Carolina State Demographics Web site. <http://demog.state.nc.us>. Accessed February 27, 2008.
- 27 2008 County Health Data Book. North Carolina State Center for Health Statistics Web site. <http://www.schs.state.nc.us/SCHS/data/databook>. Updated January 2, 2008. Accessed February 27, 2008.
- 28 Vital statistics data available from SCHS. North Carolina State Center for Health Statistics Web site. <http://www.schs.state.nc.us/SCHS/data/vitalstats.cfm>. Updated February 9, 2006. Accessed February 27, 2008.
- 29 Buescher PA. Statistical primer. no. 14. Matched live birth/infant death files. April 2000. <http://www.schs.state.nc.us/SCHS/pdf/Primer14.pdf>. Accessed February 27, 2008.
- 30 Buescher PA, Whitmire JT, Plescia M. Relationship between body mass index and medical care expenditures for North Carolina adolescents enrolled in Medicaid in 2004. *Prev Chronic Dis.* 2008;5(1). http://www.cdc.gov/pcd/issues/2008/jan/06_0131.htm. Accessed February 27, 2008.

