

**Analyses of Behavioral Risk Factor
Surveillance System Data
for Rural Health Outcomes**

**Comparison of Health-Related Factors
Between Rural and Urban Pennsylvania Residents
Using Behavioral Risk Factor Surveillance System (BRFSS) Data**
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Using BRFSS**
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Preface

Since 1989, Pennsylvania has been collecting health-related data of adult residents as part of a national data collection program called the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS, which is administered and supported by the Centers for Disease Control and Prevention, is a rich dataset that offers an in-depth look at the health behaviors and outcomes of the American population.

The two research projects highlighted in this report used the BRFSS data to: take a closer look at the health conditions and risk factors of and the use of preventive services by Pennsylvania’s rural population; and determine if geographic targeting of public health programming was a viable option in rural Pennsylvania.

The first research project was conducted by researchers from Slippery Rock University of Pennsylvania. The research goal was to compare common health conditions, risk factors for chronic diseases, and the use of preventive health care services between rural and urban Pennsylvania residents to provide more information about the health of rural Pennsylvania residents and to inform health policies.

The second project was conducted by researchers from Pennsylvania State University. The goal of this research was to analyze patterns in health status, healthy behaviors, and health care access and use in rural Pennsylvania to determine the validity of geographic targeting of public health programming in rural Pennsylvania.

The methodologies and results of these research projects are presented in the following pages.

Table of Contents

Comparison of Health-Related Factors between Rural and Urban Pennsylvania Residents Using Behavioral Risk Factor Surveillance System (BRFSS) Data

Introduction	6	Multivariate Analysis for Selected Factors That Are Significantly Different Between Rural and Urban Pa. Residents.....	15
Goals and Objectives	6	Summary of the Multivariate Analysis.....	15
Methodology.....	6	Comparisons to the National BRFSS Data	15
Description of BRFSS	6	Summary of Comparisons of the Pa. and National BRFSS Data.....	16
Rural Definition	6	Comparisons to Healthy People 2010	16
Variable Selections and Term Definitions	7	Summary of Comparisons of the Pa. BRFSS Data to Healthy People 2010	16
Statistical Methods	8	Health Profile of Adult Rural Pa. Residents	17
Strengths and Limitations of the BRFSS Data	8	Conclusions.....	18
Results.....	9	Comparisons Between Rural and Urban Pa. Residents.....	18
Description of Study Population	9	Changes Between 1996-2005/2006.....	19
Comparisons of Health Conditions Between Rural and Urban Pa. Residents.....	9	Trends Between 1996-2005/2006.....	19
Summary of Comparisons of Health Conditions.....	10	Region-Specific Comparison of Health-Related Factors.....	19
Comparisons of Health-Related Risk Factors Between Rural and Urban Pa. Residents.....	10	Evaluations of Current Progress in Health Promotion and Disease Prevention of Pa. Residents in Comparison to National Averages and Objectives ...	20
Summary of Comparisons of Risk Factors.....	11	Health Profile of Adult Rural Pa. Residents	20
Comparisons of Recommended Preventive Services Use Between Rural and Urban Pa. Residents.....	11		
Summary of Preventive Services Use	12		
Changes in Health-Related Factors Between 1996-2005/2006 Among Rural and Urban Pa. Residents.....	12		
Summary of Changes in Health-Related Factors Between 1996 – 2005/2006	13		
Trends of Health-Related Factors from 1996 to 2006 of Rural and Urban Pa. Residents	13		
Summary of Trends of Health-Related Factors	14		
Region-Specific Comparisons of Health-Related Factors Between Rural and Urban Pa. Residents	14		
Summary of Region-Specific Comparisons of Health-Related Factors	15		
		<i>Geographic Targeting of Public Health Resources Using BRFSS</i>	
		Introduction.....	21
		Results.....	21
		Conclusions.....	21
		Policy Considerations	22

Comparison of Health Related Factors Between Rural and Urban Pennsylvania Residents Using Behavioral Risk Factor Surveillance System (BRFSS) Data

Executive Summary

This research compared common health conditions, risk factors for chronic diseases, and the use of preventive health care services between rural and urban Pennsylvania residents using data from the Behavioral Risk Factor Surveillance System (BRFSS).

The BRFSS, administered and supported by the Centers for Disease Control and Prevention (CDC), is an ongoing state-specific data collection program designed to measure behavioral risk factors in the non-institutionalized U.S. population aged 18 years or older.

Pennsylvania began the BRFSS in 1989, and has continued data collection every year since. The BRFSS data are collected by state health departments and managed by the CDC for public use.

This research, conducted in 2007, analyzed the BRFSS data files from 1996 through 2006.

The research compared rural and urban residents in terms of their health conditions (cardiovascular disease, hypertension, high blood cholesterol levels, diabetes, overweight, obesity, disability, asthma, and arthritis), risk factors (smoking, alcohol use, insufficient physical activity, and insufficient fruit/vegetable consumption), preventive services use (flu and pneumonia vaccination in seniors, blood cholesterol checks, mammograms and Pap tests for women 40 years or older, prostate cancer screening for men 40 years or older, colorectal cancer screening in individuals 50 years or older, and dental checkups), and access to health care (measured as any coverage of health insurance).

The research also examined changes and trends for these health-related measurements for emerging health issues. It also compared the Pennsylvania BRFSS data with national averages and objectives of the Healthy People 2010.

According to the 2005 Pennsylvania BRFSS data, about 37 percent of respondents lived in rural Pennsylvania.

Compared to urban Pennsylvanians, rural Pennsylvanians were more likely to suffer from heart disease, especially rural males in the 45 to 64 year old age group.

Rural residents in the 45 to 65 year old age group also had a higher prevalence of overweight, obesity and arthritis than urban residents in the same age group.

Rural seniors were more likely to have high blood cholesterol levels and rural women were more likely to have a disability compared to their urban counterparts.

Certain risk factors were more common among rural residents, including smoking, binge drinking and insufficient fruit/vegetable consumption.

According to the data, rural women were less likely to have a mammogram than urban women and rural males were less likely to have had dental checkups than urban males.

Rural residents also were less likely to have been screened for colorectal cancer than urban residents.

The research also noted an increase in overweight and obesity among Pennsylvanians, and especially rural Pennsylvanians.

Compared to the national average, rural Pennsylvanians had a higher prevalence of arthritis, smoking, and binge drinking. Rural Pennsylvania women obtained mammograms less often than the national average.

While rural and urban Pennsylvania residents had many similar health outcomes, there were certain areas in which rural residents displayed inferior outcomes. Risk factors associated with poor lifestyles were more common among rural residents, which contributed to the increased risk of obesity and chronic diseases, such as heart problems.

Introduction

Rural populations in the U.S. are generally older, poorer and less healthy than their urban counterparts (Taylor et al., 2002). According to the U.S. Census Bureau, Pennsylvania has the nation's third largest rural population.

Across the U.S., the rural population increased at a slower rate than the urban population between 1990 and 2000 (12 percent vs. 14 percent). However, Pennsylvania's rural population grew faster than its urban population during that same period (4 percent vs. 3 percent).

While Pennsylvania's rural population increased, there was a 31 percent decline in rural hospital beds from 1990 to 2000 (The Center for Rural Pennsylvania, 2006). Rural residents in Pennsylvania also had fewer health care providers. About one-third of Pennsylvanians lived in rural areas but only 14 percent of physicians, 15 percent of registered nurses, 15 percent of dentists, and 17 percent of dental hygienists practiced in rural counties. There were almost 50 percent fewer physicians, 33 percent fewer registered nurses, 33 percent fewer dentists, and 24 percent fewer dental hygienists for every 1,000 rural residents as there were for urban residents (Office of Health Equity, 2006).

To monitor disease trends and inform policies for health care in rural Pennsylvania, this research evaluated the frequency of health conditions, chronic disease or injury risk factors, and the use of preventive health care services among Pennsylvania rural residents. It also made comparisons with the state's urban population.

Goals and Objectives

This research was conducted to compare common health conditions, risk factors for chronic diseases, and the use of preventive health care services between rural and urban Pennsylvania residents using the data from the Behavioral Risk Factor Surveillance System (BRFSS).

BRFSS is administered and supported by the Centers for Disease Control and Prevention (CDC) and is an ongoing state-specific data collection program designed to measure behavioral risk factors in the non-institutionalized U.S. population aged 18 years or older.

The overall research goal was to provide more information about the health of rural Pennsylvania residents so that policymakers would have more information from which to formulate effective health policies.

More specifically, the research:

- Compared the 2005/2006 BRFSS data between rural and urban Pennsylvania residents;
- Assessed changes in health-related factors over the 10-year period of 1996 to 2005-2006 for both rural and urban residents using the BRFSS data;

- Identified emerging health trends among rural and urban residents using the longitudinal BRFSS data;
- Analyzed the BRFSS data specifically for certain demographic factors; and
- Compared Pennsylvania's BRFSS data to national data.

Methodology

Description of BRFSS

The Behavioral Risk Factor Surveillance System (BRFSS) is a collaborative project of the Centers for Disease Control and Prevention (CDC) and U.S. states and territories. The BRFSS, administered and supported by the CDC's Behavioral Surveillance Branch, is an ongoing data collection program designed to measure behavioral risk factors in the U.S. adult population (18 years of age or older) living in households. The objective of the BRFSS is to collect uniform and state-specific data on preventive health practices and risk behaviors that are linked to chronic diseases, injuries, and preventable infectious diseases in the adult population (Centers for Disease Control and Prevention, 2005).

The BRFSS data collection system was initiated in 1984, and is currently in place in all states. Pennsylvania began the BRFSS in 1989, and has continued data collection every year since then.

Data collection in the BRFSS is managed by state health departments with the guidelines provided by CDC. The data collected by state health departments are then transmitted to the Behavioral Surveillance Branch of the National Center for Chronic Disease Prevention and Health Promotion at CDC for editing, processing, weighting, and analysis. Edited and weighted data files are provided to state health departments each year, and are available on CDC's website as public domain data.

This project used the BRFSS data files from 1996 through 2005/2006 downloaded from CDC's website.

The BRFSS data are collected from a random sample of adults (one per household) through a telephone survey. The survey response rate in Pennsylvania was about 46 percent in both 2005 and 2006 (http://www.cdc.gov/brfss/technical_infodata/quality.htm, accessed October 5, 2007).

Rural Definition

The research used the Center for Rural Pennsylvania definition of a rural county as follows: a rural county has a population density of less than 274 persons per square land mile. Based on this definition, 48 of Pennsylvania's 67 counties are rural. Both rural and urban counties were identified by the federal municipal identification number (FIPS codes) from the BRFSS data sets.

Variable Selections and Term Definitions

Rural/Urban Comparison

The Pennsylvania BRFSS data were used to compare health conditions, chronic disease or injury risk factors, and recommended preventive services use between rural and urban Pennsylvania residents. The 2005 BRFSS data were used for all analyses related to health conditions and chronic disease or injury risk factors, while the 2006 BRFSS data were used for all analyses related to preventive services use, since such measures were not available in the 2005 BRFSS.

The research examined the following health conditions: cardiovascular disease, hypertension, high blood cholesterol levels, diabetes, overweight, obesity, disability, asthma, and arthritis. Cardiovascular disease consisted of heart disease, heart attack, and stroke. Overweight was defined as a body mass index (BMI) of 25 or above, and obesity as a BMI of 30 or above. Disability was identified as a limitation in any activities because of physical, mental, or emotional problems. Health problems of heart disease, heart attack, stroke, diabetes, asthma, heart disease, hypertension, high blood cholesterol level, and arthritis were self-reported as being told by a doctor.

The research evaluated the following risk factors: smoking, alcohol use, physical inactivity, insufficient fruit/vegetable consumption, car seatbelt use, and driving under the influence. Smoking status was defined as current smokers (smoke everyday and some days) and former smokers. Alcohol use was classified as heavy drinkers (adult men having more than two drinks per day and adult women having more than one drink per day) and binge drinkers (adult men having five or more drinks on one occasion and adult women having four or more drinks on one occasion). Insufficient physical activity (including no physical activity) was defined as an adult not meeting the criterion of 30 minutes or more of moderate physical activity for five or more days per week or vigorous physical activity for 20 minutes or more, three or more days per week. Insufficient vigorous physical activity (including no vigorous physical activity) was determined when an adult did not have 20 minutes or more of vigorous physical activity three or more days per week.

Consuming less than five servings of fruits/vegetables per day was considered insufficient.

Risk factors for injuries measured were driving under the influence (drunk and driving) in the past month, and not using a car seatbelt most of the time. These above-mentioned risk factors were selected because they were collected over time in the BRFSS and most of them are among the objectives of Healthy People 2010, a national and statewide health promotion and disease prevention agenda.

The lack of recommended preventive services use was measured and compared between rural and urban residents. Factors examined included: adults age 65 years and older who did not have a flu shot in the past year, adults age 65 years and older who never had a pneumonia vaccination, adults 18 years and older who did not check their blood cholesterol in the past five years or never checked their blood cholesterol, women 40 years and older who did not have a mammogram for breast cancer screening in the past two years, women 18 years and older who did not have a Pap test for cervical cancer screening in the past three years, men 40 years and older who did not have prostate cancer screening in the past two years, adults 50 years and older who did not have a blood stool test in the past two years or never had a sigmoidoscopy/colonoscopy for colorectal cancer screening, and no dental checkup in the past year. The percentage of individuals without health insurance coverage was measured as access to health care.

Changes from 1996 to 2006

The 1996 and 2005/2006 BRFSS data were analyzed to examine the changes in health-related factors during the 10-year period for both rural and urban residents. The 2005 prevalence rates of health conditions and risk factors, and the 2006 prevalence rates for the lack of preventive services use were compared to those in 1996 separately for rural and urban residents.

Because the BRFSS data were available at both time points, the researchers were able to measure the following health conditions: hypertension, high blood cholesterol levels, diabetes, overweight, obesity, and arthritis.

The risk factors measured were: current smoking, binge drinking, insufficient or no physical activity, and insufficient fruit/vegetable consumption.

The lack of prevention services use included no flu shots in the past year for adults 65 years old and older, no blood cholesterol check in the past five years for adults 18 years and older, no mammogram for women 40 years and older, no Pap test for women 18 years and older, no sigmoidoscopy/colonoscopy for adults 50 years and older, and no dental checkup for the past year.

The percentage of individuals without health insurance was also evaluated for changes during the 10-year period.

Health Trends

To identify any emerging health trends among rural and urban residents between 1996 through 2005/2006, the researchers calculated prevalence rates year by year for health conditions, risk factors, and the use of preventive services. The BRFSS collects data on certain measures every year and some measures only in selected years. Thus, this analysis was performed only for the measures that were available from most years during the 10 years.

Trends were evaluated separately for rural and urban residents for diabetes, overweight, obesity, current smoking, binge drinking, no physical activity, insufficient fruit/vegetable consumption, no flu shots for adults 65 years and older, no mammogram for women 40 years and older, no Pap test for women 18 years and older, no blood stool test or sigmoidoscopy/colonoscopy for adults 50 years old and older, and no health insurance coverage.

Demographic Analysis

To provide more meaningful results that are specific to unique groups of Pennsylvanians, the researchers stratified the analyses related to current health conditions, risk factors and the use of preventive services according to the following characteristics: gender (male/female); age group (18-44/45-64/65+); race (white/other); income (<\$35,000/\$35,000+); and education (high school education or less/post high school education). These categories were chosen because of the assurance of a reasonable sample size in each category. Due to a small sample size of minorities in the Pennsylvania data, the researchers used the “other” category to include black, Hispanic (including white Hispanics) and all other races, and were unable to stratify change and trend analyses for this category.

The data were analyzed specifically for three regions – east, central, and west. The researchers compared rural and urban residents in these three regions for measures that had a reasonable sample size ($n \geq 100$), including hypertension, high blood cholesterol, overweight, obesity, disability, arthritis, current smoking, insufficient or no physical activity, insufficient fruit/vegetable consumption, no cholesterol check in the past five years, no dental checkup in the past year, and no blood stool test for colorectal cancer screening in adults 50 years and older.

Comparison with National Data

The current health status of rural and urban Pennsylvania residents was compared to the national BRFSS data – the national average. The current health status of rural and urban Pennsylvania residents was also compared to the objectives of Healthy People 2010 to identify any discrepancy between Pennsylvania rural residents and the national objectives for the measures available in the BRFSS. Healthy People 2010 was designed to identify the most significant preventable threats to health and to establish national goals to reduce these threats.

Statistical Methods

The major task of this project was data analysis. The researchers performed univariate analyses, such as a description of the study population, and an assessment of bivariate associations between rural status and health-related measures. They generated prevalence rates of health conditions, risk factors, and preventive services use. They

calculated prevalence rates by dividing the number of persons with an event of interest, (such as a health condition) by the total number of survey participants in the same group. They then evaluated the differences in prevalence rates between rural and urban residents for statistical significance. Ninety-five percent confidence intervals were provided for all prevalence rates, so that a range of rate estimates was available. The analysis identified independent correlates of certain health measures to identify if rural status was independently associated with a health measure after controlling for other related factors.

All analyses used weighted data to adjust for non-response and non-coverage of the survey so that the results were representative to Pennsylvania. These adjustments were made by applying weights in all analyses. Weights were provided by the CDC and were available in the BRFSS data files. For all data analyses, the significance level, at which a result is meaningful, was set at 0.05.

Strengths and Limitations of the BRFSS Data

The BRFSS methodology has been used and evaluated by the CDC and participating states since 1984. The content of the survey questions, questionnaire design, data collection, procedures, interviewing techniques, and data processing have been carefully developed to improve data quality. In general, data from the BRFSS are extremely reliable and valid.

There were several limitations in this study. First, the BRFSS data are collected by telephone. Individuals who live in households without a residential telephone are not included. Therefore, the BRFSS might exclude persons of lower socioeconomic status or households with cellular phones only. Second, the survey is based on non-institutionalized populations and excludes persons residing elsewhere, such as nursing homes or long-term-care facilities. Third, the BRFSS data are self-reported by respondents, which can be subject to recall bias. Fourth, the sampling frame of the BRFSS is the entire state, therefore, some rural areas might be represented by relatively few interviews. Fifth, many analyses could not be conducted for rural areas because of small sample sizes. Sixth, health conditions are reported based on diagnoses, so the data could overlook individuals whose health problems have not been tested or recognized. Finally, the BRFSS over-sampled older adults in recent years, so the proportion of older adults in the BRFSS data is greater than that in the Census data. Because of these limitations, some results from this study might be either underestimated or overestimated.

Table 1: Demographic Characteristics of the Pennsylvania Participants in the 2005 BRFSS

	ALL n (%)*	Rural n (%)*	Urban n (%)*
Rural/Urban Status	13,378 (100)	5,879 (37)	7,499 (63)
Sex			
Male	4,957 (48)	2,197 (47)	2,760 (48)
Female	8,421 (52)	3,682 (53)	4,739 (52)
Age			
18-44	4,711 (46)	2,044 (46)	2,667 (47)
45-64	5,142 (34)	2,255 (33)	2,887 (34)
65 or older	3,525 (20)	1,580 (20)	1,945 (20)
Race			
White	11,189 (85)	5,488 (93)	5,701 (81)
Black	1,357 (8)	112 (2)	1,245 (11)
Hispanic	255 (3)	79 (3)	176 (4)
Other	421 (4)	71 (2)	200 (4)
Income			
<\$15,000	1,681 (10)	806 (12)	875 (8)
\$15,000-\$24,999	2,430 (17)	1,173 (20)	1,257 (15)
\$25,000-\$34,999	1,661 (14)	812 (16)	849 (12)
\$35,000-\$49,999	1,955 (18)	869 (20)	1,086 (17)
\$50,000 or more	3,745 (43)	1,351 (33)	2,394 (48)
Education Level			
Less than H. S.	1,380 (10)	668 (11)	712 (9)
H. S. Graduation	5,466 (39)	2,757 (46)	2,709 (35)
Some Post Secondary	2,920 (23)	1,238 (23)	1,682 (22)
College or Higher	3,587 (28)	1,207 (21)	2,380 (33)

* % is based on weighted data adjusted for study design, non-response, and stratification to reflect specifically for the Pennsylvania population.

Results

Description of the Study Population

A total of 13,378 Pennsylvania residents participated in the 2005 BRFSS. Table 1 describes the study population that represented Pennsylvania non-institutionalized residents who were 18 years or older by rural/urban status. There were nearly 5 percent more females than males overall. About 20 percent of the study population was 65 years old or older, which was similar for both rural and urban residents. Almost 85 percent of the study population were white, 8 percent were black, 3 percent were Hispanic, and 4 percent were other races. Rural counties had a larger proportion of white residents than urban counties (93 percent vs. 81 percent). Nearly 40 percent of families had an annual income of less than \$35,000. Rural residents were more likely to be from

low income families. Approximately 10 percent of the study population had a less than high school education, 39 percent finished high school, and 28 percent received a college or higher education. Rural residents were less likely to graduate from a college than urban residents (21 percent vs. 33 percent). Based on the 2005 BRFSS data, 37 percent of Pennsylvanians resided in a rural county, and 63 percent lived in an urban county.

Comparisons of Health Conditions Between Rural and Urban Pa. Residents

The research compared common health conditions between rural and urban Pennsylvania residents. Compared to urban residents, rural residents had a significantly higher prevalence rate of heart disease (6 percent vs. 5 percent) and heart attack (5 percent vs. 4 percent). Although rural residents were more likely

to have high blood cholesterol (38 percent), overweight (63 percent), obesity (27 percent), disability (20 percent), arthritis (33 percent), and poor health status (5 percent) than urban residents, the differences were not statistically significant.

Urban residents showed a higher prevalence rate of stroke (3 percent) and hypertension (27 percent) than rural residents, though the differences were not significant. The occurrences of diabetes and asthma were similar between rural and urban residents.

When the researchers stratified the comparisons of health conditions between rural and urban Pennsylvania residents by gender, a higher prevalence rate of heart disease remained significant for males. Rural males were also more common to report a poor health status than urban males (5 percent vs. 3 percent). However, stroke was significantly lower among rural males than urban males (1 percent vs. 3 percent). Rural females were significantly more likely to have a disability than urban females (21 percent vs. 18 percent). All other comparisons were similar between rural and urban residents in both genders.

Age-specific comparisons of health conditions showed that rural residents age 45 to 64 years had significantly higher prevalence rates of heart disease (7 percent vs. 4 percent), overweight (73 percent vs. 67 percent), disability (25 percent vs. 20 percent), and arthritis (44 percent vs. 39 percent) than urban residents of the same age; however, a complaint of poor health status was lower among rural residents than urban residents in the same age group (4 percent vs. 7 percent). For the age group of 65 years or older, all measured health conditions were comparable between rural and urban residents, except for high blood cholesterol, which was significantly higher among rural residents (55 percent vs. 49 percent). Conversely, high blood cholesterol was more common in urban residents age 18 to 44 years

than rural residents of the same age group (19 percent vs. 24 percent).

When comparing the health conditions between rural and urban Pennsylvania residents by race, the research found no significant difference between rural and urban minority residents, probably due to the small number of races other than white in the dataset.

When comparing health conditions by family income, the research found no statistically significant difference between rural and urban Pennsylvania residents from families with an income of \$35,000 or more.

However, rural residents from families with incomes of less than \$35,000 had a significantly higher prevalence rate of overweight (67 percent vs. 62 percent) and obesity (32 percent vs. 28 percent) than urban families with incomes of less than \$35,000. Stroke, though, was more common among urban residents than rural residents from families with incomes of less than \$35,000 (5 percent vs. 3 percent).

There were no significant differences observed between rural and urban residents who had a post high school education for all health conditions measured. For those with an education level of high school or less, urban residents were more likely than rural residents to have a stroke (3 percent vs. 2 percent) and hypertension (34 percent vs. 30 percent).

Summary of Comparisons of Health Conditions

Rural residents were more likely than urban residents to suffer from heart disease and heart attacks, especially rural males age 45 to 64 years. Rural residents age 45 to 64 years also had a higher prevalence of overweight, obesity and arthritis than urban residents of the same age group.

Rural seniors (65+ years) were more likely to have high blood cholesterol levels than urban seniors. Overweight and obesity were more widespread among rural residents with low family incomes compared to their urban counterparts. Compared to urban females, rural females were more likely to have disabilities.

Comparisons of Health-Related Risk Factors Between Rural and Urban Pa. Residents

Risk factors, including smoking, alcohol use, physical inactivity, and fruit/vegetable consumption, were compared between rural and urban Pennsylvania residents using the 2005 BRFSS data.

Rural residents had a significantly higher current smoking rate than urban residents (25 percent vs. 23 percent). The majority of smokers smoked every day. The proportion of former smokers was similar between rural and urban residents. Slightly more rural residents reported being binge drinkers than urban residents, but the difference was not significant.

Overall physical activity and vigorous physical activity were measured as “not met recommendation” (including either insufficient or no physical activity) and “no physical activity at all.” The differences of these physical activity measures were not statistically significant between rural and urban residents: about half of the population reported insufficient or no physical activity and more than 25 percent of the population had insufficient or no vigorous physical activity.

The proportion meeting the recommendation of consuming five or more servings of fruits/vegetables per day was very low among rural and urban residents; however, there were significantly more rural residents than urban residents who consumed less than five servings of fruits/vegetables per day (80 percent vs. 74 percent).

When comparing health-related risk factors between rural and urban Pennsylvania residents by gender, the current smoking rate was higher in both male and female rural residents compared to their urban counterparts; however, the difference was more significant in females (25 percent vs. 21 percent).

A similar trend was also observed for binge drinking: significantly more rural females reported binge drinking than urban females (11 percent vs. 8 percent).

For physical activity, male rural residents were significantly less likely to have insufficient or no physical activity than male urban residents (47 percent vs. 52 percent). The significance of a higher proportion of rural residents who did not have five or more fruits/vegetable per day remained for both males and females.

When comparing health-related risk factors between rural and urban Pennsylvania residents in three age groups, the current smoker rates were significantly higher among young rural residents (age 18 to 44 years) than young urban residents (34 percent vs. 28 percent), higher but not significant among the rural middle age group (age 45 to 64 years) than the urban middle age group (25 percent vs. 22 percent), and significantly lower among older rural residents than older urban residents (7 percent vs. 11 percent). A similar trend was observed for the percentage of people who smoked daily. The higher proportion of rural residents who did not consume enough fruits/vegetables remained significant for the young and middle age groups.

Comparing health-related risk factors between rural and urban Pennsylvania residents specifically by family incomes, the research found that individuals from families with incomes of less than \$35,000 were more likely to smoke than individuals from families with incomes of \$35,000 or more. However, among families with incomes of \$35,000 or more, rural residents were significantly more likely to be current smokers than urban residents (22 percent vs. 18 percent). For families with incomes of less than \$35,000, rural residents were slightly less likely to be

current or former smokers than urban residents, although the differences were not significant. Among individuals from families with incomes of less than \$35,000, rural residents had a higher prevalence rate of heavy drinking than urban residents (6 percent vs. 4 percent). The proportion of those not consuming enough fruits/vegetables was significantly higher among rural residents than urban residents among both family income levels.

The researchers compared health-related risk factors between rural and urban Pennsylvania residents specifically by education level. Overall, individuals with an education level of high school or less displayed a higher prevalence rate for all risk factors measured in the BRFSS than individuals with an education level greater than high school. However, no significant differences of any risk factors were observed between rural and urban residents for both education levels, except that insufficient consumption of fruits/vegetables was more common among rural residents.

Summary of Comparisons of Risk Factors

The current smoking rate was higher among rural residents than urban residents, and the difference was greater for females, younger residents (18 to 44), and individuals with family incomes of \$35,000 or more. Rural females were also more likely to be binge drinkers than urban females. Among individuals from families with lower income levels (less than \$35,000), rural residents were more likely to be heavy alcohol drinkers than their urban counterparts. Fruit/vegetable consumption was low for all Pennsylvanians, especially rural residents.

Comparisons of Recommended Preventive Services Use Between Rural and Urban Pa. Residents

The researchers compared the use of recommended preventive services

use between rural and urban Pennsylvania residents. Preventive services use and early diagnosis of many diseases can affect prompt treatment and more effective health outcomes.

Preventive services measured in the BRFSS included immunization (such as flu shots and pneumonia vaccination), blood cholesterol level checks, mammograms for breast cancer, Pap smear tests for cervical cancer, prostate cancer screening, colorectal cancer screening (blood stool tests and sigmoidoscopy/colonoscopy), and dental checkups.

The use of preventive services was measured specifically for the recommended age and time intervals. Access to health care was measured as any health insurance coverage. The 2006 BRFSS data were used for the comparisons of preventive services use between rural and urban Pennsylvania residents except for cholesterol level checking, which was from the 2005 BRFSS data.

Most of the measured preventive services were used similarly by rural and urban Pennsylvania residents. However, women 40 years and older from rural areas had a significantly higher rate of not having a mammogram for breast cancer screening than women of the same age group from urban areas (27 percent vs. 23 percent). Rural women also had a slightly higher (non-significant) rate of not having Pap test screenings for cervical cancer than urban women (19 percent vs. 16 percent). Rural residents 50 years and older were significantly less likely to have had a sigmoidoscopy/colonoscopy for colorectal cancer screening than urban residents of the same age group (48 percent vs. 38 percent). There was a slightly higher and significant rate for not having a dental checkup in the past year among rural residents than urban residents (31 percent vs. 28 percent).

Gender-specific comparisons of preventive services use between rural and urban residents showed that there

was no difference between rural and urban women for not having a dental checkup in the past year. However rural men were significantly less likely to have had a dental checkup in the past year than urban men (31 percent vs. 25 percent). The significant difference between rural and urban residents remained in both men and women for not having a sigmoidoscopy/colonoscopy for colorectal cancer screening.

Comparisons of preventive services use between rural and urban residents by age showed that none of the differences between rural and urban residents in the 18 to 44 age group were significant.

For the 45 to 64 age group, the only significant difference was the use of sigmoidoscopy/colonoscopy, which was much lower among rural residents (53 percent vs. 42 percent). Several significantly lower preventive services uses were observed among rural residents in the 65 and older age group, including no Pap test in women (39 percent vs. 29 percent), no sigmoidoscopy/colonoscopy (42 percent vs. 30 percent), and no dental checkup in the past year (40 percent vs. 30 percent).

Race-specific comparisons of preventive services use between rural and urban residents showed a similar pattern between whites and the overall study population. For other races, rural residents had a lower use of flu shots, cholesterol level checks, Pap tests, and sigmoidoscopies/colonoscopies, while urban residents had a lower use of pneumonia vaccination, mammograms in women, prostate cancer screenings in men, dental checkups, and a higher chance of not having any health insurance; however, none of these differences was significant due to a small number of other races in the study population.

Comparisons of preventive services use between rural and urban residents by income showed that individuals from families with incomes of less than \$35,000 were less likely

to have mammograms and Pap tests in women, dental checkups, and health insurance no matter if they lived in rural or urban areas. Although the difference was not significant, older rural residents from families with incomes of less than \$35,000 were more likely to have had flu shots and pneumonia vaccinations. For families with incomes of \$35,000 or more, the only significant difference observed was that rural residents had a higher rate of not having sigmoidoscopies/ colonoscopies (47 percent vs. 35 percent).

Individuals with education levels of high school or less were less likely to use preventive services whether they lived in a rural or urban area, including flu shots, pneumonia vaccinations, Pap tests in women, prostate cancer screenings in men, dental checkups, and having health insurance. The only observed significant difference was the lower use of sigmoidoscopy/ colonoscopy in rural residents than in urban residents among all education levels.

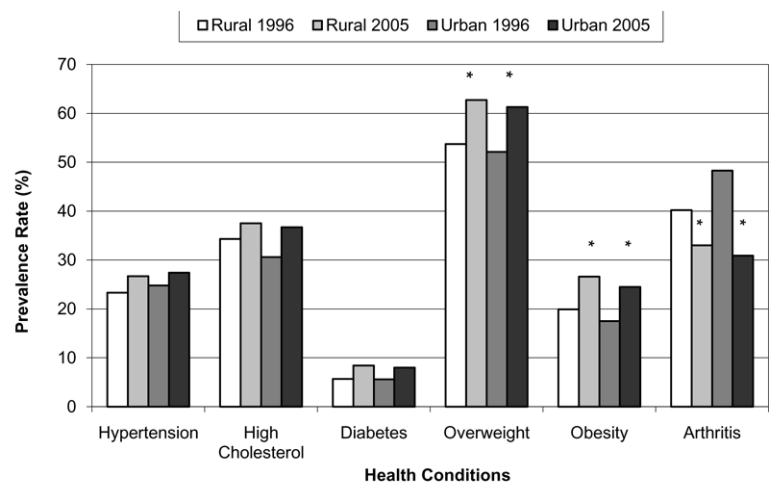
Summary of Preventive Services Use

Rural women were less likely to have a mammogram than urban women. The use of sigmoidoscopy/colonoscopy was less common among rural residents than urban residents, no matter what gender, age or income level. A higher percentage of rural males did not have dental checkups in the past year compared to urban males. Rural seniors (65+ years) were less likely to have Pap tests and dental checkups in the past year than urban seniors.

Changes in Health-Related Factors Between 1996 – 2005/2006 Among Rural and Urban Pa. Residents

Health-related factors, which were available in the BRFSS in 1996 and in 2005/2006, were evaluated for changes over time. These factors included health conditions, such as hypertension, high blood cholesterol levels, diabetes, overweight, obesity, and arthritis; risk factors, such as smoking, alcohol use, lack of physical activity, and insufficient fruit/vegetable consumption; use of preventive services, such as flu shots, cholesterol checks, mammograms and Pap tests in women, sigmoidoscopies/colonoscopies for colorectal cancer screenings, and dental checkups; and any health insurance coverage. The data for changes in health conditions and risk factors were from the 1996 BRFSS and the 2005 BRFSS, and the data for changes in use of preventive services were from the 1996 BRFSS and the 2006 BRFSS.

Figure 1: Changes in Health Conditions from 1996 to 2005 in Both Rural and Urban Pennsylvania Residents, BRFSS

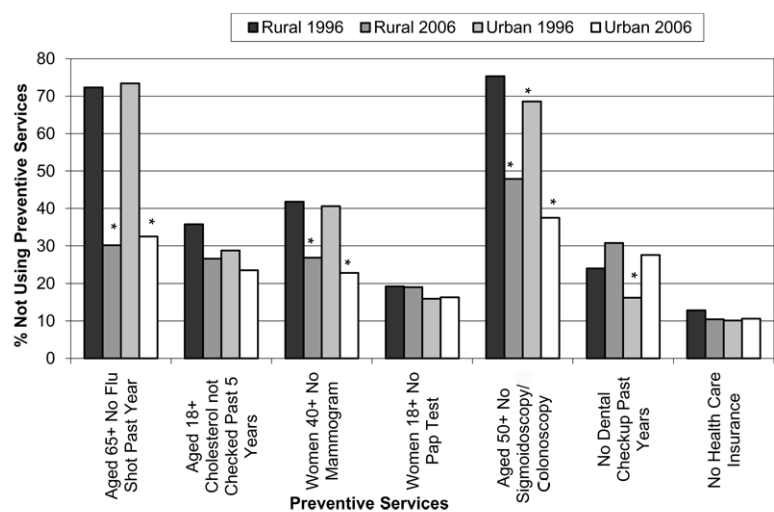


* Significant changes (p -value < 0.05) in 10 years.

Figure 1 shows the prevalence rates of several health conditions for rural and urban residents in 1996 and in 2005. Overweight and obesity significantly increased over the 10 years: overweight increased by nearly 15 percent and obesity increased by more than 26 percent. In addition to the increase in overweight and obesity, there was a non-significant increase in weight-related health conditions, such as hypertension, high blood cholesterol, and diabetes, in both rural and urban residents. However, arthritis significantly decreased over these 10 years, especially among urban residents.

In the comparison of prevalence rates for selected risk

Figure 2: Changes in Use of Preventive Services from 1996 to 2006 in Both Rural and Urban Pennsylvania Residents, BRFSS



*Significant changes in 10 years.

factors for health problems in both rural and urban residents in 1996 and in 2005, the research found virtually no changes for current smoking rates, binge drinking rates, and insufficient fruit/vegetable consumption over the 10 years for both rural and urban residents. However, there was a positive change in physical activity: a significantly lower percentage of people reported insufficient physical activity or no physical activity in 2005 compared to 1996 for both rural and urban residents.

Several preventive service use rates increased over time. Figure 2 shows the percentages of rural and urban residents who did not use preventive services as recommended in 1996 and 2006. The percentages for not having flu shots, mammograms, and sigmoidoscopy/colonoscopy decreased significantly for both rural and urban residents over this time period. The percentage of individuals who did not check their blood cholesterol level also decreased, especially among rural residents. The percentage of women who did not have a Pap test was almost identical in 1996 and 2006. The proportion of individuals without health insurance did not change significantly over this time span. The proportion of individuals who did not have a dental checkup for the past year increased significantly from 1996 to 2006 in both rural and urban areas.

Summary of Changes in Health-Related Factors Between 1996 – 2005/2006

There were no significant differences observed for changes in health-related factors between rural and urban residents. For both rural and urban residents, the prevalence of overweight and obesity increased, while the prevalence of arthritis decreased. The percentage of individuals with insufficient or no physical activity decreased. Lack of flu shots, mammograms, sigmoidoscopies/

colonoscopies, and blood cholesterol level checks also decreased over time. However, the percentage of individuals without dental checkups in the past year increased. The percentage of the population without health insurance did not change over this time period.

Trends of Health-Related Factors from 1996 to 2006 of Rural and Urban Pa. Residents

Trends of health-related factors, which were available from 1996 to 2006, were identified for both rural and urban Pennsylvania residents. These health-related factors included diabetes, overweight, obesity, current smoking, binge drinking, no leisure physical activity, insufficient fruit/vegetable consumption, no flu and pneumonia vaccinations in the elderly, no blood cholesterol checks, no mammograms and Pap tests in women, no blood stool tests and sigmoidoscopy/colonoscopy, and no health insurance.

The trend of diabetes shows a significant increase from 1996 to 2006 for both rural and urban residents: from 6 percent to 9 percent among rural residents, and from 6 percent to 8 percent among urban residents. For most years, rural residents had a higher prevalence rate of diabetes than urban residents. However, the difference between rural and urban residents was not significant for all years.

Overall, the prevalence of overweight and obesity increased from 1996 to 2006 among rural and urban residents. For almost all years, rural residents had higher prevalence rates of overweight and obesity than urban residents, although the difference was significant only for obesity in 2000, 2003 and 2004. The trend of overweight seemed to increase continuously; however, the trend of obesity has reversed since 2004 among rural residents.

The trend for current smoking rates have been consistent since

1996, although a recent decrease was observed from 2005 to 2006 in rural residents and from 2003 to 2006 in urban residents. For most years, rural residents had a higher smoking rate than urban residents, and the difference was significant in 2005 and 2006. Binge drinking trends were also examined. No data were available for binge drinking in 1998 and 2000. The trend of binge drinking was steady over the time period, except for 2003 when rural residents had a significantly lower rate of binge drinking than urban residents.

Data for leisurely physical activity were not available before the year 2000. The trend of no physical activity did not show any specific pattern. In 2000 and 2004, significantly more rural residents did not have leisurely physical activity than urban residents, while the differences between rural and urban residents were not significant in other years. However, from 2005 to 2006, there were significantly fewer rural residents without leisurely physical activity.

The food guidelines developed by the U.S. Department of Agriculture recommend at least five servings of fruits or vegetables per day. However, the percentages of both rural and urban residents who did not meet these guidelines were very high. For most years with available data, a significantly higher percentage of rural residents did not consume at least five servings of fruits/vegetables compared to urban residents.

The researchers looked for trends of older adults (65 years or older) who did not receive flu shots in the past year in both rural and urban residents. There were no flu shot data collected in 1998 and 2000. In most years with available data, about 30 to 40 percent of older adults did not have flu shots, and there was no significant difference between rural and urban residents.

More rural women did not have mammogram screenings for breast

cancer than urban women consistently over the years, although the trend of not having a mammogram was decreasing in both rural and urban women. The difference in the percentage of rural and urban women without mammograms was significant in the years of 1997, 1999, and 2006.

The trend of not having a Pap test for cervical cancer decreased from 1998 to 2000, but slightly increased afterward in both rural and urban women. Rural women had a higher rate of not having a Pap test than urban women; however, the difference was significant only in 1999. No mammogram and Pap test data were available in 2001, 2003, and 2005.

Data related to colorectal cancer screening were only available in 1996, 1999, 2002, 2004, and 2006. The percentage of individuals without a sigmoidoscopy/colonoscopy decreased tremendously between 1996 and 2006 in both rural and urban areas. However, rural residents had a significantly higher percentage of individuals who did not have a sigmoidoscopy/colonoscopy than urban residents for all years with available data except for 1999.

Access to health care was measured by health insurance coverage. The percentage of individuals without health insurance had been consistently higher among rural residents than urban residents until 2006, and the differences between rural and urban areas were significant for the years of 1997, 1999, 2002 and 2004. The trend in rural areas shows that the lowest percentage of individuals without health insurance was in 2000 (9 percent). Since then, the trend increased and reached the peak of 14 percent in 2004, before dropping. However, the trend in urban areas has continuously increased since 2001.

Summary of Trends of Health-Related Factors

In general, the trends of health-related factors between 1996 and 2006 showed similar patterns for rural and urban residents. Overweight, obesity and diabetes were increasing, especially among rural residents. Smoking was declining; however, the speed of decline was slower among rural residents than urban residents. Consistently more rural residents did not have mammograms, Pap tests, and sigmoidoscopies/colonoscopies during this time period. The trend of no health insurance among rural residents decreased since 2004, and the percentage of residents without health insurance was consistently higher among rural residents than urban residents except for 2006.

Region-Specific Comparisons of Health-Related Factors Between Rural and Urban Pa. Residents

This section presents region-specific comparisons of health-related factors between rural and urban residents. Due to a small sample size after stratifying the study

population by region, the researchers were only able to provide valid results for the health conditions of hypertension, high blood cholesterol levels, overweight, obesity, arthritis, and disability; the risk factors of current smoking, insufficient or no physical activity, and insufficient consumption of fruits/vegetables; and the preventive services use of cholesterol level checks, blood stool tests for screening colorectal cancer, and dental checkups. Data used for the analyses related to medical conditions and risk factors were from the 2005 BRFSS. Data for preventive services use were from the 2006 BRFSS, except for the cholesterol check variable that used the 2005 BRFSS data.

The comparison shows that individuals from central Pennsylvania were less likely to have hypertension, and individuals from the east were less likely to have high blood cholesterol levels. No significant differences were observed for both health conditions by region between rural and urban residents.

In comparisons between the prevalence rates of overweight and obesity between rural and urban residents by three regions, the differences were small. However, the eastern region had the lowest prevalence rates of overweight and obesity. The difference between rural and urban residents in each region was not significant.

The central region had the lowest disability prevalence rate compared to the eastern and western regions. Rural residents seemed to have a higher prevalence rate of disability than urban residents in the east and central regions, although the differences were not statistically significant. Individuals, including rural and urban residents, from the west had a much higher prevalence rate of arthritis than those from the other two regions.

Lifestyle related risk factors were compared between rural and urban residents by region. Rural residents from all three regions were more likely to report insufficient or no physical activity, and the difference between rural and urban residents was significant for those in the east. Rural residents from the central and western regions had a significantly higher rate of insufficient fruit and vegetable consumption than urban residents. Current smoking was more common among rural residents in the eastern and western regions, and the difference was significant for the west.

The use of three preventive services was compared between rural and urban residents by regions. Rural residents were less likely to have their blood cholesterol checked in the past five years than urban residents in all three regions, but the differences were not significant. There were no meaningful variations in dental checkups and blood stool tests for colorectal cancer among the three regions, and the differences between rural and urban residents were not significant for all regions.

Summary of Region-Specific Comparisons of Health-Related Factors

Although there were no differences between rural and urban residents within a region, the prevalence of high blood cholesterol was lowest in the east, arthritis was most common in the west, and the central region had the lowest rate of hypertension and disability. In the east, rural residents were more likely to smoke and less likely to participate in physical activity than urban residents. In the central region, more rural residents reported insufficient fruit/vegetable consumption than urban residents. In the west, rural residents had higher rates of smoking and insufficient fruit/vegetable consumption compared to urban residents.

Multivariate Analysis for Selected Factors That Are Significantly Different Between Rural and Urban Pa. Residents

The prevalence of heart disease and heart attack was significantly higher among rural residents than urban residents in Pennsylvania. This difference remains even after stratification by gender and age. In the multivariate analysis, heart disease and heart attack were combined to create a new variable of any coronary heart disease (CHD). Included in a multivariate model were factors that were associated with CHD in the univariate analysis and factors that might have a relationship with CHD, such as age, gender, smoking, alcohol use, no physical activity, overweight, higher cholesterol, hypertension, and diabetes. This multivariate model evaluated the independent influence of being a rural resident on CHD after adjusting for other possible factors that might contribute to CHD occurrence.

Male gender, old age, hypertension, high blood cholesterol and overweight were all significantly associated with CHD. Compared to females, the risk for CHD was higher among

males. Individuals with hypertension and high blood cholesterol, and who were overweight had a higher risk of CHD. However, after controlling for these risk factors, being a rural resident was still a significant factor linked with an increased chance of CHD.

Rural Pennsylvania residents had a higher current smoking rate compared to urban residents in the earlier univariate analysis. In the multivariate model, binge drinking and no physical activity were significantly and independently associated with current smoking. After controlling for drinking and physical activity, rural residents still had a 14 percent increased risk of current smoking; however, the association was not statistically significant. The results indicate that smoking, alcohol use, and no physical activity were all associated with each other.

The earlier univariate analysis also showed a higher percentage of rural Pennsylvania residents consuming less fruits/vegetables than recommended compared to urban residents. In the multivariate model, male gender, binge drinking, no physical activity, and current smoking were all significantly and independently associated with insufficient consumption of fruits/vegetables. After controlling for these factors, a rural resident still had a 39 percent increase in the chance of not consuming sufficient fruits/vegetables.

The results of the multivariate analysis indicate that rural residents had a cluster of poor lifestyles, including alcohol use, smoking, lack of physical activity, and insufficient consumption of fruits/vegetables.

Summary of the Multivariate Analysis

Living in a rural area was a significant and independent risk factor for heart disease. Rural residents showed a cluster of risk factors from poor lifestyles, including alcohol use, smok-

ing, lack of physical activity, and insufficient consumption of fruits/vegetables.

Comparisons to the National BRFSS Data

To evaluate if there were any differences in health-related factors between Pennsylvania and the nation, selected health conditions, risk factors, and use of preventive services in both rural and urban Pennsylvania residents were compared to those of the population average of the U.S. using the national BRFSS data available at the CDC's website. In comparisons for hypertension, high blood cholesterol and diabetes, the differences were not statistically significant, although both rural and urban Pennsylvania residents had higher prevalence rates of hypertension, high blood cholesterol and diabetes compared to the national average.

The prevalence rates of disability, asthma, and poor health status were similar between Pennsylvania residents and the national population. However, arthritis was significantly more common among Pennsylvania residents, especially among rural residents, than the national population. This finding related to arthritis might contribute to the fact that a larger proportion of rural residents than urban residents and the national average were elderly.

Current smoking rates were highest among rural Pennsylvania residents, followed by urban Pennsylvania residents, and national residents. No significant difference was observed for heavy alcohol drinking. Rural Pennsylvania residents were significantly more like to report binge drinking than the national population.

Compared to the national average, there were significantly fewer seniors without a flu shot in the past year among rural Pennsylvania residents. All Pennsylvania seniors were also more likely to have had a pneumonia vaccine, although the finding was

not statistically significant. The percentages of adults who never had their cholesterol levels checked were about the same between rural Pennsylvania residents and the national population, and a slightly lower percentage of urban Pennsylvania residents never had their cholesterol levels checked.

Rural Pennsylvania residents were less likely to use some of the available preventive services, such as mammograms, Pap tests and prostate cancer screenings, than the national population, and the difference was significant for women 40 and older without mammograms.

The rates of blood stool tests for colorectal cancer screenings were similar between Pennsylvania residents and the national population. The use of sigmoidoscopy/colonoscopy was significantly lower among rural Pennsylvania residents than urban Pennsylvania residents, but not significantly different from the national average.

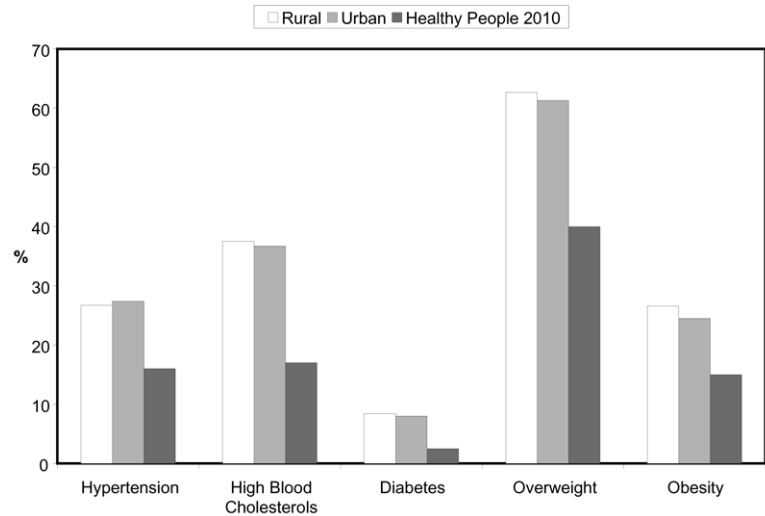
The percentage of adults without a dental checkup in the past year was significantly higher among rural Pennsylvania residents than urban Pennsylvania residents, but not significantly different from the national average.

Both rural and urban Pennsylvania residents had a significantly lower proportion of individuals who did not have any health insurance than the national population.

Summary of Comparisons of the Pa. and National BRFSS Data

Compared to the national population, rural Pennsylvania residents had a higher prevalence of arthritis, were

Figure 3: Comparisons of Selected Health Conditions for Rural and Urban Pennsylvania Residents to the Objectives of Healthy People 2010



more likely to be current smokers and to experience binge drinking. Women aged 40 and older were less likely to have had a mammogram in the past two years. However, more rural Pennsylvania seniors had flu shots in the past year, and fewer rural Pennsylvania residents did not have health insurance coverage.

Comparisons to Healthy People 2010

Selected health-related factors were compared to the national objectives in Healthy People 2010.

Only the objectives that were comparable to the measures used in this study were evaluated. Figure 3 shows that the prevalence rates of hypertension, high blood cholesterol levels, diabetes, overweight and obesity in both rural and urban Pennsylvania residents were significantly higher than the national objectives.

Both rural and urban Pennsylvania residents showed higher prevalence rates of current smoking and binge drinking compared to the objectives of Healthy People 2010.

The percentage of seniors with flu shots and pneumonia vaccinations were lower among both rural and urban Pennsylvania residents than the national objectives. However, the percentage of Pennsylvania residents, both rural and urban, who visited a dentist were higher than the national objectives.

Summary of Comparisons of the Pa. BRFSS Data to Healthy People 2010

Neither rural nor urban Pennsylvania residents met the Healthy People 2010 objectives

Figure 4: Self-Reported General Health Status (%) by Age in Rural Pennsylvania Population

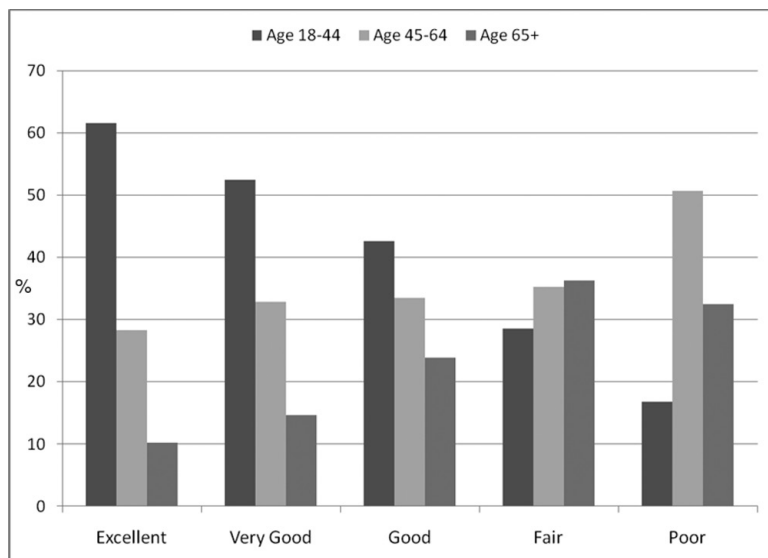
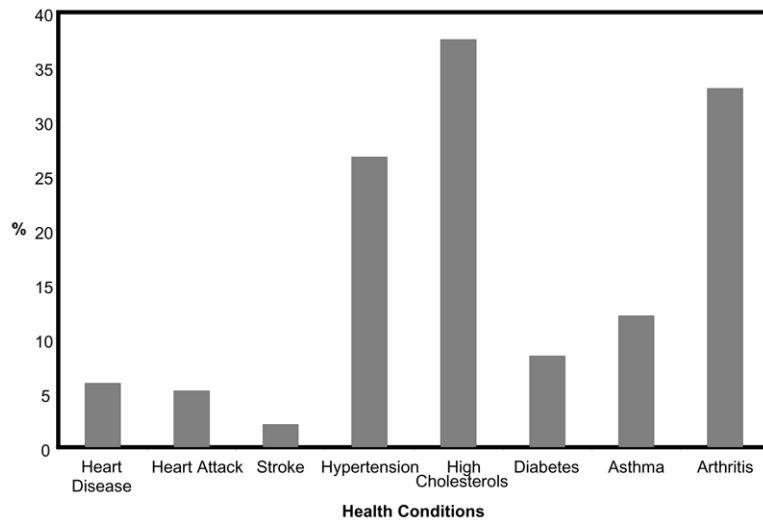


Figure 5: Prevalence Rate (%) of Selected Health Conditions among Rural Pennsylvania's Population



that were related to the measures used in this study, including selected health conditions (hypertension, diabetes, high blood cholesterol levels, overweight and obesity), risk factors (current smoking and binge drinking), and use of preventive services (flu shots and pneumonia vaccination). However, the percentages of both rural and urban Pennsylvania residents who visited a dentist for preventive checkup were higher than the national objectives.

Health Profile of Adult Rural Pa. Residents

Although various comparisons have been presented earlier in great detail between rural and urban residents for different health-related factors, this section summarizes most findings about rural Pennsylvania residents to yield a health profile of the rural adult population aged 18 years and older.

The 2005 BRFSS data revealed that 37 percent of respondents resided in rural Pennsylvania counties. Nearly 53 percent of the rural population was female. The proportion of the rural population decreased in younger age groups. Male population exceeded female population in every age group except for those 65 years and older,

in which the female population was about 28 percent higher than the male population. More than 20 percent of the rural adult population was 65 years or older, which was 3 percentage points higher than the U.S. population of the same age group. The vast majority of the rural population was white (93 percent). Two thirds of rural families (67 percent) had an annual income of less than \$50,000, compared to 58 percent of the U.S. population. One in every five adults (21 percent) in rural communi-

ties completed a college education or above, while nationally 31 percent of the population had that level of education. Slightly more than 60 percent of rural adults were married, 9 percent were divorced, 9 percent were widowed, 2 percent were separated, 17 were never married, and 3 percent lived with a partner.

Since sampling methods are different between the BRFSS and the Census, variations in the demographics might exist between the two data sources.

Most rural residents reported having a good general health status, with 12 percent of individuals ranking their health status as fair and 5 percent as poor (Figure 4).

Figure 5 shows the prevalence rate of selected health conditions among the rural population. The most common health condition was high blood cholesterol levels (38 percent), while nationally 36 percent of the population had high blood cholesterol levels.

The second most common health condition among the rural population was arthritis (33 percent), compared to 27 percent nationwide, followed by hypertension (27 percent), which was comparable to the national prevalence rate.

Figure 6: Life-Quality Related Factors among Rural Pennsylvania's Population

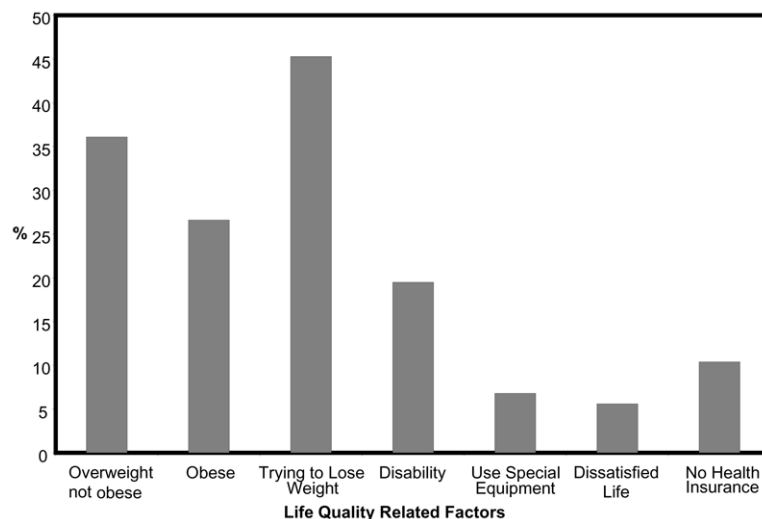
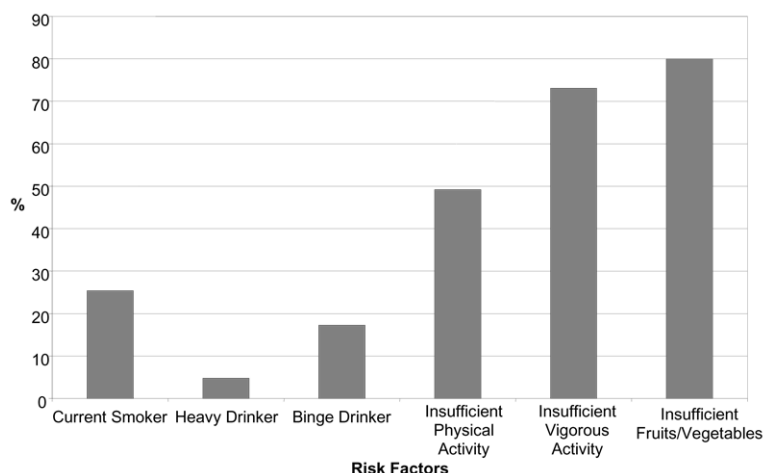


Figure 7: Prevalence Rate (%) of Risk Factors among Rural Pennsylvania's Population



The research evaluated several life-quality related factors (Figure 6). About 6 percent of the rural population was dissatisfied with their life. Nearly 20 percent of rural residents experienced some kind of disability, and 7 percent needed to use special equipment for their health problems. About 27 percent of the rural Pennsylvania population was obese (nationally 24 percent), and another 36 percent was overweight. More than 45 percent of rural adults were trying to lose weight.

About 11 percent of the rural population had no health insurance coverage.

Figure 7 summarizes the prevalence rate of selected risk factors among the rural Pennsylvania population. One in every four rural adults was currently smoking. Although

only 5 percent of rural residents were classified as heavy drinkers, 17 percent were binge drinkers. The binge drinking rate was 14 percent in the nation. Nearly half of the rural population did not meet the recommended physical activity levels, which were 30 or more minutes of moderate physical activity five or more days per week, or vigorous physical activity for 20 or more minutes three or more days per week.

Four in every five rural residents (80 percent) consumed less than five servings of fruits/vegetables (77 percent for the U.S population) per day.

Figure 8 shows the percentage of rural Pennsylvania residents who did not use recommended preventive services, including immunization for older adults, screenings for breast cancer, cervical cancer, prostate cancer and colorectal cancer, and dental checkups. Overall, the use of all these preventive services was lower among rural Pennsylvania residents than the national average.

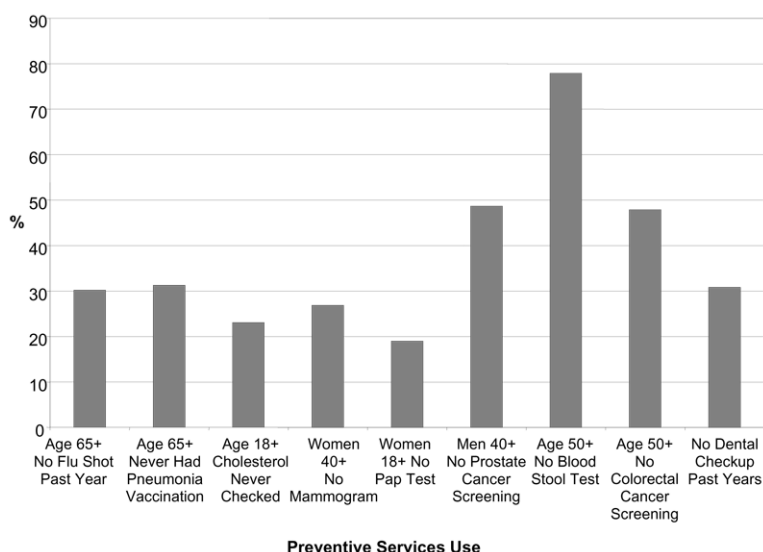
Conclusions Comparisons Between Rural and Urban Pa. Residents

In the U.S., heart disease is currently the leading cause of death. Heart disease is significantly more common in rural residents than urban residents in Pennsylvania, especially among rural middle-aged men. A number of risk factors are associated with the occurrence of heart disease, including smoking, overweight, poor diet, sedentary lifestyle, high blood pressure, high blood cholesterol, diabetes, and family history.

The results of this study showed that rural Pennsylvanians were also more likely to have these above-mentioned risk factors for heart disease. Compared to their urban counterparts, rural residents in the middle age group (45 to 64) and in families with lower incomes were more likely to be overweight and obese. Rural seniors were more likely to have high blood cholesterol than urban seniors. Current smoking rates were higher among rural residents than urban residents. Fruit/vegetable consumption was consistently insufficient among rural residents. All these risk factors might contribute to the higher rate of heart disease among rural residents, although the BRFSS data were cross-sectional and the temporal relationship was not clear.

Overweight and obesity is a significant public health problem in the U.S. in general, and in Pennsylvania in particular. More than

Figure 8: Preventive Services Use among Rural Pennsylvania's Population



60 percent of Pennsylvanians were overweight and one in every four Pennsylvanians was obese. However, this problem was worse among the middle age group in rural areas and among individuals from families with lower incomes. Rural residents in the middle age group were also more likely to have arthritis, a condition often associated with overweight.

Smoking contributes to severe health problems, including heart disease. Current smoking rates were significantly higher among rural residents than urban residents, and the difference was even greater among females and those in the young age group. Along with smoking more, rural women were also more likely to experience binge drinking than urban women. Smoking and alcohol drinking are two important risk factors for the health of women and children.

The results of this research indicated that rural residents were more likely to have a cluster of risk factors indicating poor lifestyles, including smoking, alcohol use, lack of physical activity, and insufficient consumption of fruits/vegetables. All these factors increase the risk of overweight, obesity, heart disease, diabetes, high blood cholesterol level, and overall poor health.

The use of preventive services was lower among rural residents than urban residents in Pennsylvania. Rural women were less likely to have a mammogram than urban women. Rural seniors were less likely to have a Pap test than urban seniors. The use of sigmoidoscopy/colonoscopy was less common among rural residents of any gender and/or socioeconomic status compared to their urban counterparts. Having a dental checkup in the past year was less likely among rural males and rural seniors compared to their urban counterparts.

This research also identified some areas where rural residents had better indicators of health than urban residents. Stroke rates were lower among rural men than urban men. Rural men were also more likely to participate in physical activity than urban men. In the young age group, rural residents had a lower prevalence of high blood cholesterol than urban residents. In the middle age group, fewer rural residents complained about a poor health status than urban residents.

Changes Between 1996-2005/2006

Health-related factors were evaluated for changes between 1996–2005/2006 in both rural and urban Pennsylvania. For both rural and urban residents, the prevalence of overweight and obesity increased significantly during this time period: overweight increased by nearly 15 percent and obesity increased by more than 26 percent. The positive changes observed were that a lower percentage of Pennsylvanians reported insufficient or no physical

activity in 2005/2006 compared to 1996. The prevalence of arthritis has decreased over time.

The use of preventive services increased during this time period for flu shots, mammograms, sigmoidoscopies/colonoscopies, and blood cholesterol level screenings. However, fewer individuals had a dental checkup in the past year in 2005/2006 compared to 1996. The percentage of the population without health insurance did not change noticeably during this time period. The changes of these health-related factors were similar between rural and urban residents, and none of the differences between rural and urban residents was significant.

Trends Between 1996-2005/2006

To identify emerging health problems, the research evaluated several health-related factors between 1996 and 2006. Overall the trends of these health-related factors during this time period showed similar patterns for rural and urban residents. Overweight, obesity and diabetes were continuously increasing overtime, indicating they were emerging, especially among rural residents.

The trend of smoking was declining; however, the speed of decline was slower among rural residents than urban residents.

The trend of no physical activity was unstable with more rural residents lacking sufficient physical activity in most years.

Consistently more rural residents than urban residents consumed insufficient fruits/vegetables each year, and this trend was still increasing among rural residents.

The trend of receiving a flu shot was similar between rural and urban seniors. The variation in percentages of seniors who received a flu shot might be due to the fact that there was a flu vaccine shortage in some years during the study period.

Although the trends showed similar patterns, more rural women did not have mammograms and Pap tests than urban women in every year, and the trend of not having a Pap test was slightly increasing since the year 2000.

The trend of no sigmoidoscopy/colonoscopy was decreasing for both rural and urban residents, although rural residents still lagged behind urban residents. However, the use of blood stool tests was decreasing since the year 2002, which might be due to the increase in the use of sigmoidoscopy/colonoscopy, a more accurate screening for colorectal cancer.

The trend of no health insurance among rural residents increased from 2000 until 2004, and then decreased since 2004. Although the trend of no insurance was similar for urban residents, the percentage of residents without health insurance was consistently higher among rural residents than urban residents except for the year 2006.

Region-Specific Comparison of Health-Related Factors

The prevalence of high blood cholesterol was lowest in the east, and arthritis was most common in the west. The central region had the lowest rate of hypertension and disability. In the east, rural residents were more likely to smoke and less likely to participate in physical activity than urban residents. In the central region, more rural residents reported insufficient fruit/vegetable consumption than urban residents. In the west, rural residents had higher rates of smoking and insufficient fruit/vegetable consumption compared to urban residents.

Evaluations of Current Progress in Health Promotion and Disease Prevention of Pa. Residents in Comparison to National Averages and Objectives

The comparisons of health-related factors between rural and urban Pennsylvania residents and the national averages of the BRFSS data showed that most of the factors compared in this study were similar between Pennsylvania residents and the national population.

Some areas that deserve attention are higher involvement in smoking and binge drinking among rural Pennsylvania residents. These risk factors are closely linked to chronic diseases and injuries, so health education and intervention need to be reinforced in rural areas.

The other main finding was a lack of mammograms among rural Pennsylvania women compared to the national average. Improved education on the importance of mammograms and better access to preventive care services among rural women are crucial.

Neither rural nor urban Pennsylvania residents met the Healthy People 2010 objectives that related to the measures used in this study, including selected health conditions (hypertension, diabetes, high blood cholesterol levels, overweight and obesity), risk factors (current smoking and binge drinking), and the use of preventive services (flu shots and pneumonia vaccination). However, the percentage of both rural and urban Pennsylvania residents visiting a dentist for preventive checkups was higher than the national objectives. The comparisons show that Pennsylvania has a long way to go to reach these national health objectives.

Health Profile of Adult Rural Pa. Residents

Although most measures were similar between rural and urban residents, rural residents had a higher proportion of seniors (especially female seniors), whites, and low income families. More than 80 percent of rural residents ranked their health status as good or excellent. Hypertension, high blood cholesterol levels, and arthritis were the most common health conditions among rural adults. Compared to urban residents, rural residents were more likely to be overweight and obese, and more than 45 percent of rural adults were trying to lose weight. Some prevalent risk factors observed among rural residents were smoking, binge drinking, lack of physical activity, and insufficient fruit/vegetable consumption. Most of the measures of preventive services use were similar between rural and urban residents; however, rural residents were less likely to use certain cancer screenings, such as screenings for breast cancer and colorectal cancer.

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Geographic Targeting of Public Health Resources Using BRFSS

Executive Summary

In 2007-2008, researchers analyzed patterns in health status, healthy behaviors, and health care access and use in rural Pennsylvania using the Behavioral Risk Factor Surveillance System (BRFSS). The goal of the research was to determine the validity of geographic targeting of public health programming in rural Pennsylvania.

In general, the research found little evidence to support the use of geographic targeting of public health resources. It also determined that local primary care physician and dentist supplies do not largely affect health care use.

Introduction

Using data from the BRFSS, the researchers analyzed patterns in health status, healthy behaviors, and health care access and use in rural Pennsylvania. They also investigated the effect of local provider supply on health care use.

The research consisted of three analyses. The first was a description of the geographic distribution of total and primary care physicians in Pennsylvania.

The second was an exploration of the effect of local primary care physician supply on health care access and use in rural Pennsylvania.

And the third was a documentation of urban-rural differences for selected public health indicators, changes in the indicators over time for the rural sample, and patterns in the indicators by community characteristics for the rural sample.

Results

In general, the analyses revealed little evidence for the use of geographic targeting of public health resources. This was true for targeting based on community characteristics and rural location.

In terms of targeting based on community characteristics, the researchers found few differences in health status, healthy behaviors, and use by community type.

In terms of rural location, the researchers found that rural respondents exhibited a higher public health need on all three types of indicators. However, for most indicators, the differences were not substantial and often depended on the composition of the rural population.

Therefore, the researchers debated if specially designed resource distribution should be centered around these small differences. However, they also recognized that limitations of the research should not lead to any definitive conclusions on the use of geographic targeting as a strategy for the distribution of public health resources. The BRFSS sample does not include adequate subsamples to test the need for public health resources in specific communities.

The research also found that the local primary care physician and dentist supplies had very little effect on health care access and use in rural areas.

The researchers set up three models of the relationship between local provider supply and health care use as potential scenarios. In the first scenario, the local provider supply was consistently related to health care use. In the second scenario, the local provider supply had little effect on health care use. And in the third, a limited local provider supply might inhibit health care use, but only for some groups and/or some types of care.

The results of this analysis were most consistent with the second of the three model scenarios and largely inconsistent with the first scenario. Although the research offered little support for the third scenario, the researchers suggest that methodological limitations might have impacted the results.

Conclusions

In general, the research suggested the following: there was little evidence to support geographic targeting of public health resources, and the effect of local primary care physician and dentist supply on health care use was largely inconsequential.

Despite the absence of positive findings, the research results included several findings that should be noted, as follows:

- Regardless of the measurement method employed, rural physician supplies were significantly lower than urban supplies. The difference was characteristic of all categories of physicians and for the total supply of physicians.
- Family practice physicians were the most equitably distributed physician specialty. All other primary care physicians were distributed in patterns resembling the total physician workforce.
- Metropolitan areas always had higher physician supplies, while more remote areas of the commonwealth had lower supplies.
- An individual's sex, age, income, and whether he/

she was in a health plan affected health care access and use. In general, females, older persons, higher income persons, and persons with a health plan use health care more often and are more likely to have a regular source of care.

- For the rural population, distance from a city had no effect on health care access and use (after controlling for other community factors).
- Health status differences between urban and rural Pennsylvanians were found on a variety of indicators, including diabetes, asthma, total tooth loss, self-reported health status, overweight and obesity, high cholesterol, and arthritis. For all cases except asthma, rural residents were less healthy. In general, the differences were substantively small.
- Healthy behavior differences between urban and rural Pennsylvanians were found on several indicators including regular exercise, wearing seatbelts, and eating fruits and vegetables. In all three cases, rural residents exhibited less healthy behavior than urban residents. The differences were generally small, although the difference for fruit and vegetable consumption between urban and rural Pennsylvanians was almost 5 percent.
- Health care access and use differences between urban and rural Pennsylvanians were found on a variety of indicators including having a health plan, having a dental visit in the previous year, visiting a dentist in the last 5 years, obtaining a pneumonia vaccination, obtaining an HIV test, obtaining a mammogram, obtaining a sigmoidoscopy or colonoscopy, and having blood cholesterol tested. In all cases, rural residents used health care less. Some differences were substantial: HIV test (9 percent), sigmoidoscopy or colonoscopy (8 percent), and blood cholesterol (6 percent).
- For about half of the 18 public health related indicators for which an urban-rural difference was found, the population composition was primarily responsible for the statistically significant finding.
- In rural Pennsylvania, diabetes rates increased, colonoscopy and sigmoidoscopy use increased, and bloodstool testing dropped between 2002-2003 and 2005-2006.
- The southeast, north central, and south central Pennsylvania Department of Health regions generally had better self-reported health status and healthy behaviors than the northeast, northwest and southwest regions. The southeast region generally scored higher than the other regions with respect to health care use.

- Although only for limited indicators and somewhat inconsistently, residents of communities with higher poverty rates and residents of more remote communities had poorer scores on public health-related indicators.

Policy Considerations

The following are policy considerations determined by the research results:

- Further research could inform policy related to public health resource distribution and the distribution of health care providers. The Pennsylvania Department of Health could coordinate its BRFSS local sample program to produce information that could better serve statewide planning needs.
- Policies that are designed to achieve physician supply equality should focus on strengthening the family practice workforce. Several policies could enhance the family practice workforce including: (1) reimbursement equality or bonuses for family practice/primary care services through Pennsylvania's medical assistance program, (2) grants to encourage the development and support for family practice residency programs, and (3) making (some of the) financial support for medical schools contingent upon graduate placements in primary care, in Pennsylvania, and in rural Pennsylvania.
- Health care coverage rates in rural areas are significantly less than those in urban areas. Special provisions for rural populations should be incorporated into any proposed plan.
- Rural populations reported more negative health statuses, fewer healthy behaviors, and less health care use than urban populations. In general, these differences are important but not large enough to warrant special programs or initiatives for rural areas. More important, however, is the incidence in the population as a whole. Much of what is noteworthy is well-known among public health professionals, including the high incidence of obesity and overweight, a growing incidence of diabetes and hyperglycemia, and poor nutritional practices. All of these trends could be addressed through public education, health provider education, and reimbursement for services related to education, diagnosis, and treatment.

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