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**Closing the Rural Mortality Gap?**

**An examination of 10-year cardiovascular mortality trends in  
Washington and Aroostook Counties, Maine**

**Christy Daggett**

**Capstone Project for the  
Master of Public Policy and Management program  
University of Southern Maine**

**Lisa Morris, Capstone Advisor**

**Fall 2013**

# Closing the Rural Mortality Gap?

## *An examination of 10-year cardiovascular mortality trends in Washington and Aroostook Counties, Maine*

*Christy Daggett, MPP Candidate '13, Muskie School of Public Service*

### I. INTRODUCTION

#### ❖ *Overview*

This study examines a significant reduction in cardiovascular disease (CVD) mortality<sup>1</sup> in two rural, white, low-income counties in Maine over 1999-2009: Washington County and Aroostook County. Two similar counties with similarly high rates of CVD mortality—Penobscot and Piscataquis - were selected as comparators. The study considers different factors known to correlate with CVD mortality, including behavioral risk factors, co-morbid conditions, insurance coverage, and social determinants of health.

#### ❖ *The Rural/Urban Divide in CVD Mortality Rates*

The dramatic 60% decline in CVD death rates over the second half of the 20<sup>th</sup> century is one of the great achievements of medicine and public health. The decline is attributed both to medical advances and to a drastic decline in the percentage of the US population using tobacco, from a high of 42% in 1965 to 19.3% in 2010<sup>2</sup>.

However, behind the CVD success story, disparities in disease and mortality remain to the extent that it has been suggested that “coronary heart disease has shifted from a disease of the privileged to one of the disadvantaged.”<sup>3</sup> Heart disease, cancer, and stroke are the top three killers of Americans. The ratio of metropolitan to non-metropolitan cancer mortality has declined consistently over the past 20 years, but rural stroke and heart disease (CVD) mortality has remained persistently high, and is the main driver of the rural “mortality penalty”.<sup>4</sup>

National mortality rates for metropolitan and non-metropolitan areas were similar and declined together until about 1990, when the mortality decline in nonmetropolitan areas

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<sup>1</sup> CVD mortality is defined by the World Health Organization as death caused by “hypertensive diseases, ischemic heart diseases, pulmonary heart disease and diseases of pulmonary circulation, other forms of heart disease, cerebrovascular diseases (stroke), diseases of arteries, arterioles and capillaries, diseases of veins, lymphatic vessels and lymph nodes, not elsewhere classified, and other diseases of the circulatory system.” This study uses the WHO definition of CVD mortality.

<sup>2</sup> Centers for Disease Control and Prevention, National Center for Health Statistics. FASTSTATS: Smoking. <http://www.cdc.gov/nchs/fastats/smoking.htm>. Accessed August 23, 2012.

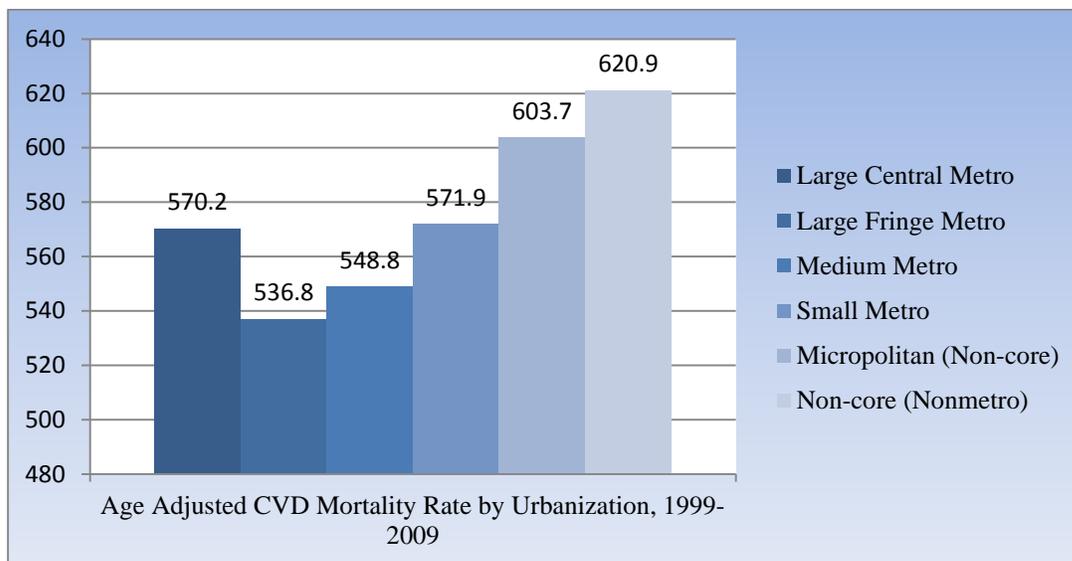
<sup>3</sup> Wing S. Social inequalities in the decline of coronary mortality. *Am J Public Health* 1988 November; 78(11): 1415-1416.

<sup>4</sup> Cossman J, James W, Cosby A, and Cossman R. Underlying causes of the emerging nonmetropolitan mortality penalty. *Am J Public Health*, 2010 August; 100(8):1417-1419.

slowed dramatically. In essence, mortality for all causes continues to decline in urban areas, but the rate of decline in rural areas has slowed to the extent that a gap in life expectancy opened in the 1990s and is still widening. Before 1990, the annual average difference in nonmetropolitan mortality amounted to 5.8 excess deaths per 100,000. By 2001-2004 (the most recently available data), the rural “mortality penalty” had reached 71.7 excess deaths per 100,000.<sup>5</sup>

Based upon this, it is not surprising that the 10 year CVD mortality rate of 620.9/100,000 for non-core American counties over 1999-2009 is significantly higher than the mortality rate of 570.2/100,000 in large metros, or 536.8/100,000 in large fringe metros, 548.8/100,000 in medium metro areas, and 571.9/100,000 in small metro areas. (See Figure 1)

**Figure I: 10-Year CVD Mortality Rates, U.S. Men and Women Aged 35+, by Urbanization**



### ❖ *The Case for Researching County-Level CVD Mortality*

Many factors correlate with high cardiovascular mortality rates: smoking, diabetes, obesity, inactivity, hypertension (high blood pressure), lack of health insurance, and poverty are prime culprits. Many of these factors are preventable. Beyond the toll on individuals and families, the costs of heart attack and stroke treatment and mortality are high. State-level data show that heart attacks cost MaineCare \$29 million per year: stroke costs \$55 million.<sup>6</sup>

<sup>5</sup> Cosby A et al. Primary evidence for an emerging nonmetropolitan mortality penalty in the United States. *Am J Public Health*, 2008 August; 98(8): 1470-1472.

<sup>6</sup> Drewette-Card, Rebecca. Preventing and controlling cardiovascular disease and diabetes in Maine: Maine cardiovascular health and diabetes strategic plan 2011-2020. Maine Department of Health and Human Services/Maine Center for Disease Control and Prevention. June 2011

During the period of 1990 to 2004, it has been estimated that an excess 389,000 deaths in rural America were attributable to the nonmetropolitan penalty.<sup>7</sup> More recently, researchers found that life expectancy for women is *declining* in about 43% of rural counties – with especially steep declines for white women without high school diplomas.<sup>8</sup> A separate large study pinpointed Washington County, Maine, as the only county in the Northeastern US to see women’s life expectancy decline over 1983-1999.<sup>9</sup> Since cardiovascular mortality is a prime driver of premature death in rural areas, and is known to be highly responsive to risk factor modifications, focusing on successful county-level strategies to reduce cardiovascular risk and mortality may be the best way to close the rural mortality gap.

## II. BACKGROUND

### ❖ CVD Mortality in Rural Maine

While rates of CVD death in Maine generally are lower than in the rest of the United States, Maine has one of the highest rates of CVD mortality in New England at 504/100,000, and rates are particularly high in the rural northern half of the state, ranging from 526.6 – 600.2 deaths/100,000.<sup>10</sup> In particular, the stroke rate in northeastern counties is above the US average.<sup>11</sup>

Washington, Aroostook, Penobscot, and Piscataquis Counties had the highest CVD mortality rates in Maine over 1999-2009 (*See Figure II*). The 10-year rate in Washington County was the highest at 600.2 deaths/100,000, followed by Penobscot (592), Aroostook (579) and Piscataquis (574.7).<sup>12</sup> Penobscot County is one of 3 Maine counties classified as metropolitan by the US Census Bureau, while the other 3 counties are rural. Cumberland County, ranked first among Maine counties both in urbanization and in median household income, had the lowest rate of CVD mortality (430)

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<sup>7</sup> Cosby A et al.

<sup>8</sup> Kindig D and Cheng E. Even as mortality fell in most US counties, female mortality nonetheless rose in 42.8 percent of counties from 1992 to 2006. *Health Affairs*, March 2013 vol. 32 no. 3 451-458

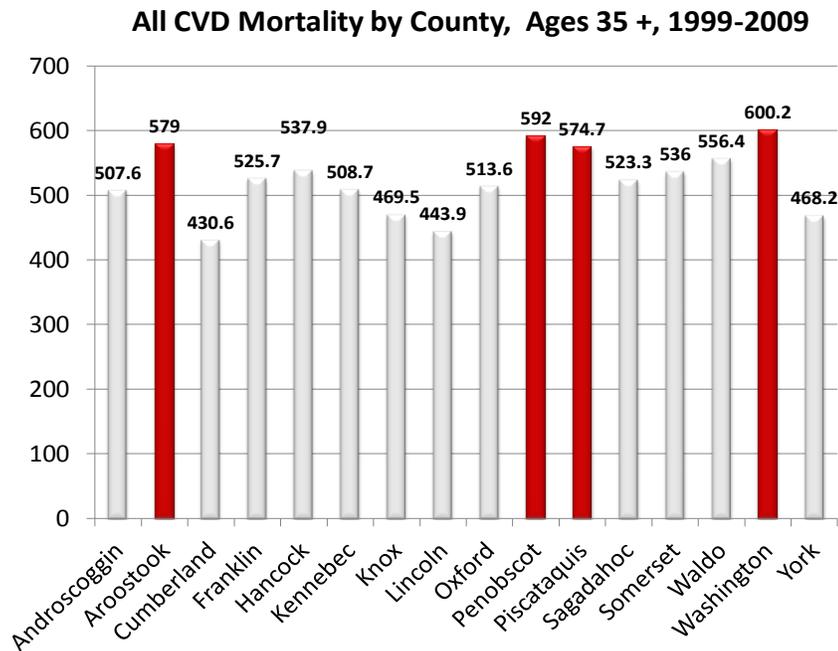
<sup>9</sup> Ezzati M, Friedman A, Kulkarni S, Murray C. The reversal of fortunes: trends in county mortality and cross-county mortality disparities in the United States. *PLoS Med.* 2008 Apr 22;5(4):e66.

<sup>10</sup> Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2009 on CDC WONDER Online Database, released 2012. Data for year 2009 are compiled from the Multiple Cause of Death File 2009, Series 20 No. 2O, 2012, Data for year 2008 are compiled from the Multiple Cause of Death File 2008, Series 20 No. 2N, 2011, data for year 2007 are compiled from Multiple Cause of Death File 2007, Series 20 No. 2M, 2010, data for years 2005-2006 data are compiled from Multiple Cause of Death File 2005-2006, Series 20, No. 2L, 2009, and data for years 1999-2004 are compiled from the Multiple Cause of Death File 1999-2004, Series 20, No. 2J, 2007. Accessed at <http://wonder.cdc.gov/ucd-icd10.html> on Aug 23, 2012 9:36:28 AM

<sup>11</sup> Drewette-Card, R. Maine Cardiovascular Health and Diabetes Strategic Plan 2011-2020. June 2011.

<sup>12</sup> Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2009 on CDC WONDER Online Database, released 2012.

**Figure II: 10-Year CVD Mortality Rates, Men and Women Aged 35+, All Maine Counties**



**❖ The Decline in CVD Mortality at the State and County Level in Maine, 1999-2009**

Over 1999-2009, US age-adjusted CVD death rates declined at a rate of -31.8%.<sup>13</sup> This is a widely known phenomenon, and is generally attributed to a mix of clinical advances over the period, including statin drugs, antithrombotics, and improved imaging.<sup>14</sup> In the 1980s, 20% of heart attack patients died in the hospital, and 40% of discharged patients died within a year. By 2007, the one-year mortality rate for heart attack patients was between 4-8%.<sup>15</sup> Over the same period, however, CVD mortality rates for rural Americans declined only -27.5%.<sup>16</sup>

In Maine, CVD death rates declined at a slightly steeper rate of -34.6%.<sup>17</sup> Maine still has the highest stroke death rate in New England, and the third highest rate of heart disease-related

<sup>13</sup> Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2009 on CDC WONDER Online Database, released 2012.

<sup>14</sup> Weisfeldt, M and Zeiman S. Advances in the prevention and treatment of cardiovascular disease. *Health Affairs*, January 2007 v. 26 no. 1: 25-37.

<sup>15</sup> Ibid

<sup>16</sup> Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2009 on CDC WONDER Online Database, released 2012.

<sup>17</sup> Ibid.

mortality in the region.<sup>18</sup> The most rural state in the nation, Maine echoed national/rural trends over 1999-2009. Maine medium metros – the most urbanized areas of the state – have an average age-adjusted CVD mortality rate of 444.7/100,000<sup>19</sup>. In contrast, rural Maine has a rate of 526.8/100,000.<sup>20</sup>

However, over 1999-2009, CVD mortality in Aroostook County declined fairly steadily year-to-year for a ten-year decline of -38.1%.<sup>21</sup> The relatively faster rate of decline in rural, low-income Aroostook is surprising, especially when considering the known disparities for CVD outcomes in rural regions of the US. It is equally unusual because Aroostook has the highest rate of smoking in the state, and relatively low socioeconomic status. All of these factors correspond with higher rates of CVD mortality in a population.

A very similar pattern of year-to-year decline in mortality occurred for Washington County, which saw a -37.1% decline in mortality over the period. Washington County consistently ranks at the bottom of health and socioeconomic indicators among Maine counties, with high rates of poverty, obesity, and smoking.

Over the same period, CVD mortality in Penobscot declined by 23.8%<sup>22</sup>, and by 11.3%<sup>23</sup> in Piscataquis County. The lower rate of decline in Penobscot relative to Aroostook and Washington is particularly puzzling, because not only is Penobscot more urban and wealthier per capita, but is home to Eastern Maine Medical Center, which provides specialized emergency cardiac care to the northern two-thirds of the state.<sup>24</sup>

Region	Age-Adjusted Annual CVD Mortality Rate Per 100,000, 1999	Age-Adjusted Annual CVD Mortality Rate Per 100,000, 2009	Percentage Change
Maine	622.8	407.2	-34.6%
Aroostook	675.9	418.2	-38.1%
Penobscot	644.2	490.4	-23.8%
Piscataquis	604.2	535.6	-11.3%
Washington	720.4	467	-37.1%

Interestingly, when types of CVD mortality are analyzed separately, both Aroostook and Washington saw a pattern of decline in deaths due to *stroke*, although not as large a decline as all-cause CVD death. This is not surprising, since population improvements in stroke mortality tend to lag improvements in other types of CVD mortality. The intractability of stroke death

<sup>18</sup> Drewette-Card, Rebecca. Preventing and controlling cardiovascular disease and diabetes in Maine: Maine cardiovascular health and diabetes strategic plan 2011-2020. Maine Department of Health and Human Services/Maine Center for Disease Control and Prevention. June 2011

<sup>19</sup> Centers for Disease Control and Prevention, National Center for Health Statistics. Underlying Cause of Death 1999-2009 on CDC WONDER Online Database, released 2012.

<sup>20</sup> Ibid

<sup>21</sup> Ibid

<sup>22</sup> Ibid

<sup>23</sup> Ibid

<sup>24</sup> Even if cardiac patients from Aroostook and Washington Counties travel to Bangor/Penobscot for medical care and die at the hospital, this does not confound the higher mortality rates in Penobscot, as US CDC mortality data is derived from official death certificates. County of residence is determined on a death certificate by where a decedent lived, and is different from place of death.

statistics is partially due to the fact that about 40% of strokes are *cryptogenic*: that is, they occur in the absence of risk factors.<sup>25</sup>

Where Washington and Aroostook saw most significant improvement in ten year outcomes was in deaths due to *ischemic heart disease*, or reduced blood supply to the heart muscle. Ischemic heart disease death declined -53.6% in Washington and -47.1% in Aroostook. Ischemic heart disease is the most common cause of death in high-income nations.<sup>26</sup> More so than stroke, ischemic heart disease also is notably risk-factor dependent. It is thought that modifiable risk factors are responsible for about 90% of ischemic heart disease, while they explain only 60% of all strokes.<sup>27</sup> The steep decline in ischemic heart disease death in Washington and Aroostook could indicate county-level differences in modifiable risk factors over the period.

<b>County<sup>28</sup></b>	<b>1999-2009 Percentage Change, Stroke</b>	<b>1999-2009 Percentage Change, Ischemic Heart Disease</b>
<b>Aroostook</b>	-26.6%	-47.1%
<b>Penobscot</b>	- 33.3%	-38.8%
<b>Washington</b>	-28.2%	- 53.6%

### III. METHODS

❖ **Key Research Question: Why did mortality rates drop more in Aroostook and Washington counties than in the comparator counties?**

❖ **Conceptual Framework**

This project analyzes traditional CVD risk factors (obesity, smoking, inactivity, diabetes, and hypertension rates), rates of insurance coverage, and social determinants of health (poverty, self-reported stress) in Aroostook, Washington, Penobscot and Piscataquis to determine which health and socioeconomic factors may partially explain the improved outcomes in Aroostook and Washington Counties. In addition, a focus group/survey approach, designed to include both community and national experts and providers, enriched the trend data.

<sup>25</sup> Schneider AT et al. Ischemic stroke subtypes: a population-based study of incidence rates among blacks and whites. *Stroke*, 2004;35(7):1552.

<sup>26</sup> World Health Organization. The top 10 causes of death by broad income group (June 2011). Available at <http://www.who.int/mediacentre/factsheets/fs310/en/index.html>

<sup>27</sup> Soler E and Ruiz V. Epidemiology and risk factors of cerebral ischemia and ischemic heart diseases: similarities and differences. *Curr Cardiol Rev*. 2010 August; 6(3): 138–149.

<sup>28</sup> No data was available for Piscataquis over the time period

Annual county-level mortality data was derived using the CDC WONDER Compressed Mortality Files.

Data for risk factors and co-morbidities was derived from responses to the Behavioral Risk Factor Survey (BRFSS) maintained by the United States Centers of Disease Control. BRFSS data are representative of the total non-institutionalized U.S. population over 18 years of age living in households with a land-line telephone.

Data for insurance coverage was generated based upon the Small Area Health Insurance Estimates (SAHIE) database maintained by the United States Census Bureau.

The percentage of county residents living in poverty was derived from the Small Area Income and Poverty Estimates (SAIPE) maintained by the United States Census Bureau.

The percentage of residents reporting frequent mental distress was generated from BRFSS data.

❖ *Focus Groups/Surveys of Community, State and National Experts*

22 parties were approached in each of the four counties, balanced between clinical staff and community public health professionals; 13 respondents agreed to participate. State and national experts on CVD mortality and disparities also participated. The thirteen participants come from a variety of backgrounds: 4 are epidemiologists, 2 are public health professionals at the state level, 3 are clinical staff sited in the counties of study, and 4 are public health professionals at the county level. 9 experts participated in the focus group; 4 public health agencies took the multi-part survey online.

<b>County/Profession</b>	Epidemiologist	Clinical	Public Health Professional
Aroostook		**	X
Penobscot			
Piscataquis			XX
Washington		*	X
State/National Level	****		**

\*= focus group participant X = survey

A loose Delphi approach informed the process for the 9 epidemiological, clinical, and health disparities experts. An abbreviated copy of the data on CVD mortality and risk factor prevalence presented above was shared with each participant before inviting their thoughts on possible explanations for the county-level phenomena. This process was open-ended to encourage spontaneity.

A four-part survey (Appendix I) was distributed via weblink to county-level public health professionals. Four public health entities participated in Washington, Piscataquis, and Aroostook Counties. The Washington and Aroostook agencies chose to complete the survey together as an all-staff project. The purpose of the survey was to solicit each community-based expert’s view on his or her community’s strengths and weaknesses, as well as to assess what kind of targeted outreach had been conducted in each county to combat CVD risk factors. The surveys contained

a mix of closed and open-ended questions. These questions assessed (1) Community public health strengths and weaknesses, (2) smoking rates, outreach activities, and barriers to decreasing smoking rates (3) obesity, activities to address obesity, and barriers to decreasing obesity rates (4) health insurance coverage, how lack of health insurance affects public health in your community, and barriers to increasing health insurance coverage rates, (5) poverty, how poverty affects public health in your community, and barriers to reducing poverty, (6) physical inactivity, outreach activities designed to increase physical activity, and barriers to increasing physical activity, (7) frequent mental distress, outreach activities designed to address frequent mental distress, and barriers to reducing frequent mental distress, (8) hypertension, outreach activities to address hypertension, and barriers to reducing hypertension prevalence and (9) diabetes, outreach activities designed to reduce diabetes, and barriers to reducing diabetes in your community. All participants were informed that their county of residence and profession would be identified, but that individual names and practices or businesses would not be disclosed.

Data from the focus groups was transcribed or printed and analyzed with an eye to emerging themes, and the survey responses were used to augment the focus group findings.

#### ❖ *Important Considerations for Rural Datasets*

Confidence intervals are necessarily wide when considering datasets from such small county populations. It is therefore important to consider general trends, rather than isolated annual data. 95% confidence intervals, where required, are reported here in parentheses.

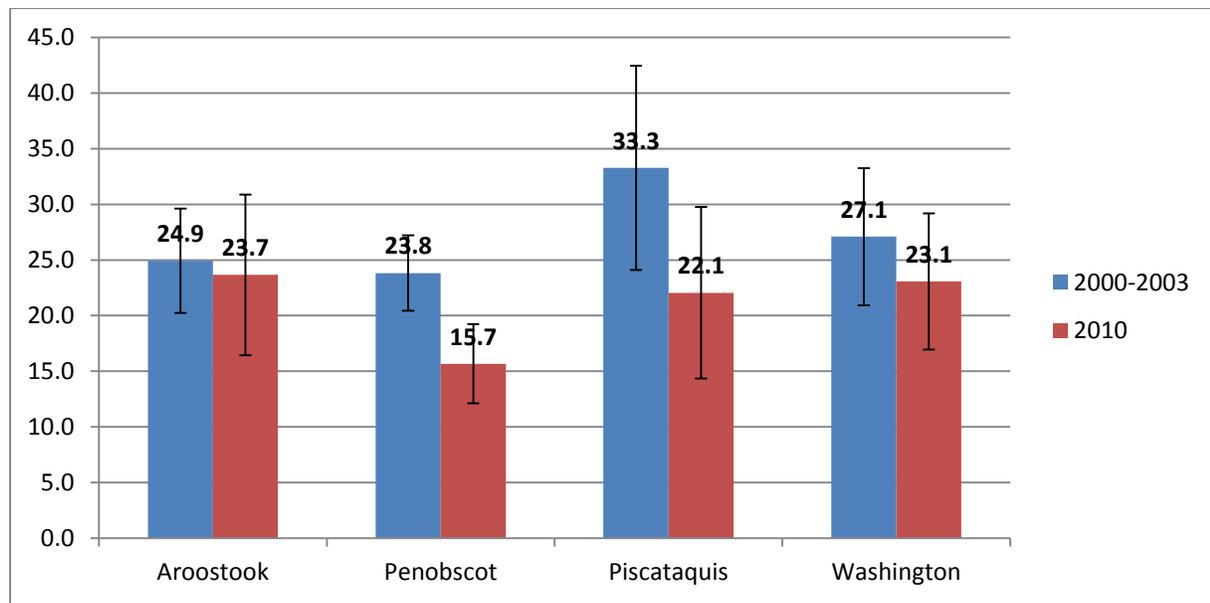
For the BRFSS data, the small size of the county-level datasets obligated the Maine BRFSS administrator to generate prevalence estimates based on several years combined. This resulted in different years being used as data points, although the years are all within the 10-year period studied, or one year after.

There are some limitations to BRFSS data. BRFSS is a telephone-based survey; it does not reach people without telephones. Before 2011, BRFSS relied mostly on landline numbers; cell users were underrepresented. Methodology was changed after 2010 so that 2011 data reflects cell phone users more accurately, but it is not advised to compare post 2010 data to years previous due to the methodological changes. All BRFSS data are self-reported, with the attendant limitations of participants' possible understatement of what they perceive to be undesirable behaviors or conditions, and overstatement of perceived "good" health behaviors, as well as confusion over diagnoses or health literacy barriers.

## IV. FINDINGS

### ❖ Smoking

Smoking prevalence is determined by the rate of *adults (aged  $\geq 18$  years) in a county who reported having smoked  $\geq 100$  cigarettes during their lifetime and who currently smoke every day or some days*. Smoking is highly correlated with CVD mortality. Over 2000-2003 and 2010, Piscataquis and Penobscot Counties had greater rates of decrease of smoking (-11.2% and -8.1%), in comparison to Aroostook's -1.2% decrease and a -4.0% decrease in Washington County. In addition, smoking rates overall remained highest in Aroostook (23.7%) and Washington (23.1%).

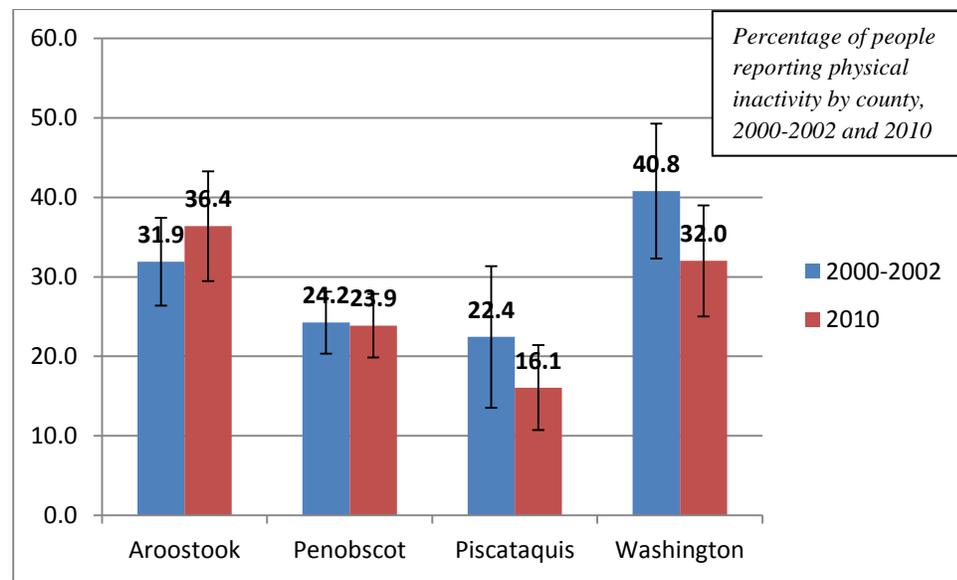


<i>Smoking prevalence</i>	<b>Aroostook, ME</b>	<b>Washington, ME</b>	<b>Penobscot, ME</b>	<b>Piscataquis, ME</b>
<b>2000-2003</b>	<b>24.9%</b> (20.2-29.6)	<b>27.1%</b> (20.9-33.3)	<b>23.8%</b> (20.4-27.2)	<b>33.3%</b> (24.1-42.5)
<b>2010</b>	<b>23.7%</b> (16.4-30.9)	<b>23.1%</b> (17.0-29.2)	<b>15.7%</b> (12.1-19.2)	<b>22.1%</b> (14.4-29.8)
<i>Percentage Change &amp; Rank</i>	<b>- 1.2% (1)</b>	<b>- 4.0% (2)</b>	<b>- 8.1% (4)</b>	<b>- 11.2% (3)</b>

## ❖ Physical Inactivity

County-level prevalence of physical inactivity is determined by the number of BRFSS respondents replying no to the question, “During the past month, other than your regular job, did you participate in any physical activities or exercise such as running, calisthenics, golf, gardening, or walking for exercise?” Physical inactivity is associated with higher risk of CVD mortality.<sup>29</sup> It has been estimated that as many as 1/3 of CVD deaths are linked to physical inactivity.<sup>30</sup>

Washington, Piscataquis and Penobscot Counties all saw reductions in the rate of physical inactivity among residents during the study period. This is consistent with national trends, although too many Americans remain physically inactive. In particular, Piscataquis County saw a significant drop (-6.3%) in prevalence of physical inactivity, and by 2010, Piscataquis residents were the most active population of the four counties studied. Inactivity in Washington County also dropped steeply (-8.8%), but almost a third (32.0%) of Washington County residents remain physically inactive. Aroostook County alone saw an increase in physical inactivity among its residents (+4.5%). By 2010, 36.4% of Aroostook County residents were physically inactive in their spare time.



<i>Prevalence of physical inactivity</i>	<b>Aroostook, ME</b>	<b>Washington, ME</b>	<b>Penobscot, ME</b>	<b>Piscataquis, ME</b>
<b>2000-2002</b>	31.9% (26.4-37.4)	40.8% (32.3-49.3)	24.2% (20.4-28.1)	22.4% (13.5-31.3)
<b>2010</b>	36.4% (29.5-43.3)	32.0% (25.0-39.0)	23.9% (19.9-27.9)	16.1% (10.7-21.4)
<b>Percentage Change &amp; Rank</b>	+ 4.5% (1)	-8.8% (2)	-0.3% (3)	- 6.3% (4)

<sup>29</sup> Kokkinos P, Sheriff H, Kheirbek R. Physical inactivity and mortality risk. *Cardio res pract.* 2011; v. 2011.

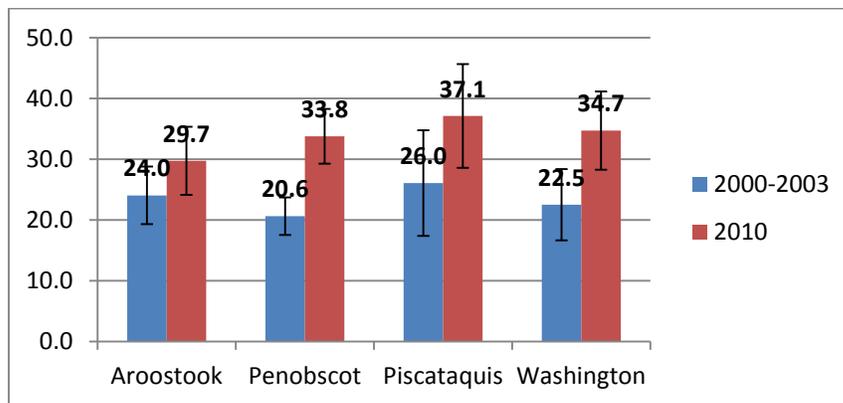
<sup>30</sup> Ainsworth. BE, Macera CA. Physical Activity. In: Brownson RC, Remington PL, Davis JR, eds. *Chronic Disease Epidemiology and Control*. 2nd ed. Washington, D.C.: American Public Health Association; 1998:191-213.

❖ *Obesity*

Obesity prevalence is derived from BRFSS respondents' answers to the questions, "How much do you weigh without shoes?" and "How tall are you without shoes?" Obesity is defined as a Body Mass Index (weight in kilograms divided by the square of one's height in meters) of greater than 30.

Obesity is associated with higher CVD mortality rates. A 16-year study of participants in two prospective cohort studies, the Health Professionals Follow-up Study (N = 27,859 men; age range 39–75 years) and the Nurses' Health Study (N = 41,534 women; 39–65 years) found that compared to average-weight people (BMI 18.5–22.9), men with a BMI greater than 30 had a multivariate-adjusted relative risk of coronary heart disease of 1.81 (95% CI 1.48 – 2.22). Women whose BMI was greater than 30 had a relative risk of 2.16 (95% CI 1.81 – 2.58).<sup>31</sup> A 14-year study of 234,865 Korean men aged 45–64 found that there was a positive association across the whole range of BMI and ischemic stroke (caused by blockage of an artery to the brain).

Obesity prevalence has increased dramatically nationwide over the past twenty years across regions and socioeconomic groups, so that no state has a rate of obesity prevalence less than 20%.<sup>32</sup> The four counties studied here are no exception to this trend. However, the increase in Aroostook County (+5.7%) was significantly less than the increases seen in Piscataquis (+11.1%), Washington (+12.2%), and Penobscot (+13.2%) over the period. Piscataquis had the highest prevalence of obesity (37.1% of residents) by 2010, and Aroostook had the lowest (29.7%).



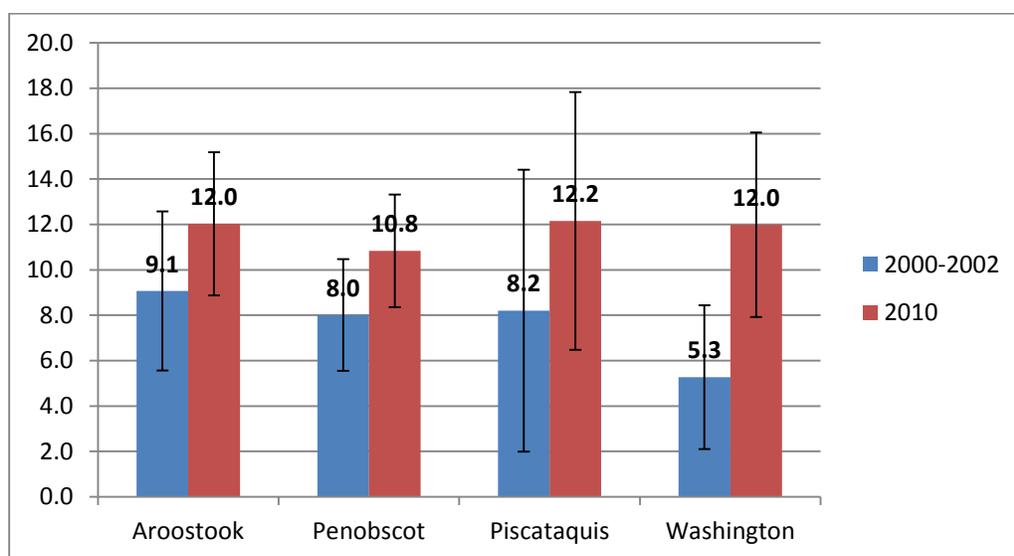
<i>Obesity prevalence</i>	<b>Aroostook, ME</b>	<b>Penobscot, ME</b>	<b>Piscataquis, ME</b>	<b>Washington, ME</b>
<b>2000-2003</b>	<b>24.0%</b> (19.3-28.8)	<b>20.6%</b> (17.5-23.7)	<b>26.0%</b> (17.3-34.7)	22.5% ( <b>16.6-28.4</b> )
<b>2010</b>	<b>29.7%</b> (24.1-35.3)	<b>33.8%</b> (29.3-38.3)	<b>37.1%</b> (28.6-45.7)	34.7% ( <b>28.3-41.2</b> )
<b>Percentage Change &amp; Rank</b>	<b>+ 5.7% (4)</b>	<b>+13.2% (3)</b>	<b>+11.1% (1)</b>	<b>+12.2% (2)</b>

<sup>31</sup> Flint A, Rexrode K, Hu F, Glynn R, Caspard H, Manson J, Willett W, and Rimm E. Body mass index, waist circumference, and risk of coronary heart disease: a prospective study among men and women. *Obes Res Clin Pract.* 2010 JUL-SEP; 4(3): e171-e181.

<sup>32</sup> Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion. *Overweight and Obesity.* August 13, 2012. Accessed January 23, 2013 at <http://www.cdc.gov/obesity/data/adult.html>.

❖ *Diabetes*

Diabetes prevalence is determined by BRFSS responses to the question, “Have you ever been told by a doctor, nurse or other health professional that you have diabetes?” Diabetes is a risk factor for CVD mortality. A meta-analysis of 37 studies of type 2 diabetes and CVD mortality (n=447,064) by Huxley<sup>33</sup> concluded that overall the rate of CVD mortality was higher for those with diabetes than for those without (5.4 v. 1.6%). Diabetes is linked to obesity and inactivity, and so the rate of diabetes nationally has risen along with obesity and inactivity in the population. While Washington saw the steepest jump in diabetes prevalence (+6.7%) between 2000-2002 and 2010, all four counties had a diabetes prevalence between 10.8 (Penobscot) and ≥12% of overall population (Aroostook, Washington, Piscataquis) by 2010.



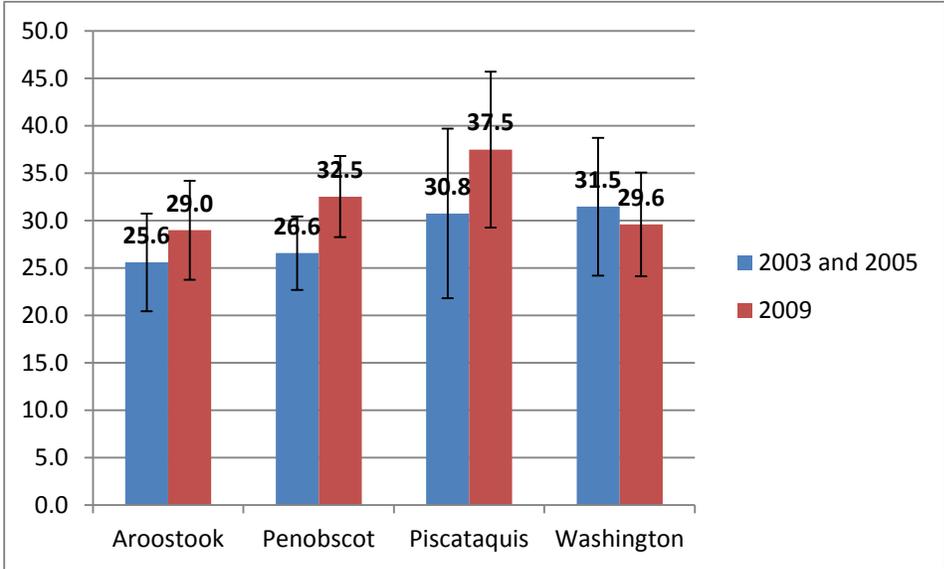
<i>Diabetes prevalence</i>	<b>Aroostook, ME</b>	<b>Washington, ME</b>	<b>Penobscot, ME</b>	<b>Piscataquis, ME</b>
<b>2000-2002</b>	<b>9.1%</b> (5.6-12.6)	<b>5.3%</b> (2.1-8.4)	<b>8.0%</b> (5.5-10.5)	<b>8.2%</b> (2.0-14.4)
<b>2010</b>	<b>12.0%</b> (8.9-15.2)	<b>12.0%</b> (7.9-16.1)	<b>10.8%</b> (8.4-13.3)	<b>12.2%</b> (6.5-17.8)
<b>Percentage Change &amp; Rank</b>	<b>+2.9%(2)</b>	<b>+6.7% (2)</b>	<b>+2.8% (3)</b>	<b>+4.0% (1)</b>

<sup>3333</sup> Huxley R, Barzi F, Woodward M. Excess risk of fatal coronary heart disease associated with diabetes in men and women: meta-analysis of 37 prospective cohort studies. *British Medical Journal* 2005; 332:73 (21 December 2005)

❖ **Hypertension**

Hypertension prevalence is determined by respondents’ answers to the BRFSS question, “*Have you ever been told by a doctor, nurse or other health professional that you have high blood pressure (or hypertension)?*” Hypertension is associated with increased rate of CVD mortality. National epidemiologic studies have shown that controlled hypertension is associated with a relative risk of CVD mortality of 1.15, and uncontrolled hypertension is associated with a relative risk of 1.74.<sup>34</sup>

Hypertension prevalence rose in 3 of 4 counties studied here over 2003, 2005 and 2009. Prevalence dropped by 1.9% in Washington. By 2009, hypertension prevalence overall was highest in Piscataquis (37.5%) and lowest in Aroostook (29.0%) and Washington (29.6%) Counties.



<i>Hypertension prevalence</i>	<b>Aroostook, ME</b>	<b>Washington, ME</b>	<b>Penobscot, ME</b>	<b>Piscataquis, ME</b>
<b>2003 and 2005</b>	<b>25.6%</b> (20.4-30.8)	<b>31.5%</b> (24.2-38.7)	<b>26.6%</b> (22.7-30.4)	<b>30.8%</b> (21.8-39.7)
<b>2009</b>	<b>29.0%</b> (23.8-34.2)	<b>29.6%</b> (24.1-35.1)	<b>32.5%</b> (28.3-36.8)	<b>37.5%</b> (29.3-45.7)
<b>Percentage Change &amp; Rank</b>	<b>+ 3.4% (1)</b>	<b>-1.9% (2)</b>	<b>+5.9 (3)</b>	<b>+ 6.7% (4)</b>

<sup>34</sup> Gu Q, Burt VL, Paulose-Ram R, Yoon S, Gillum RF. High blood pressure and cardiovascular disease mortality risk among U.S. adults: the third National Health and Nutrition Examination Survey mortality follow-up study. *Ann Epidemiol.* 2008 Apr;18(4):302-9.

## ❖ Insurance Coverage

The US Census Bureau defines uninsured by a negative answer to “*Is this person currently covered by specifically stated health insurance or health coverage plans?*”

Insurance coverage is vital to accessing not only critical care but the preventive and surveillance care required to diagnose and treat conditions underlying CVD. A national prospective cohort study found that persons without insurance had higher rates of stroke and death than those who were insured. The uninsured were less likely to report routine physical examinations, more likely to be unaware of hypertension, and less likely to have their hypertension controlled.<sup>35</sup>

The percentage of uninsured in each county studied rose over the period 2000 – 2009. By 2009, 17% of people in Washington County were uninsured. 14.2% of people in Aroostook County were uninsured. Penobscot County had a lower percentage of its population without insurance – 12.1%. The percentage of uninsured in Piscataquis (14.4%) was closer to that seen in Aroostook. Overall, data does not show that people in any of the counties saw improved access to insurance coverage over the period studied – in fact, the case is quite the opposite.

<i>Percentage Uninsured</i>	<u>Aroostook, ME</u>	<u>Penobscot, ME</u>	<u>Piscataquis, ME</u>	<u>Washington, ME</u>
2000	11.5%	10.1%	10.9%	15.7%
2009	14.2%	12.1%	14.4%	7.0%
<i>Percentage Change &amp; Rank</i>	+ 2.7% (3)	+ 2.0% (4)	+3.5% (2)	+ 1.3% (1)

## ❖ Social Determinants of Health: Poverty and Frequent Mental Distress

It is well known that daily smoking, obesity, physical inactivity, diabetes, and hypertension elevate risk of CVD death.<sup>363738</sup> However, it is increasingly evident that “social determinants of health”<sup>39</sup> can be nearly as influential as traditional risk factors, genetics, and level and type of medical care in determining a community’s overall public health.

<sup>35</sup> Fowler-Brown A, Corbie-Smith G, Garrett J, Lurie N. Risk of cardiovascular events and death--does insurance matter? *J Gen Intern Med.* 2007 Apr;22(4):502-7.

<sup>36</sup> Chen Z, Borham J. Smoking and cardiovascular disease. *Semin Vasc Med.* 2002 Aug;2(3):243-52.

<sup>37</sup> Flegal K, Graubard B, Williamson D, Gail M. Cause-specific excess deaths associated with underweight, overweight, and obesity. *JAMA* 2007; 298 (17): 2028-2037.

<sup>38</sup> Kokkinos P, Sheriff H, Kheirbek R. Physical inactivity and mortality risk. *Cardio res pract.* 2011; v. 2011.

<sup>39</sup> “Social determinants of health” have been defined by the World Health Organization as the “conditions under which people live and work. They are the ‘causes behind the causes of ill-health’.” (World Health Organization: Action on the social determinants of health: learning from previous experiences. 2005: background paper prepared for the Commission on Social Determinants of Health.) Filate defined them as: *postsecondary education, unemployment rate, low income rate, income inequality, and high life stress.* This project defines them as: *low income rate and frequent mental distress.*

## ❖ *Poverty*

Poverty is defined by the US Census Bureau in compliance with the Office of Management and Budget's (OMB) Statistical Policy Directive 14. If a family's total income is less than the family's threshold set by the federal government, then that family and every individual in it is considered in poverty. The same thresholds are used throughout the United States without regard for geographical area or relative cost of living. They are updated to reflect changes in the Consumer Price Index (CPI).

Low socioeconomic status is related to a higher risk of CVD mortality. A 1985-1994 analysis of US Census Data and CDC mortality data for every county in the 48 contiguous U.S. states found that county income was inversely related to CVD, coronary heart disease, and stroke mortality<sup>40</sup>.

All four counties studied saw an increase in the poverty rate over the period of study (2000-2009). Washington was the poorest, with 20.6% of residents living in poverty. Aroostook and Piscataquis were comparable, with 16.4% and 16.1% of their residents in poverty respectively. Penobscot saw the steepest rise in poverty over the timeframe, but by 2009, only 15.3% of Penobscot residents were in poverty.

<i>Poverty (all ages)</i>	<b>Aroostook, ME</b>	<b>Washington, ME</b>	<b>Penobscot, ME</b>	<b>Piscataquis, ME</b>
2000	13.4%	16.8%	11.4%	13.3%
2009	16.4%	20.6%	15.3%	16.1%
<i>Percentage Change &amp; Rank</i>	+ 3.0% (2)	+ 3.8% (1)	+ 3.9% (4)	+ 2.8% (3)

## ❖ **Prevalence of Frequent Mental Distress**

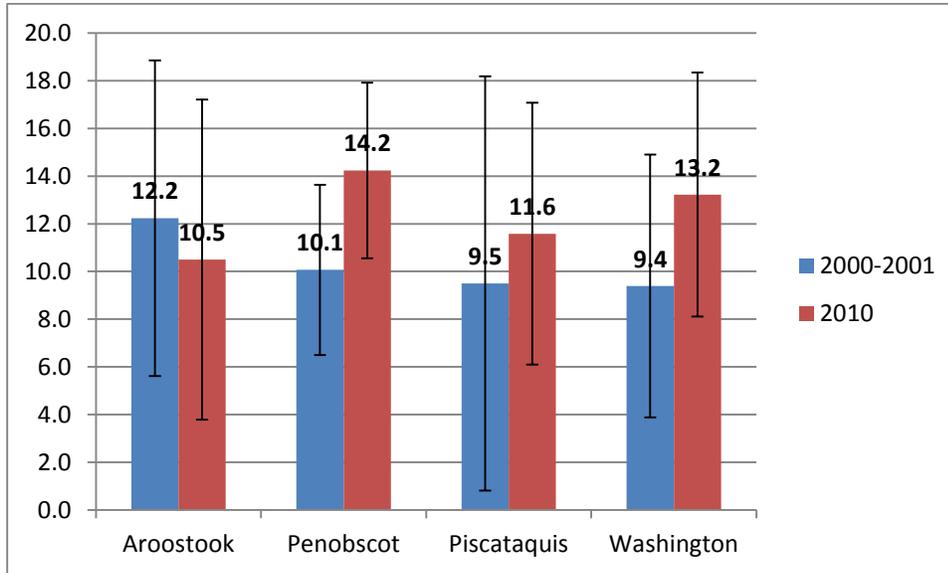
Frequent mental distress is defined by the BRFSS as a positive response to the question, "*Now, thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?*"

Beyond the frequent connections made between stress and heart attack in popular culture, self-reported mental distress is linked to CVD mortality. A study of 6,935 white men aged 47-55 without previous incidence of heart attack asked participants to rate their level of mental distress on a scale of 1-4 (4 being highest stress level). 6% of the men with the lowest stress ratings (n = 5,865) either experienced a nonfatal heart attack or a fatal CVD event by the study's end. 10% of the men with the highest 2 stress ratings experienced a nonfatal or life-ending heart attack

<sup>40</sup> Tyroler, Herman A. (2004, May 1). Income, income inequality, and cardiovascular disease mortality: relations among county populations of the United States, 1985 to 1994. *Southern Medical Journal*.

over the same period. Similar associations were seen with stroke rates and with death from cardiovascular disease in general.<sup>41</sup>

Self-reported frequent mental distress rose in 3 of the 4 counties studied over 2000-2001 and 2010. Aroostook saw a 1.7% drop in frequent mental distress, and had the lowest prevalence (10.5%) by 2010. Prevalence rose by 2.9% in Piscataquis over the same period, but overall prevalence of frequent mental distress in Piscataquis stood at 11.6%. Both Washington and Penobscot had similar increases in prevalence (3.8%, 4.1%) and overall rates (13.2%, 14.2%) by 2010.



**Prevalence of Frequent Mental Distress**

	Aroostook, ME	Washington, ME	Penobscot, ME	Piscataquis, ME
2000-2001	12.2% (5.6-18.9)	9.4% (3.9-14.9)	10.1% (6.5-13.6)	9.5% (.8-18.2)
2010	10.5% (3.8-17.2)	13.2% (8.1-18.3)	14.2% (10.6 – 17.9)	11.6 % (6.1 – 17.1)

**Percentage Change & Rank**

- 1.7% (1)	+ 3.8% (3)	+ 4.1% (4)	+ 2.1% (2)
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❖ **Discussion**

There were few health measures discussed above where prevalence trends moved in a way that would at least partially explain the improvement in CVD mortality rates in Aroostook and Washington over 1999-2009. Aroostook and Washington Counties have the highest prevalence

<sup>41</sup> Rosengren A, Tibblin G, Wilhelmsen L. Self-perceived psychological stress and incidence of coronary artery disease in middle-aged men. *Am J Cardiol.* 1991 Nov 1;68(11):1171-5.

of daily smoking of the 4 counties studied, and saw the smallest decreases in smoking over the period studied. Their residents also have the highest rates of physical inactivity – no leisure time physical activity within the past month. The prevalence of diabetes increased most in Washington over the period, but current rates of diabetes are about the same across all 4 counties. In short, looking at trends in smoking, inactivity, and diabetes does not explain the improvement in outcomes in Washington and Aroostook over 1999-2009. In terms of social determinants of health, rates of poverty and uninsurance were highest in Aroostook and Washington.

According to the trend data, the rate of obesity increased least in Aroostook, and the most recently available trend data shows Aroostook having a slightly lower rate of obesity (29.7%) when compared to the other 3 counties studied, and especially when compared to Piscataquis (37.1%). Also, overall rates of hypertension are a bit lower in Aroostook (29%) and Washington (29.6%), and Washington saw a small decline in hypertension prevalence over the period. Aroostook saw a 1.7% drop in frequent mental distress, and had the lowest prevalence (10.5%) by 2010. However, Washington saw a 4.1% increase in frequent mental distress over the period, and by 2009, 14.2% of county residents reported frequent mental distress – the highest of all counties.

It is well known that the modifiable risk factors for CVD mortality often cascade into and amplify one another in confounding ways (for example, obesity can lead to diabetes, which is a risk factor for a heart attack; but what more proximately caused the heart attack?) The WHO funded the world-wide INTERHEART study to research this issue. The INTERHEART authors isolated 9 risk factors that cause 90% of heart attacks.<sup>42</sup> Of the risk factors where Washington and/or Aroostook had a lower prevalence (obesity, hypertension, and frequent mental distress), INTERHEART found that obesity amounted to a lifetime heart attack odds ratio of 1.12, hypertension amounted to an odds ratio of 1.91, and “psychosocial factors” amounted to an odds ratio of 2.67 (“psychosocial factors” are an inexact comparison for frequent mental distress, however: as the INTERHEART researchers defined psychosocial factors, they are more akin to a bundled social determinants of health measure). When the researchers repeated the study focusing on stroke (INTERSTROKE), hypertension stood out as the most important modifiable risk factor for fatal stroke. This suggests that when focusing on improving *all* CVD mortality, hypertension may be the most important risk factor to consider. By 2009, both Washington and Aroostook had lower population prevalence of hypertension than the comparator counties. However, while Washington saw a small improvement in hypertension prevalence over the period studied, Aroostook did not.

Since the risk factor analysis revealed little in terms of clear positive trends in risk factor prevalence across *both* counties over the period, the project was expanded to include interviewing experts and providers in the communities to get their input on what might lie behind the mortality decline.

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<sup>42</sup> Yusuf S et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet*. 2004 Sep 11-17;364(9438):937-52.

## ❖ Focus Group Results

Four themes emerged from the focus group: the emergence of federally qualifying health centers (FQHCs) in the rural counties over the time period studied, the importance of preventive care and community-based Healthy Maine Partnership outreach work, the importance of targeting population hypertension prevalence, and the considerable access issues and socioeconomic barriers faced by rural residents.

***Vitalization of Federally Qualifying Health Centers (FQHCs) in the Rural Counties Over the Time Period Studied:*** FQHCs are sliding-fee clinics supported by the Health Resources and Services Administration (HRSA). While some states budget to support local FQHC work, Maine is one of 35 states where the state makes no contribution. FQHCs must meet the following criteria<sup>43</sup>:

***Located in or serve a high need community*** (designated Medically Underserved Area or Population).

***Governed by a community board*** composed of a majority (51% or more) of health center patients who represent the population served.

***Provide comprehensive primary health care services as well as supportive services*** (education, translation and transportation, etc.) that promote access to health care.

***Provide services available to all*** with fees adjusted based on ability to pay.

***Meet other performance and accountability requirements*** regarding administrative, clinical, and financial operations.

Four of the nine respondents spoke to the critical role FQHCs fill in Maine's rural counties. An Aroostook respondent noted that the Pines FQHC blossomed over the time studied. Pines currently offers services through several offices and 40 providers. Similarly, Fish River Rural Health Care has expanded to two sites, one in Fort Kent and one in remote Eagle Lake. In particular, Fish River was selected by the Bureau of Primary Health Care to participate in the Health Disparities Collaborative in 2002, and providers focused on expanding and improving cardiovascular disease care as part of the Collaborative. A state-level expert reflected on this: “*From 2004-2008, there was something called the “Health Disparities Collaborative” which focused on CVD, depression, diabetes care; there were a few sites in Washington and Aroostook counties. This was funded by HRSA. This was before my time, [but] that work may have improved health centers ability to work in these disease areas.*”

Along the same lines of quality of care, one clinical expert in Washington wrote, “*A lot of things have improved in the most recent years based on implementation of evidence based practices, federal programs like PCMH (patient-centered medical home) and the QI (quality improvement)*”

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<sup>43</sup> <http://bphc.hrsa.gov/about/>

*movement overall that is focused on the triple aim (better health, better access and decreased costs)”*

**Centrality of Preventive Care and Community-Based Public Health Outreach:** Several respondents noted the importance of preventive care in reducing CVD mortality. Said one state-level expert: *“From a public health perspective there are so many other factors that influence individual behaviors and choices (smoking, diet, etc), as well as opportunities to stay well (which could include walking paths/how easy or difficult is it to find a place to exercise? Mobility of the population? Community health initiatives—like Healthy Maine Streets?).”*

A Washington County clinician echoed this point when discussing the 1999-2009 time frame: *“Simultaneously, there has been a big surge through the HMP grantee’s and other health supporting organizations to target health living, especially through dietary education. We have many food pantries that not only support those with little income for food, but they offer training on choosing healthy foods and even cooking healthy foods. We have also had a major growth in agricultural options through community farmer’s markets, local farm stands, gardens at lower costs than the grocery stores and many of the farmer’s markets are accepting food stamps as well.”* An Aroostook colleague also cited obesity and population health efforts: *“It’s the way we eat up here . . . we came from an area where you worked hard, and over time we can’t burn it off in these sitting jobs. The mills and the lumber industry have automated, and the food hasn’t adjusted to our lifestyle. [Other] programs have a hard time getting people to stick to their programs – the HMP tries to teach moderation . . . [The] HMP cuts are frustrating, because we are starting to make progress.”*

### **Importance of Targeting Population Hypertension Prevalence:**

A Washington County clinician specifically highlighted the important role of hypertension detection and affordable treatment in that county, saying, *“All local pharmacies, fire stations and health centers are supporting BP screenings and calibration of home equipment. While Hypertension is only one target for improving population health, it is one that has caught the attention of the community at large and is easy to understand. Know your numbers is easy to understand & learn how to manage. We also offer prescription drug assistance programs through FQHC’s at least for patients who need financial support to take their needed medications. We have many patients who have come to learn about the value of this program and take advantage of the benefit. This may be available through other organizations, but I am certain it is an FQHC requirement that has had a positive impact.”*

### **Health Access Issues and Socioeconomic Barriers**

Rural poverty was a recurrent theme, from transportation barriers to the role of poverty in obesity rates. An Aroostook expert said, *“We have major issues with obesity even in Pre-K. Daycares call the HMP for help with obese kids with cookies for lunch. People say it’s hard to get traditional meals on. People in their teens and twenties have no idea how to cook. School lunch has issues, but they’re working on it – but they’re limited in money and time . . . Healthy food is a better buy, but try to explain this to people who have to fill empty stomachs.”*

Another clinician focused on the concentration of health clinics in Washington and how many locations help rural people access care: *“I also believe that increased access to care through FQHC’s and rural health centers with external funding supports (not state based) have been integral in this improvement . . . Washington County has seven FQHC’s with services in 9 different locations around the county: Eastport Health Care; Eastport & Machias, Regional Medical Center of Lubec; Lubec & Machias, Harrington Family Health Center; Harrington, St Croix Family Health Center; Princeton, East Grand Health Center; Danforth, Pleasant Point Health Center (tribal); Perry & Indian Township Health Center (tribal); Princeton. The saturation of services for Washington County residents in centers that they can get to is key since transportation is also a core challenge for many.”*

#### ❖ **Community-Based Public Health Professionals: Survey Results**

**Public Health Strengths and Weaknesses:** Three out of four respondents noted that a “sense of community” was the greatest public health asset in their county. The Washington County respondent noted that physicians were collaborating more and that outreach, including high blood pressure checks, was increasing. Obesity, tobacco use, and substance abuse were the most commonly cited public health problems, cited by 100% of respondents.

**Smoking and Related Outreach:** All respondents felt that smoking rates were a problem in their communities, and each public health organization had done work to address community smoking rates. Washington and Aroostook both conducted awareness and outreach, while Piscataquis respondents indicated they had done awareness activities only, noting that smoking cessation classes in that county had seen low turnout. Two of four respondents cited “culture” as the greatest barrier to decreasing smoking rates.

**Obesity and Inactivity:** All respondents rated obesity and inactivity as a community problem. All respondents had conducted community activities to address obesity and inactivity. Piscataquis County did not hold support groups. Washington County respondents also obtained grant funding to conduct a “Biggest Loser” competition, as well as food pantry education and community/school outreach. All cited motivation and poverty as the greatest barriers to obesity prevention. Piscataquis County respondents noted that time pressures added to the obesity problem, explaining in comments that single-parent families and people working multiple jobs were especially time-pressed.

**Diabetes and Hypertension:** All respondents agreed that diabetes and hypertension were public health problems in their community. Three of four respondents – Washington, Aroostook, and one Piscataquis respondent – indicated they had done activities to deal with diabetes and hypertension. Three of four indicated that transportation was one of the biggest barriers to reducing diabetes – presumably transportation to support groups, but possibly also transportation to physician visits. Transportation was also cited as a barrier to reducing hypertension. Poverty and a lack of affordable healthcare were also cited as obstacles in hypertension prevention. With particular regard to hypertension, Aroostook County respondents indicated under “Other” that they had promoted a plant-based diet, and hosted clinical groups where they tracked risk and educated people on how to make lifestyle changes.

**Health Insurance Coverage, Poverty, and Barriers:** All respondents indicated that lack of health insurance coverage and poverty were problems in their communities – unsurprisingly,

since poverty was cited most commonly as a public health problem in an open-ended question asking respondents to list community strengths and problems. In the comments, respondents linked rural poverty they saw in their community to a lack of preventive care, poor nutrition, domestic violence, substance abuse, adverse childhood experiences, tobacco use, and depression. Washington County respondents wrote simply, “The issue of poverty touches every aspect of public health in our community.” When asked for the biggest barrier to reducing poverty, the poor rural economy was cited by all.

**Frequent Mental Distress:** Half of respondents felt that frequent mental distress was a problem in their communities. None of the respondents had been involved in activities designed to raise awareness of or reduce frequent mental distress.

## V. CONCLUSIONS

Over time, researchers have realized that, rather than one America, there is a patchwork of Americas with different health outcomes and life expectancies – and these disparities are growing. The rural-urban disparity has been growing since the 1990s, and the difference in CVD mortality rates is a prime driver.

The case in Aroostook and Washington Counties gives an opportunity to probe population risk factors and community expertise and generate hypotheses that perhaps can be tested in other rural low-income counties. It would be particularly interesting to see whether region and race correlate with different mortality outcomes in US rural counties with similar household income. The dramatic drop seen in ischemic heart disease-related mortality in the counties studied is also interesting, since ischemic heart disease is closely tied to modifiable risk factors.

The risk factor analysis confirmed that for the most part, Washington and Aroostook were poorer and unhealthier than the selected Maine comparator counties, with some notable exceptions, such as reduced prevalence of hypertension in Washington, lower prevalence of obesity in Aroostook, and a lower prevalence of frequent mental distress in Aroostook. However, none of the risk factors declined in severity across *both* Aroostook and Washington over 1999-2009. Also, the small sample size dictated that few trends rise to the level of statistical significance; this is one of the limitations of county-level research. However, the risk factor trends that would seem to partially explain the improvement in Washington and Aroostook over 1999-2009 (lower rates of or declines in hypertension and obesity prevalence) are highly correlated with CVD mortality. Other, larger projects, such as the well-known REGARDS study, have pinpointed county-level differences in hypertension prevalence and treatment as a key driver of stroke mortality disparities, calculating that differences in hypertension accounts for as much as *one-third* of the mortality disparity between blacks and whites in the southeastern United States.<sup>44</sup> (Dr. George

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<sup>44</sup> Howard G et al. *Racial and geographic differences in awareness, treatment, and control of hypertension: The reasons for geographic and racial differences in stroke study*. Stroke. 2006; **37**: 1171-1178.

Howard, lead investigator of the REGARDS study, served as an expert in this project's focus group)

Since the risk factor analysis failed to isolate any factors that might partially explain the improvement in mortality rates for *both* Washington and Aroostook, a mixed survey/focus group approach was used to solicit the opinions and insight of community-based experts and clinicians (due to the small number of respondents in the rural counties (9 in focus group and 4 agencies participating in the survey), conclusions are made with some caution). Respondents tended to agree about the advent of federally qualifying health centers in increasing rural access to preventive care over the study period, the success of community outreach over the period (notably Healthy Maine Partnerships), the importance of focusing on prevention and hypertension in outreach, and the significant socioeconomic and access barriers faced by rural populations.

We have seen a 60% drop in CVD mortality since the 1960s. Researchers tend to agree that the innovative medications and imaging strategies behind this advance are now implemented widely. Barring more pharmaceutical breakthroughs, future reductions in CVD mortality likely will be linked to lifestyle changes and early risk-factor screening. I feel my research points to the importance of addressing rural disparities by placing a high emphasis on hypertension and obesity awareness, detection, and treatment; by increasing access to affordable preventive care through FQHCs; protecting community-based public health outreach; and policy solutions aimed at reducing rural healthcare barriers such as disproportionate rural poverty, lower rates of health insurance coverage, and transportation barriers to care.

## ***APPENDIX I: SURVEY QUESTIONS***

Thinking of your target community, what in your opinion are some public health **strengths** of your community? (Examples: sense of community, green space, access to physicians/care)

Thinking of your target community, what in your opinion is the greatest public health **problem** for residents? (Examples: tobacco use, obesity, lack of access to care)\_\_\_\_\_

Do you think that **high smoking rates** are a problem in your target community?

Yes No

Has your organization conducted activities to address **smoking rates** in your community? Yes No

*If yes, then describe:*

- Awareness
- Support groups for tobacco users
- Smoking cessation classes
- Improving access to tobacco cessation referrals/connecting with medical providers

Other (please describe)

If you feel that tobacco use is a problem in your community, then what do you feel is the **biggest barrier** to reducing rates of smoking in your community?

Do you think that **obesity** is a problem in your community? Yes No

Has your organization conducted activities to address **obesity** in your community? Yes No

*If yes, then describe:*

- General awareness
- Nutrition instruction or classes
- Physical activities – awareness
- Physical activities – support groups
- Physical activities – facilitating (Bike paths, open gym, etc.)

Other (please describe)

If you feel that obesity is a problem in your community, then what do you feel is the **biggest barrier** to reducing obesity in your community?

Do you think that **diabetes** is a problem in your community? Yes No

Has your organization conducted activities to address **diabetes** in your community? Yes No

*If yes, then describe:*

- General awareness

- Nutrition instruction or classes
- Physical activities – awareness
- Physical activities – support groups
- Physical activities – facilitating (Bike paths, open gym, etc.)
- Connecting with diabetes screening/providers
- Other (please describe) \_\_\_\_\_

If you feel that diabetes is a problem in your community, then what do you feel is the **biggest barrier** to reducing diabetes in your community?

Do you think that **hypertension** is a problem in your community? Yes No

Has your organization conducted activities to address **hypertension** in your community? Yes No

*If yes, then describe:*

- Awareness
- Support groups
- Improving access to screening/connecting with medical providers
- Other (please describe)

If you feel that hypertension is a problem in your community, then what do you feel is the **biggest barrier** to reducing hypertension in your community?

Do you think that **physical inactivity** is a problem in your community? Yes No

Has your organization conducted activities to address **physical inactivity** in your community? Yes No

*If yes, then describe:*

- Awareness
- Support groups (example: walking groups, free classes)
- Improving access to activity (example: bike paths, creating trails)
- Other (please describe)

If you feel that physical inactivity is a problem in your community, then what do you feel is the **biggest barrier** to increasing physical inactivity in your community?

Do you think that **lack of health insurance coverage** (being uninsured) is a public health problem in your community? Yes No

How do you feel lack of health insurance coverage **affects public health** in your community?

If you feel that lack of health insurance coverage is a problem in your community, then what do you feel is the **biggest barrier** to increasing rates of insurance coverage in your community?

Do you think that **poverty** is a public health problem in your community? Yes No

How do you feel poverty **affects public health** in your community?

If you feel that poverty is a problem in your community, then what do you feel is the **biggest barrier** to increasing poverty in your community?

Do you think that **frequent mental distress** (having poor mental health more than 14 out of 30 days per month) is a problem in your community? Yes No

Has your organization conducted activities to address **frequent mental distress** in your community?

Yes No

*If yes, then describe:*

- Awareness
- Support groups (example: groups for those with mental illness or their caregivers)
- Improving access to treatment (referrals to mental health providers)
- Other (please describe)

If you feel that frequent mental distress is a problem in your community, then what do you feel is the **biggest barrier** to reducing frequent mental distress in your community?