

**URBAN/RURAL DIFFERENCES  
IN SUICIDES IN OREGON, 2001**

by  
**Elizabeth A. Stevenson**

**A DISSERTATION**

**Presented to the Department of Public Health  
and the Oregon Health & Science University  
School of Medicine  
in partial fulfillment of  
the requirements for the degree of  
Masters in Public Health  
December 2003**

School of Medicine  
Oregon Health & Science University

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CERTIFICATE OF APPROVAL


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This is to certify that the M.P.H. thesis of

Elizabeth A. Stevenson

has been approved

  
Donald Austin, M.D., M.P.H.  
Chair

  
Melvin A. Kohn, M.D., M.P.H.  
Member

  
Jodi Zepidus, Ph.D.  
Member

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## Acknowledgements

A project of this size does not get completed by one person alone. *Non nobis solum nati sumus*. I would like to thank everyone who helped along the way to gather and evaluate this data. Mel Kohn and Janice Alexander, who thought of doing this project; Dr. Karen Gunson, Eugene Jacoby and the deputy medical examiners in Multnomah county who spent time explaining reporting methods to me and allowed me use of their limited space at the Multnomah County Morgue; Frank Ratti, the chief deputy medical examiner of Lane County for working and sharing his data with me; Peter Batten, the retired Medical Examiner in Marion county, for sharing his expertise with me; Thomas Brundage at DHS for his help learning SAS PROC GENMOD and his assistance (on numerous occasions) in running analyses and help interpreting the output; Jennifer Woodward and her staff at the Vital Statistics office in Portland for organizing and helping me gather death certificates in a short amount of time; Maryann Evans, for helping me geocode data and produce beautiful maps; Jodi Lapidus for her invaluable statistical help and overall good sound advice; George Hough at the PSU Center for Research for his help deciphering Census Bureau denominators; Tom Becker for help shaping this project into its final product; Janne Boone for checking my details along the way and listening to my presentation and talking on the phone; and my thesis adviser, Don Austin, for sticking with me throughout this project.

I'd also like to thank my friend, David Taylor, for his invaluable programming advice that helped tremendously in gathering data, and for his keen editing eye for the finished project.

## Abstract

*Objectives:* Low population density, along with firearm usage and older age, has been linked to higher suicide rates. While nationwide studies of suicide have shown a link between county population density and suicide rates, it is unknown what the nature of the connection is, although it has been hypothesized that firearm ownership (mainly hunting weapons) is associated with higher suicide rates in rural areas. Suicide is a leading cause of death in both males and females in the State of Oregon. This thesis details the demographic characteristics of completed suicides between urban and rural areas in the State of Oregon in 2001. In this study, alternative definitions of urban and rural were explored, including county-level population size and the Census Bureau's definition of urban and rural. *Methods:* Data abstraction of medical examiner files and collection of death certificates in 512 people who completed suicide in this time frame in Oregon. *Results:* This study showed that different definitions of urban and rural led to differing interpretations of mortality rates. While the most rural counties in Oregon had higher suicide mortality rates, using the Census Bureau definitions of urban and rural found that urban clusters (which are considered part of urban areas by the Census Bureau) had the highest suicide mortality rates. Firearm usage was constant throughout all regions of the state; handguns were used most frequently in firearm suicides. While rural regions of the state saw more hunting weapons used in the commission of suicides, handguns remained the weapon of choice. Older age groups, especially those 75 and older, were at highest risk of suicide in all regions of the state, but especially in rural counties or urban clusters. Using Poisson regression analyses, and controlling for age, method of suicide, urban/rural status and gender showed that for those older than 75 the relative risk of suicide was more than twice of any younger age group. *Conclusions:* County-level mortality data are a coarse descriptor of population density and more accurate methods should be used to measure and describe populations by density measures. Prevention efforts should target middle-age groups of both sexes, along with elderly men, especially in urban cluster areas.

## ***I. SPECIFIC AIMS***

The overall goal of this study is to describe features of urban and rural suicides that may help future prevention efforts reduce the suicide rate in Oregon. Toward achieving this goal, this study examines Oregon's suicide cases in 2001. The specific aims of this research project are the following:

1. identify all suicides in Oregon in the Year 2001;
2. include all eligible cases in the study;
3. define urban and rural areas within the state;
4. examine cases by method of suicide and describe the age, gender, and the region in state where the victim lived; and
5. examine features of cases that differed between urban and rural areas.

## ***II. BACKGROUND AND SIGNIFICANCE***

Death by suicide takes the lives of about 30,000 people in the U.S. every year, a number that exceeds homicide mortality rates and rivals motor vehicle mortality rates.<sup>[1]</sup> The consequences to the friends and families of suicides, who are forever changed, are more significant than tabulated numbers. The toll to society is huge. The lost wages and productivity alone, for the U.S. suicides in 1998, were estimated to total \$11.8 billion. This does not include medical and medical examiner expenses for emergency intervention and investigation or productivity lost to bereavement.<sup>[2]</sup>

Analyses of regional suicide rates in the U.S. have consistently shown that rates in the Northeastern states are the lowest, while rates in the Western states are the highest.



Nevada consistently has the highest suicide mortality rates, at about 22 per 100,000 population. Wyoming, Montana and New Mexico follow close behind Nevada with rates that range between 18 and 19 per 100,000 population. Oregon has a suicide rate of about 15 per 100,000 population. These rates have changed little over the last 20 years.<sup>[1]</sup>

In 1999-2000 in Oregon, suicide was the second leading cause of death in the 15-34 year old age group; the third leading cause of death in the 10-14 year age group; the fourth leading cause of death in the 35-54 year age group and the eighth leading cause of death in the 55-64 year old age group. By gender, suicide in Oregon in 2001 was the seventh leading cause of death for all males, and the fourteenth leading cause of death for all females.<sup>[3]</sup>

Many complex factors account for the regional differences in suicide mortality rates.<sup>[4]</sup> These factors are not well-studied. However, it is known that suicide mortality rates are influenced by factors that include age, gender, ethnicity and population density of the county of the victim's residence.<sup>[4,5,6,7,8,9,10,11,12]</sup>

In nearly every country where suicide has been studied, the risk of suicide increases with age.<sup>[5, 6, 9, 11, 13, 14, 15, 16, 17]</sup> The one exception appears to be the People's Republic of China (PRC),<sup>[18, 19, 20]</sup> where younger females tend to commit suicide more often than older age groups of either gender. This trend (suicide risk increasing with age) is a trend worldwide, even in nations where they have lower suicide rates. In Greece, a nation with a very low rate of suicide, an increase in suicide rates with age has been reported, especially in males.<sup>[17]</sup>

In some countries that are subject to socio-economic upheaval, the rates have increased in recent years. For example, in Belarus, a former Soviet satellite, the suicide

rates have increased dramatically since the break up of the Soviet Union. One hypothesis is that the collapse of the Soviet Union and the resulting socio-economic flux is responsible for this increase. For instance, the rate for middle-aged men in Belarus (40-49 years of age) is 100.8/100,000 in 1995, up from 84.2/100,000 in 1985. More strikingly, elderly (70+ years) male suicide rates in Belarus nearly doubled from 43.6/100,000 in 1985 to 71.4/100,000 in 1995.<sup>[11]</sup>

Worldwide, other than in the PRC, males are more prone to complete suicide than females.<sup>[1, 8, 10, 21]</sup> In the U.S., Whites are more likely to complete suicide than non-Whites.<sup>[4, 8, 22]</sup> Additional risk factors for suicide include psychiatric illness<sup>[7]</sup> and alcohol abuse.<sup>[23]</sup>

Rural areas in the U.S. have higher suicide rates than urban areas.<sup>[2, Appendix A]</sup> The explanations for this are unclear, but have included the hypothesis that increased urbanization decreases the use of firearms in suicides and therefore the lethality of suicide attempts.

Worldwide studies also have found that there are higher rates of suicide in rural areas than in urban areas.<sup>[11, 20, 24]</sup> In the U.S., applying the Poisson Mixture Model to county-level mortality data, one study has shown that the less dense the population, the higher the suicide rate.<sup>[2]</sup> Another study showed that there was an increasing rural/urban gradient in US suicide mortality between 1970 and 1997.<sup>[16]</sup> But the risk and/or protective factors that produce these urban/rural differences in suicides are not well-studied.

It is also hypothesized that suicide rates in rural areas could be increased because people living in rural areas have little or no access to mental health treatment, or that treatment is difficult to obtain because of geographic isolation.<sup>[2, pp. 34-36]</sup>

Only a handful of studies worldwide have addressed the environmental issues of urban and rural differences in suicide, and only a few of these studies use a U.S. population as the basis of research. The U.S. studies have used county-level mortality data and classified the counties by population size.<sup>[2, 25]</sup>

The definition of urban and rural is not clear-cut. According to the Office of Rural Health at OHSU, the following methodology has been developed to classify areas as rural and urban in Oregon. “Urban” designates a geographic area (county) that does not meet the criteria for either frontier or rural designation. “Mixed Urban/Rural” designates a geographic area (county) having both communities that meet the criteria for frontier or rural designation and communities that do not meet these criteria. There are two rural components: “Rural” designates a geographic area (county) 10 or more miles from a population center of 30,000 or more. Rural also includes “Frontier” which designates a geographic area (county) that has a population density of six people per square mile or less. These are the designated categories and the counties designated in each:

**Table 1 – Oregon Office of Rural Health Designation of Urban and Rural Counties**

<b>Office of Rural Health Designation (urban v. rural)</b>	<b>Counties</b>
<i>Urban</i> – no rural or frontier features in the county	Multnomah
<i>Urban/Rural</i> – mixed urban and rural features in the county.	Washington, Clackamas, Marion, Linn, Benton, Lane, Deschutes and Jackson
<i>Rural</i> – Counties with population centers that are 10 or more miles from a population center of 30,000 or more.	Clatsop, Columbia, Tillamook, Yamhill, Polk, Lincoln, Douglas, Coos, Curry, Josephine, Klamath, Jefferson, Wasco, Hood River, Umatilla and Union
<i>Frontier</i> – Counties that have a population density of six people per square mile or less.	Wallowa, Baker, Malheur, Harney, Grant, Morrow, Gilliam, Sherman, Wheeler, Crook and Lake

These designations are important for policy considerations for both federal and state planners in the State of Oregon. Hospitals that are in areas defined as rural are classified as either Type “A” or Type “B” and receive higher reimbursement rates from Medicaid and Medicare.<sup>1</sup> Physicians who practice in rural areas of the state receive important tax advantages and, in some cases, help with payment of their liability insurance premiums. However, for this research project, these county descriptors are unacceptably coarse definitions of urban and rural. Although these descriptors are important to consider when setting policy for the state in regards to political matters, they are less useful when assessing exposure of density of population to the outcome of suicide. This research contrasts two different definitions of urban and rural with respect to suicide: the county level analysis of population size within a county’s border and the Census Bureau designation of urban areas, urban clusters and rural areas within the state, which is not tied to county boundaries, but population density.

<sup>1</sup> However, there are exceptions to this rule. For instance, Cottage Grove Healthcare Community is in an Urban/Rural mixed county (Lane) and nonetheless it operates as a Type B hospital. It received a waiver from the federal government to receive the Type B designation in an effort to be profitable and increase access to health care to low-income rural residents.

The following research questions were explored in this study:

- 1. Was there a difference in rates of suicide in 2001 between populations living in metropolitan area counties, middle population counties and the least populated counties within Oregon?**
- 2. Was there a difference in rates of suicide between urban areas, urban clusters and rural areas in Oregon?**
- 3. Are older residents (75+) in Oregon at higher risk of suicide than other age groups?**
- 4. Are elderly residents at higher risk of suicide in rural Oregon than in urban Oregon?**
- 5. Were firearms used more frequently in suicides in the more rural areas of the state? And also, which firearms were more frequently used, handguns or hunting guns?**

### ***III. METHODS***

#### **Overview**

This research is both descriptive and quantitative in scope. This study describes the suicide population data obtained by summarizing information from the abstracts of the suicide case files and death certificate information. Analyses of the data compare different groups of suicide victims within the year 2001. Further, different definitions of urban and rural are explored in analyzing the statistical differences within the state between suicide victims in these locations.

## Study Population and Study Participants

### The State of Oregon

Oregon is a state of nearly three and a half million individuals. It is divided almost evenly between male and female population, although females slightly outnumber males in every age group.

Two-fifths of the state's population is centered in the Metro area, consisting of Multnomah, Washington and Clackamas counties, a population of more than one million people.

### Urban and Rural Areas In Oregon

There are many ways to define urban and rural areas in any geographic location. For purposes of this research, two different definitions of urban and rural are used. The county-level method encompasses the following classifications:

**Table 2 - Designation of Urban and Rural Counties, by County Population in 2001**

County-Level Analysis	Most densely populated counties ( <i>&gt;340,000 people</i> )	Middle Population Density Counties ( <i>100,000 – 339,999 people</i> )	Least Densely Populated Counties ( <i>&lt;100,000 people</i> )
Total Population	<b>1,467,300</b>	<b>1,125,800</b>	<b>878,600</b>
Counties included:	Multnomah, Washington, and Clackamas	Lane, Marion, Deschutes, Douglas, Jackson and Linn	Baker, Benton, Clatsop, Columbia, Coos, Crook, Curry, Gilliam, Grant, Harney, Hood River, Jefferson, Josephine, Klamath, Lake, Lincoln, Malheur, Morrow, Polk, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco, Wheeler, Yamhill



**Table 3 - Census Bureau's Definitions of Urban Areas, Urban Clusters and Rural Areas in Oregon**

Census Bureau Definition	Place Names	Population Total
Urban Areas >1,000 people per square mile	Bend, Corvallis, Eugene, Longview WA-OR, Medford, Portland OR area, Salem	1,976,124
Urban Clusters >500-999 people per square mile near an Urban Area	Albany, Astoria, Aumsville, Baker City, Bandon, Boardman, Brookings, Burns, City of The Dalles, Coos Bay, Coquille, Cottage Grove, Creswell, Dallas, Depoe Bay, Eagle Point, Estacada, Florence, Grants Pass, Harrisburg, Hermiston, Hood River, Irrigon, Jefferson, Junction City, Klamath Falls, Lafayette, La Grande, Lakeview, Lebanon, Lincoln City, McMinnville, Madras, Milton-Freewater, Molalla, Monmouth-Independence, Mount Hood Village, Myrtle Creek, Newberg, Newport, Nyssa, Oakridge, Ontario, Pendleton, Prineville, Redmond, Reedsport, Roseburg, St. Helens, Sandy, Seaside, Shady Cove, Sheridan, Silverton, Stanfield, Stayton, Sutherlin, Sweet Home, Tillamook, Toledo, Veneta, Waldport, Weiser, ID-OR, West Ontario (Snake River Correctional Institution), Woodburn	718,020
Rural Areas All other areas not designated urban		727,255

**Figure 2 – Approximation of the Census Bureau Designation of Urban Areas, Urban Clusters and Rural Areas**

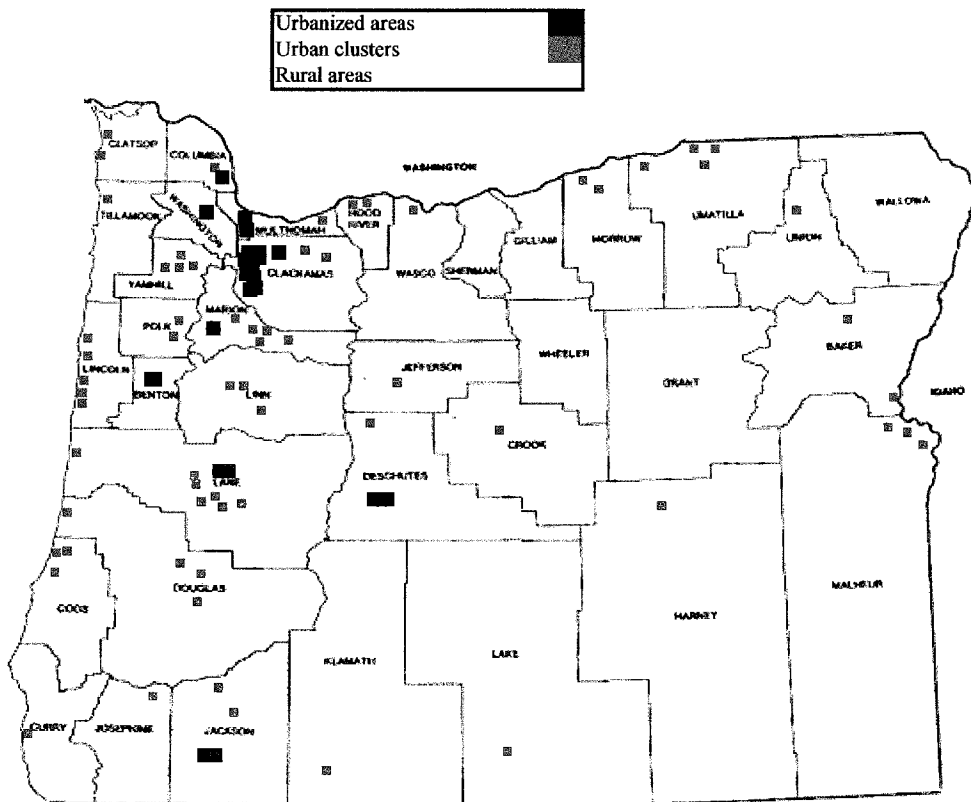




Figure 2 shows an approximation of the areas that the Census Bureau has designated urbanized areas (the black dots approximate these areas) urban clusters (the smaller red dots designate these areas) and rural (all the white spaces in between).

The Census Bureau defines its Urban Areas, Urban Clusters and Rural areas as follows:

“For Census 2000, the Census Bureau classifies as “urban” all territory, population, and housing units located within an urbanized area (UA) or an urban cluster (UC). It delineates UA and UC boundaries to encompass densely settled territory, which consists of:

- Core census block groups or blocks that have a population density of at least 1,000 people per square mile and
- Surrounding census blocks that have an overall density of at least 500 people per square mile.

In addition, under certain conditions, less densely settled territory may be part of each UA or UC.

The Census Bureau’s classification of “rural” consists of all territory, population, and housing units located outside of UAs and UCs. The rural component contains both place and nonplace territory. Geographic entities, such as census tracts, counties, metropolitan areas, and the territory outside metropolitan areas, often are “split” between urban and rural territory, and the population and housing units they contain often are partly classified as urban and partly classified as rural.”<sup>2</sup>

The Census Bureau further states that:

“An urbanized area (UA) consists of densely settled territory that contains 50,000 or more people. A UA may contain both place and nonplace territory. The U.S. Census Bureau delineates UAs to provide a better separation of urban and rural territory, population, and housing in the vicinity of large places. At least 35,000 people in a UA must live in an area that is not part of a military reservation.”

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<sup>2</sup> From the Census Bureau’s website at [www.census.gov](http://www.census.gov)

Case Selection - The data used to answer the research questions were collected for each suicide decedent identified by the death certificates in the 2001 vital statistics database of the Oregon Health Division.

Inclusion/Exclusion Criteria – All suicide victims that committed the act of suicide inside Oregon were originally included in the data set. Excluded were victims of suicides that originally occurred in other states but who *died* in Oregon. For example, any person who sustained a self-inflicted gunshot wound in Vancouver, Washington (across the Columbia River from Portland), survived long enough to be “life-flighted” to either Emanuel Hospital or OHSU in Portland (the two Level-One Trauma Hospitals in Oregon), and then died in Portland, was excluded from the analysis.

In 2001, there were 530 suicide victims who committed suicide within the State and died in the State of Oregon. Of these 530 victims, 4 had no known last address and 14 lived outside of Oregon but committed suicide in Oregon. When the data were analyzed these 18 suicide victim records were excluded as their addresses were not geocodable, either because their addresses were outside of Oregon, or because they had no last known address and their exposure risk factors were not known. All analyses were performed using N=512.

#### Data Abstraction

I abstracted all decedent case files from the year 2001 at the medical examiner offices in Portland and in Eugene. Generally, the information available in a medical examiner file includes a medical examiner’s report; an autopsy report (if an autopsy was completed) or an external autopsy report (if no full autopsy was completed); and a copy of the death certificate. Additionally, some counties include the original police reports

from the reporting officers and perhaps some medical files if the subject was known to be a patient at mental health or hospital facilities. These files contain bits and pieces of evidence within them about the motives and circumstances surrounding a person's decision to commit suicide. I abstracted as much information as was available in these files using a form I programmed in Microsoft Access for the process. I developed an abstraction table based on the Death Review questionnaire for the child fatality review team at the Department of Human Services<sup>3</sup>. However, counties are not uniform in their reporting procedures and much of this information was left blank.

Thirty-five of Oregon's thirty-six counties keep their medical examiner data at the Multnomah County Morgue in Portland, Oregon. Lane County (the county seat is Eugene) keeps its own records. The medical examiners in Lane County are housed in the District Attorney's office in the Lane County Courthouse in the middle of downtown Eugene.

### **Study procedures**

Under ORS 146.090 *et al*, the Medical Examiner has jurisdiction over all suspicious deaths in the state. After a death is discovered, if the circumstances are not clear, the county Medical Examiner is called. The Medical Examiner has control over the body and the investigation of circumstances surrounding the death. The death is investigated to determine whether to classify it as a homicide, a suicide, undetermined, natural or unintentional death.

Self-inflicted gunshot wounds are usually the easiest suicide cases to determine. However, the Medical Examiner will investigate the circumstances surrounding the suicide. This means that the investigator will interview those closest to the suicide

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<sup>3</sup> Available online at <http://www.dhs.state.or.us/publichealth/ipe/stat.cfm>.

victim, will obtain any psychiatric or diagnostic reports from medical providers or hospitals and will request blood toxicology work if there is reason to believe that the decedent was intoxicated. In most firearm suicide cases, the wound is consistent with the handedness of the victim (either right or left), although this is not definitive evidence. Spatter marks will spray consistently with the aim of the weapon. Expanded slugs will be recovered from the victim or from wherever they lodged after exiting the body. The usual determination of suicide by firearm is based on finding that there is fouling or contact powder burns of the skin around the entrance wound (indicating close contact between the weapon and the subject) and a fracture of one or both supraorbital plates if it is a gunshot wound to the head. Further evidence could include backsplash or streaked blood spattered across the hands or forearms in a pattern consistent with blow-back of the weapon. Blood, particles of cerebrum, or masses of hair commonly adhere to the muzzle of the weapon used in a contact injury.<sup>[26]</sup>

Asphyxiation deaths (suicide by hanging is the most common) are more thoroughly investigated before ruling a suicide. Suicidal hangings differ from judicial executions in that suicidal hangings result in partial vascular compromise while judicial executions involve a fracture of the odontoid process after a six to ten foot drop from the gallows trap.<sup>[26]</sup> Some suicide cases, in which victims are found hanging by the neck from a lower-than-expected place (usually a bedroom closet clothes rod) with knees bent, are mistaken for homicides. An untrained observer will note that the suicide victim could simply stand up to stop the asphyxiation.<sup>4</sup> The point, however, is that someone committing suicide does not want to stand up. A minority of asphyxiation deaths include

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<sup>4</sup> Personal conversation with Eugene Jacoby, Deputy medical examiner for the State of Oregon.

placing plastic bags over a persons' head and securing it (usually with duct tape) to stop the flow of oxygen to the brain.

Poisoning deaths are the most difficult to identify as suicide cases. Further investigation, including toxicology and interviews with family and medical providers, must be performed before determinations can be made. Absent suicide notes or definitive evidence, many of these will have cause of death classified as “undetermined”.

These three cause of death categories comprise the majority of suicides. The rest of the deaths occur as a result of jumping from a high place, self-mutilation through cutting, or drowning in bodies of water.

### **Sample Size and Power Calculations**

In order to estimate sample sizes large enough to compare incidence rates, I used a method suggested by *Rosner*.<sup>[27, p. 694]</sup> To assure at least a 95% confidence interval and 80% power, sufficient sample sizes to compare county-level data were available. In Tables 4 and 5, below, are shown the sample sizes needed to compare incidence rates between the county groups. As shown in these tables, sufficient numbers are available to compare the groups.

**Table 4 - Sample Size Estimate for Mortality Rate Comparisons, Metro vs. Middle Population Counties**

Comparing These Groups:	Crude Incidence Rate	Events in Group	Underlying Population Size	Subjects Needed for 80% Power, 95% CI	This study expected to yield this many events:
Group 1 (Metro Counties)	11.7/100,000	171	1,467,300	1,003,611	117
Group 2 (Middle Pop Counties)	16.7/100,000	188	1,125,800	770,030	129

**Table 5 - Sample Size Estimate for Mortality Rate Comparisons, Metro vs. Rural Counties**

Comparing These Groups:	Crude Incidence Rate	Events in Group	Underlying Population Size	Subjects Needed for 80% Power, 95% CI	This study expected to yield this many events:
Group 1 (Metro Counties)	11.7/100,000	171	1,467,300	908,265	106
Group 2 (Rural Counties)	17.4/100,000	153	878,600	543,857	95

However, for the urban areas, urban clusters and rural areas analyses, while my sample sizes for the urban areas were sufficient, the sample size for the rural area was not. In Tables 6 and 7 below I show my calculations for sample sizes needed for 95% CI and 80% power. Table 6 shows sufficient power, but Table 7 shows that I am short a few subjects to show a true difference with 80% power.

**Table 6 - Sample Size Estimate for Mortality Rate Comparisons, Urban Areas vs. Urban Clusters**

Comparing These Groups:	Incidence Rate	Events in Group	Underlying Population Size	Subjects Needed for 80% Power, 95% CI	This study expected to yield this many events:
Group 1 (Urbanized area)	14.4/100,000	287	1,976,124	1,183,996	172
Group 2 (Urban Cluster)	21.0/100,000	151	718,020	430,202	90

**Table 7 - Sample Size Estimate for Mortality Rate Comparisons, Urban Areas vs. Rural Areas**

Comparing These Groups:	Incidence Rate	Events in Group	Underlying Population Size	Subjects Needed for 80% Power, 95% CI	This study expected to yield this many events:
Group 1 (Urbanized Area)	14.4/100,000	287	1,976,124	1,994,240	289
Group 2 (Rural Area)	10.2/100,000	74	727,255	733,922	75

Although I am short two subjects in the urbanized area and one in the rural area group to achieve 80% power, it is close. I estimate that I have 79% power to find differences between the two groups.

### **Statistical Methods and Data Collection**

The data for this research included an individual-based abstraction of suicide files based in the medical examiner's offices in Oregon. I abstracted all available data from the medical examiner files about the methods, motives and evidence surrounding the suicide. The list below describes the most complete variables used in this study.

**Table 8 - Variables Collected, Variable Description and Frequencies**

<b>Variables</b>	<b>Description of Variable</b>	<b># of Responses to Question N=530<sup>5</sup></b>
<b>Age Of Victim</b>	Calculated variable between date of death and date of birth	530
<b>Gender</b>	Male or female as indicated on death certificate	530
<b>Racial Category</b>	Race of victim per death certificate.	529
<b>Hispanicity Of Victim</b>	From death certificate, whether victim was Hispanic or not	529
<b>Place Of Incident</b>	From death certificate	526
<b>County Of Death</b>	From death certificate	530
<b>County Of Incident</b>	From death certificate	530
<b>Method Of Suicide</b>	From death certificate	530
<b>Are There Any Other Factors About This Suicide Not Detailed Elsewhere In This Report?</b>	Descriptive category for any other pertinent information in the file, such as terminal illness or other descriptive factors noted by the medical examiner as leading to the suicide.	460

Sometimes included in the medical examiners notes is information regarding the reasons why the victim committed suicide. I routinely noted these reasons in a comment section of my database while I was abstracting the files. Reasons relating to severe chronic or terminal illness were reported by some medical examiners in some counties.

This project used statistical techniques (proportions and rates) to describe the data. I used Chi-Square analyses to describe the data when assessing differences between groups defined by gender, geographic location and methods of suicide. I also analyzed the data with Poisson regression analysis to help explain the differences between the groups and the effects of these variables on the outcome of suicide.

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<sup>5</sup> All analyses were conducted using N=512 instead of N=530 as described in the Methodology. The 18 suicide victims without a verified Oregon residence were left out of the analyses.



The data were initially gathered during the fall/winter of 2002/2003 using a Microsoft Access database created and programmed by me. Because most of the data are in Portland, most of my time abstracting data was spent at the Morgue in Portland. The Morgue is open 24 hours a day/7 days a week. For the Lane County cases I traveled to the Lane County Courthouse in Eugene which is only open on weekdays during business hours. For the Lane County cases, I was supervised in my abstraction of cases by the Chief Deputy Medical Examiner in Lane County.

All information was secured by an agreement with the Oregon Department of Human Services, Health Division, Epidemiology Section and with the knowledge and consent of Dr. Melvin Kohn, the State Epidemiologist. Initially, no individually identifiable factors were recorded in the Microsoft Access database (i.e. Name, Residence Address or Residence Zip code).

After further review in October 2003, in order to analyze the data in accordance with the Census Bureau's designation of urban and rural places, I gathered more geographic data (residential street address, city and zip code) from the death certificates in the Vital Statistics section of the Oregon Health Division. Approximately 20 cases had been reclassified to suicide from undetermined death in the year between. One suicide case in Lane County that I had abstracted the year previous had been reclassified to accidental death. The suicide death count for 2001 in this thesis is based on the vital statistics files as of October 17, 2003.

I used county of residence abstracted from the final residence address of the victim from the victim's death certificate in all statistical analyses. For county-level

analyses, the final county of residence was used to determine whether the case belonged in the metro area, the middle population counties or the least populated counties.

I also classified urban and rural cases in accordance with the Census Bureau's designations of urban areas, urban clusters and rural areas. I did not have access to the shape files necessary to classify the cases electronically by their geocode, so I used the maps on the Census Bureau's website to find the addresses and code them to their appropriate areas. I used the denominator age-sex tables for urban areas, urban clusters and rural areas from the Census Bureau's website. Finally, in order to make the map in Figure 3, I geocoded the last-known addresses of the suicide victims in 2001.

I used county of residence as the indicator for all statistics in the results section, except for Figure 4 where I showed the county of incidence for rates in counties.

Statistical analyses were performed using SPSS (v. 11.5 for Windows) and SAS (v. 8.0 for Windows).

## IV. RESULTS

**Table 9 - Demographics Characteristics of Oregon Victims of Suicide, by Gender and County of Residence, 2001 (N=512)**

Statistic	Categories	Results
2001 Suicides		N=512
Age Range at Death		13.7 – 91.9 years
Mean Age ( $\pm$ SD)		47.7 ( $\pm$ 18.4)
Gender (% of total)	Male	399 (78)
	Female	113 (22)
Method (% of total)	Firearm	278 (54)
	Asphyxiation	104 (20)
	Poisoning	96 (19)
	Jumping from High Place	10 ( 2)
	Cutting	9 ( 2)
	Other	8 ( 2)
	Drowning	6 ( 1)
Race (% of total)	Late Effects of Self-Inflicted Injury	1 ( 0)
	White	478 (93)
	Other	12 ( 2)
	Asian	11 ( 2)
	American Indian	9 ( 2)
	African American	1 ( 0)
Hispanic (% of total)	Unknown	1 ( 0)
	Hispanic	19 ( 4)
	Not Hispanic	492 (96)
Firearm Type (% of Firearm Suicides)	Unknown	1 ( 0)
	Handgun	188 (68)
	Hunting Rifle	43 (16)
	Shotgun	37 (13)
	Military Rifle	2 ( 1)
Crude Rate (per 100,000)	Unspecified	8 ( 3)
		14.7
Age-adjusted Rate (95% CI)		14.5 (13.3-15.8)

Table 9 shows the overall demographic characteristics of suicide decedents in Oregon in 2001 by county of residence. As expected, the use of firearms in suicide was greater than any other method, accounting for 54% of all suicides. Asphyxiation deaths (self-hangings or placing bags over heads) and poisoning suicides were nearly equal in 2001 (~20%). The rest of the suicide cases (jumping, cutting, drowning, other specified means) made up the last 7% of suicides.

While 93% of suicide victims in Oregon were racially White, the White population in Oregon consists of only 86.6% of Oregonians.<sup>6</sup> In contrast, Hispanics, the next largest ethnic group in Oregon, accounted for less than 4% of the suicide victims, but make up about 8% of the total population in Oregon.<sup>7</sup> White non-Hispanics (N=465) had an overall crude suicide rate of 16.3. The age-adjustment lowered it to 15.6 (95% CI: 14.1-17.0). The Hispanic crude suicide rate was 6.9 (N=19) but when the age-adjustment was done it rose to 13.9 (95% CI: 5.2-22.5). The difference between the rates of White non-Hispanics and Hispanics is therefore explained, at least in part, by the ages of the victims.

Firearms are the most frequently used method for suicide victims and handguns are the most frequent weapon of choice for firearm suicide victims. Of all firearm suicides in Oregon in 2001, 68% used a handgun.

The crude suicide rate for residents of Oregon in 2001 (N=512) was 14.7/100,000. Age-adjusted to the U.S. 2000 Standard Million, it was 14.5 (13.3-15.8). The crude suicide rate for the entire population (N=530) which included out-of-state residents and homeless people who committed suicide and died in Oregon was 15.3 and an age-adjusted rate of 15.0 (13.8-16.3).

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<sup>6</sup> 2000 US Census, People QuickFacts, available online at <http://quickfacts.census.gov>

<sup>7</sup> *Ibid.*

**Figure 3 - Place of Last Residence of Suicide Victims in Oregon (2001)**

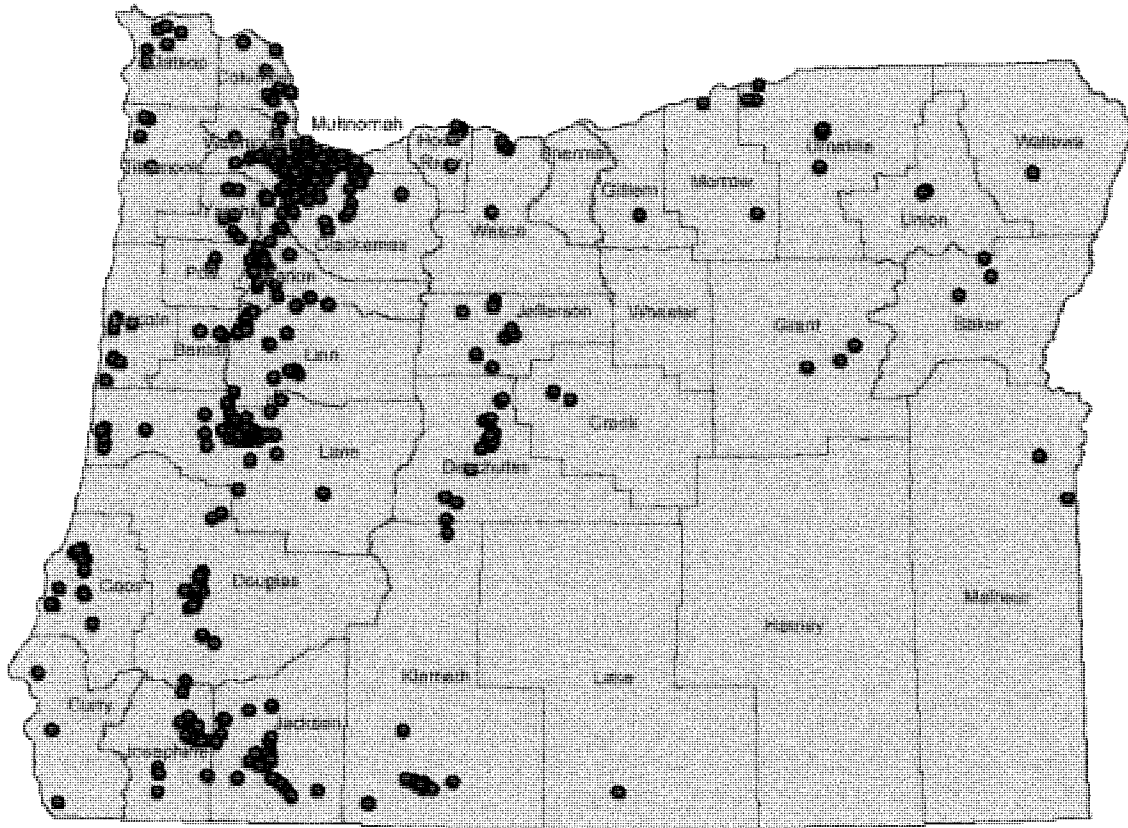
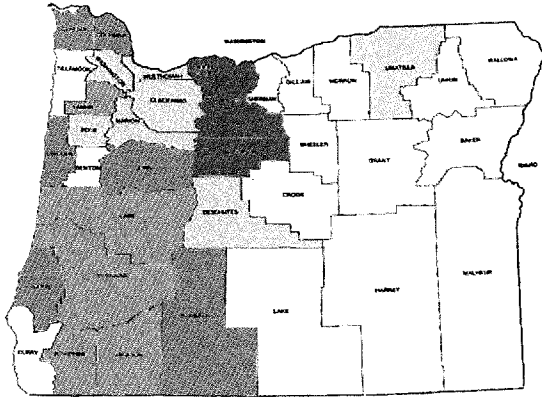
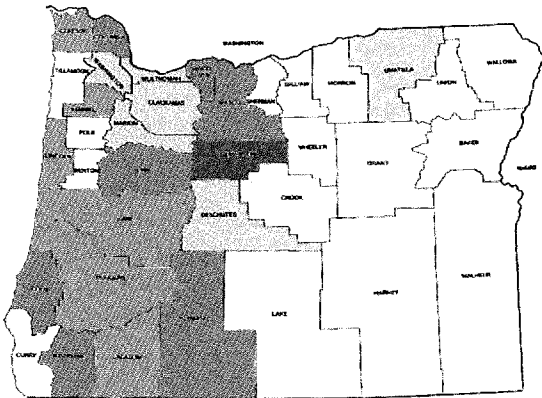


Figure 3 is a geocoded map of the last residence of 512 suicide victims in Oregon. There is a cluster of suicides around the known urban areas in Oregon. The area known as the I-5 corridor (the left-hand third of the state from north to south) shows the most suicide victims in the state.

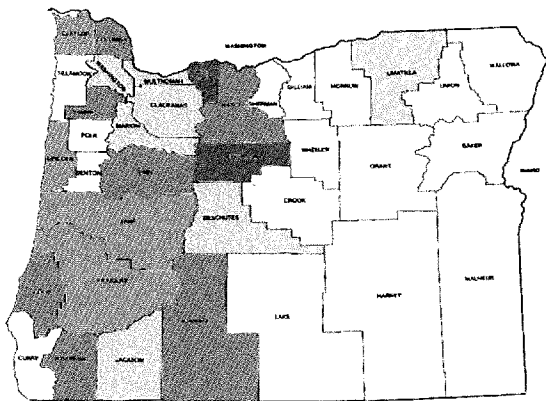
**Figure 4 – Oregon Suicide Rates,<sup>8</sup> Classified by County of Incident, 2001 (N=512)**



**Figure 5 – Oregon Suicide Rates, Classified by County of Residence, 2001 (N=512)**



**Figure 6 – Oregon Age Adjusted Suicide Rates, Classified by County of Residence, 2001 (N=512)**



<i>Legend</i>		
Crude rates (per 100,000)	Description	Color key
Blank	Count <=5	
9-14.9	Below Mean	
15-19.9	Mean and Slightly Higher	
20-29.9	Above Mean	
>30.0	High	

<sup>8</sup> In Figures 4, 5 & 6, Counties with fewer than 5 suicides are excluded.

Figure 4 shows the rates of suicide throughout the state by county of incident. The counties that are blank represent counties with  $\leq 5$  suicides in the year. If grouped together, the low count counties' crude rate is below the mean at 12.5/100,000. The age-adjustment lowers it slightly to 12.3 (95% CI: 8.1-16.6)

The yellow colored counties have crude rates below the mean for the state ( $<15.0$ ); the tan colored counties have the mean crude rate for the state and slightly higher. The green colored counties have rates that are greater than the mean (between 20-29 per 100,000) and the dark rust colored counties had crude suicide rates of above 30 per 100,000. Age-adjusting these rates did not change the classification of any of these counties.

Figure 5 shows the same classification of suicide rates by county, but sorting by county of residence, instead of county of incidence. Hood River and Wasco Counties, which had previously been two of the highest suicide rate counties shown in Figure 4, are now one rate step lower in Figure 5. Polk County now appears in the lowest count category, though it had been in the low-risk counties in Figure 4. The low-count counties' crude rates also dropped to 11.0/100,000. The age-adjusted rate was slightly higher at 12.8 (95% CI: 7.6-18.1).

When the rates for the same counties in Figure 5 are age-adjusted, there is a slight difference in results, as seen in Figure 6. Hood River County increases its rate over 30 per 100,000 as a result of the age adjustment.

**Table 10 – Crosstabulation of County of Incident and County of Residence of Suicide Victims in Oregon, 2001 (N=512)**

**Urban/Rural by County of Incident \* Urban/Rural by County of Residence Crosstabulation**

Count		Urban/Rural by County of Residence			Total
		Metro Counties	Middle Population Counties	Least Populous Counties	
Urban/Rural by County of Incident	Metro Counties	159	0	4	163
	Middle Population Counties	2	176	8	186
	Least Populous Counties	10	12	141	163
Total		171	188	153	512

In order to evaluate movement of suicide victims from county to county, I performed a crosstabulation on the two variables: county of incident and county of residence (N=512), shown in Table 10. It shows that 12 of the suicide victims (or 7%) who lived in the metro counties went to less populated counties to commit suicide. Twelve people who lived in middle population areas (or 6% of the middle population victims) went to the least populated counties to commit suicide, and none went to the metro area to commit suicide. Twelve people (nearly 8%) who lived in the least populated counties went to more densely populated areas to commit suicide. Nevertheless, the measure of agreement of the Kappa Statistic was .894 with a corresponding p-value of <.001.



**Figure 7 - Distribution of Place of Incident of Suicide Victims in 2001 (N=512)**

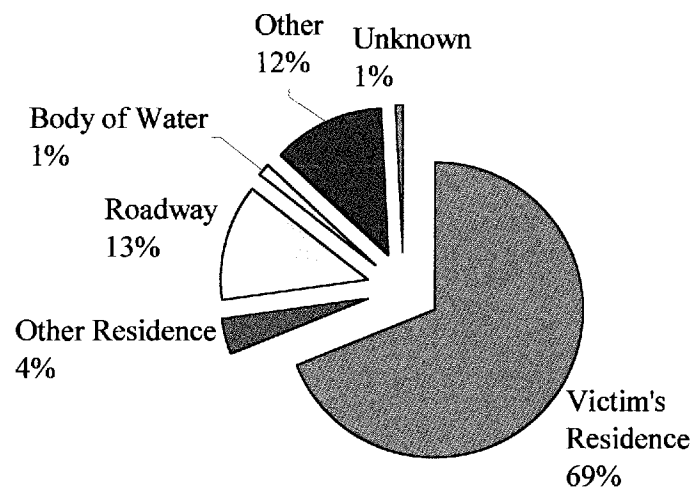


Figure 7 illustrates that well over half of all suicides occurred in the victim's residence, followed by equal, smaller numbers of suicides occurring in roadways or in parks and rural areas (under "other" in Figure 7).

**Table 11 - Demographic Characteristics of Oregon Suicide Victims, by Gender and Residence, 2001 (N=512)**

Statistic	Categories	Male	Female	T-Test P Value
<b>2001 Suicides</b>		N= 399	N=113	
Age Range		13.7 – 91.9 years	14.3 – 91.1 years	
Mean Age (±SD)		47.6 (±18.6) years	48.0 (±17.6) years	p=.852
				$\chi^2$ p value
Method (% of Gender Total)	Firearm	237 (59)	41 (36)	<b>p&lt;.001</b>
	Asphyxiation	84 (21)	20 (18)	
	Poisoning	51 (13)	45 (40)	
	Other	27 ( 7)	7 ( 6)	
Firearm Type (% of Firearm Suicides)	Handgun	160 (65)	33 (81)	p=.173
	Hunting Rifle	40 (17)	4 (10)	
	Shotgun	36 (15)	2 ( 5)	
	Other	8 ( 3)	2 ( 5)	
Crude Rate (per 100,000)		23.2	6.5	
Age-Adjusted rate (95% CI)		23.5 (21.2–25.8)	6.3 (5.1-7.5)	<b>p&lt;.001</b>

Table 11 shows the statistical differences between males and females who committed suicide in Oregon in 2001. Males in Oregon, on average, were four times more likely to complete suicide than females. During 1992-94 the crude suicide death rate for males was 26.2/100,000, compared to 6.8/100,000 for females.<sup>[18]</sup> This trend continues to date, with a crude death rate of 23.2/100,000 for males and 6.5/100,000 for females in 2001. Age adjustment moves the male rate up slightly, to 23.5, and the female rate down slightly, to 6.3. The rates are significantly different (p<.001).

There is a statistically significant difference between the genders in the method used for suicide. While men use firearms for suicide, women use self-poisoning over firearms when committing suicide (40% vs. 36%). However, when women do use firearms, they demonstrate a clear preference for handguns over any other type of firearm as 81% of females who used a firearm used a handgun.

**Table 12 – Demographic Characteristics of Oregon Suicide Victims, by Classification of Residence, 2001 (N=512)**

Definition Of Urban/Rural By Population Size At The County Level		Most Urban (>350,000) 3 counties  N= 171	Middle Density (100,000-349,000) 6 counties  N= 188	Lowest Density (<100,000) 27 counties  N= 153	
Age Range		17.6-86.3	13.7-90.8	14.3-91.8	
					<b>One Way ANOVA</b>
Mean Age (±SD)		46.4 (±15.9)	47.6 (±18.8)	49.2 (±20.3)	p=.110
					<b>χ<sup>2</sup> p value</b>
Gender (%)	Male	131 (77)	147 (78)	121 (79)	p=.861
	Female	40 (23)	41 (22)	32 (21)	
Method (%)	Firearm	77 (45)	109 (58)	92 (60)	p=.003
	Asphyxiation	43 (25)	36 (19)	25 (16)	
	Poisoning	30 (18)	36 (19)	30 (20)	
	Other	21 (12)	7 ( 4)	6 ( 4)	
Firearm Type (% of Firearm Suicides)	Handgun	57 (74)	73 (67)	58 (63)	p=.012
	Shotgun	9 (12)	16 (15)	12 (13)	
	Hunting Rifle	11 (14)	19 (17)	13 (14)	
	Other	0	1 ( 1)	9 ( 10)	
Crude Rate (per 100,000)		11.7	16.7	17.4	
Age Adjusted rate (95% CI)		14.4 (12.1-16.7)	16.5 (14.2-18.9)	17.2 (14.4-19.9)	p<.001

Table 12 shows the county level analysis of suicide victims by demographic characteristics for the victim’s county of residence. Table 12 shows that the rates for suicides increased with decreasing county population. The least populated counties (<100,000 population per county) had an average age-adjusted rate of 18.5/100,000 (15.6-21.4) compared to the most populated counties (>345,000 population per county) of 13.7/100,000 (11.5-15.9). I tested the difference in incidence rates for significance using the normal theory method.<sup>[27, p.684]</sup> It indicated that the differences between all three rates was significant at the p<.001 level.

The proportion of firearm suicides increased from the metro counties (45%) to the middle population counties (58%) to the highest proportion in the least populated counties (60%), showing a gradient of increased firearm usage the less population the

counties had. Asphyxiation deaths made up one-quarter of the suicide deaths in the most urban area, but decreased to 19% in the middle population counties and then to 16% of the deaths in the less populated counties. Poisoning deaths remained almost constant, between 18-20%, in all three groups. Most of the “other” deaths in the most urban counties were jumping from high places, indicating the role of physical architecture in the most urban areas. In the most urban area, there were a cluster of deaths surrounding tall buildings and high bridges. Those deaths were classified as “jumping from high places” and then sub-classified as “residential premises,” “other man-made structures” or “natural sites.” The one jumping death in rural Oregon occurred at the coast when a male jumped off a cliff in Tillamook County. The differences in methods between the three groups was significant at  $p=.003$ .

The type of firearm usage was also significant in Table 12. Handguns were used three-quarters of the time in firearm suicides in the metro counties, while handgun usage dropped off to 63% in the least populated counties. Shotguns and hunting rifles were used more frequently in middle populated counties and less frequently in either the metro counties or the least populated counties.

**Table 13 – Demographic Characteristics of Oregon Suicide Victims, by Census Bureau Definition of Urban and Rural, 2001 (N=512)**

Statistic		Most Urban Urban Areas	Middle Density Urban Clusters	Lowest Density Rural Areas	P Values
Urban/Rural Census Bureau Definition					
Total Population		1,976,124	718,020	727,255	
Suicide Count	Total N=512	N= 287	N= 151	N= 74	
Age Range		16.9-90.8 yrs.	13.7– 91.9 yrs.	15.6-85.7 yrs.	
					<b>One-Way ANOVA</b>
Mean Age (±SD)	47.0 (±16.8) yrs.	47.6 (±17.7) yrs.	46.5 (±19.3) yrs.	50.4 (±19.3) yrs.	p=.322
	<b>Categories:</b>				<b>χ<sup>2</sup> p value</b>
Gender (%)	Male	229 (80)	117 (78)	53 (72)	p=.312
	Female	58 (20)	34 (23)	21 (28)	
Method (%)	Firearm	148 (52)	84 (56)	46 (62)	p=.261
	Asphyxiation	64 (22)	31 (21)	9 (12)	
	Poisoning	51 (18)	29 (19)	16 (22)	
	Other	24 ( 8)	7 ( 5)	3 ( 4)	
Firearm Type (% of Firearm Total)	Handgun	108 (73)	53 (63)	27 (59)	p=.02 <sup>9</sup>
	Hunting Rifle	24 (16)	11 (13)	8 (17)	
	Shotgun	16 (11)	14 (17)	7 (15)	
	Military Rifle	0	1 ( 1)	1 ( 2)	
	Unspecified	0	5 ( 6)	3 ( 7)	
Crude Rate (per 100,000)		14.5	21.0	10.2	
Age-adjusted Rates (95% CI)		14.4 (12.7-16.1)	21.3 (17.9-24.7)	10.3 (7.9-12.8)	p<.001

Distributions of suicide victims, according to the Census Bureau’s definitions of urban and rural, are presented in Table 13. Table 13 shows that the highest rate of suicide is in the middle density group, urban clusters, suggesting that people who live in small towns (enumerated above in Table 3) were more likely to commit suicide than those who lived in either large urban areas or the most rural areas in Oregon. When adjusted for age, the rates remained stable. The differences between the urban clusters and urban areas, tested with the normal theory method, were significant at the p<.001

<sup>9</sup> I collapsed this variable into Handgun, Hunting Rifle, Shotgun and Other (Military Rifle and Unspecified collapsed) to calculate the Chi-Square p-value.

level. I tested for significance between the urban cluster and the rural areas and it was significant at  $p=.0074$ .

While the rates were significantly different between the urban areas and urban clusters, the methods used were not. While there is an increasing gradient of firearm usage in suicides from the most urban areas to the most rural areas, it is not statistically significant. However, the type of firearm used is statistically significant between the three groups. Like Table 12, almost three-quarters of the firearm suicides in the urban areas used a handgun, while handgun usage dropped off to only 59% in the rural areas. Shotguns were used proportionally more in urban cluster areas, but hunting rifles were used proportionally more in the rural areas.

**Table 14 - Suicide Rates (per 100,000) for Oregon by Age Group (2001)**

Age Group	N per year	Population At Risk	Age Group Crude Rate
0-14	5	699,577	0.7
15-24	47	474,833	9.9
25-34	89	470,695	18.9
35-44	116	526,574	22.0
45-54	106	507,155	20.9
55-64	49	304,388	16.1
65-74	40	219,342	18.2
75-84	43	161,404	26.6
85+	17	57,431	29.6
<b>All Ages:</b>	<b>512</b>	<b>3,421,399</b>	<b>15.0</b>

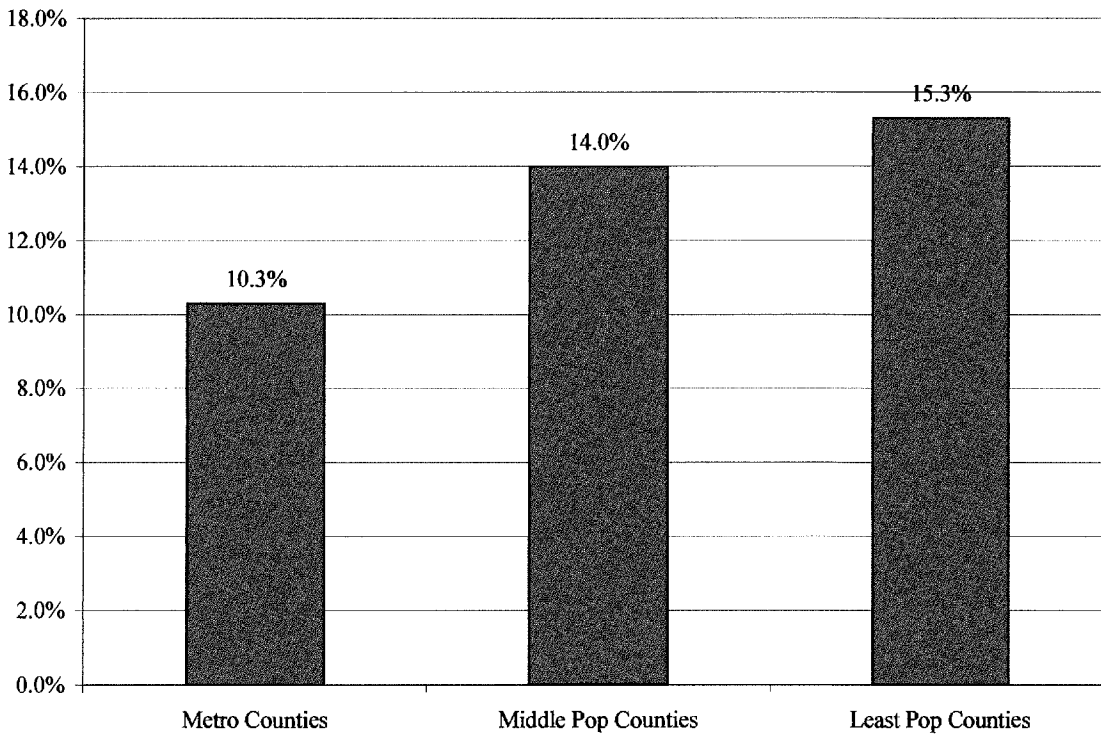
Table 14 shows the crude suicide rates by age group for the entire state. While suicide rates for those 65-74 years of age were actually lower than the 25-54 year olds, the people 75 years of age or older had a higher incidence rate than any younger group.

The elevated age-specific rates for 75+ years of age are not a new phenomenon. They have been elevated since at least 1995, as shown in Table 15.

**Table 15 - Age-Specific Rates for Oregon Victims of Suicide, per 100,000, 75+ years of Age, 1995-2001**

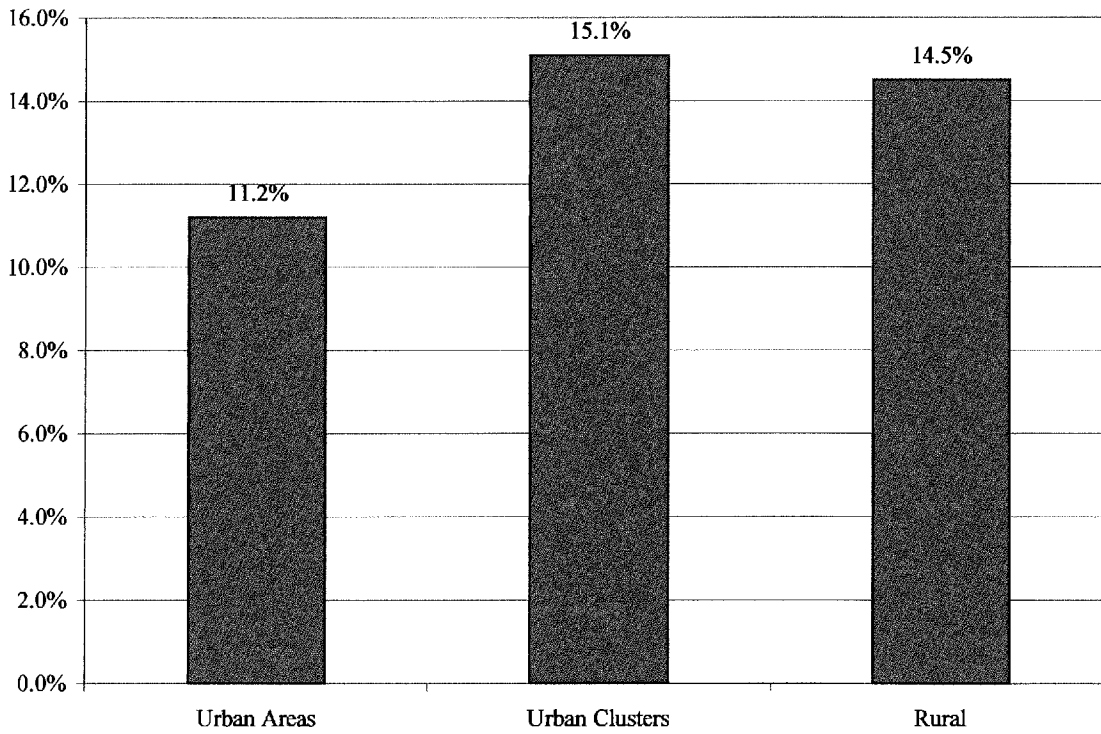
	75+ Age-Specific Rate
1995	27.9
1996	30.2
1997	31.1
1998	35.2
1999	29.2
2000	37.0
2001	27.4

**Figure 8 - Proportion of Elderly (65+) Living in Counties Classified by Population Size, Oregon (2001)**



Oregon's overall proportion of people 65 years of age and older (12.8%) is slightly higher than the nation as a whole (12.6%). In Oregon, the proportion of people 65 years of age and older is greater in less populated areas than in the urban areas. Using the county definition of urban/rural, there is an increasing proportion of elderly living in less populated areas (Figure 8).

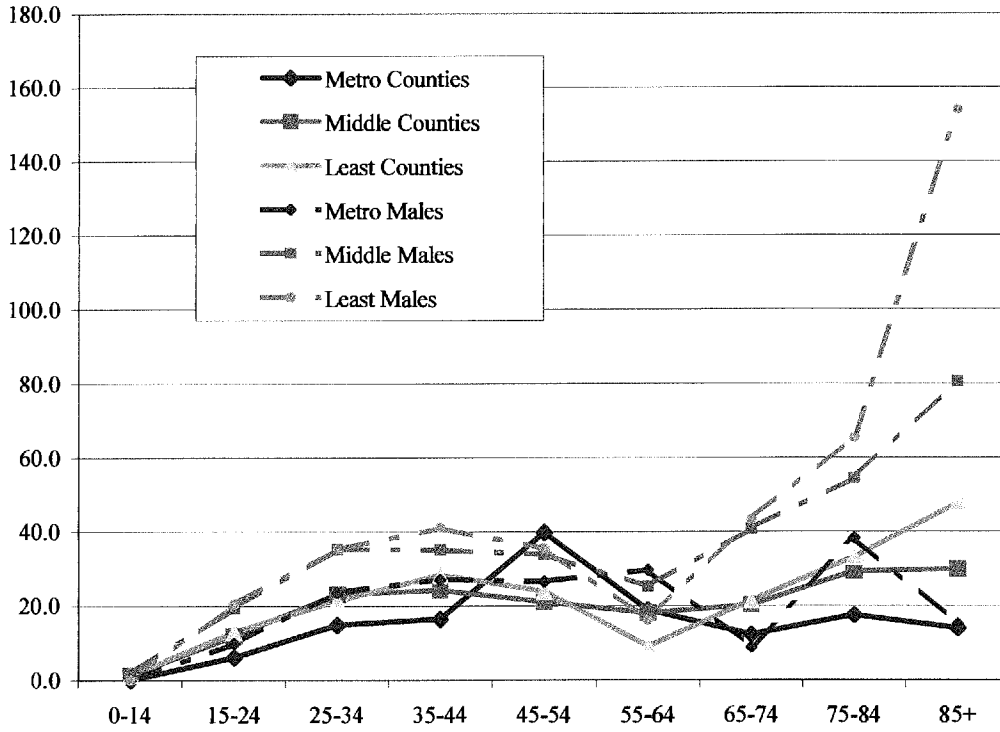
**Figure 9 - Proportion of Elderly (65+) Living in Areas Classified by Census Bureau Definition of Urban and Rural, Oregon (2001)**



Using the Census Bureau’s definitions of urban and rural areas (Figure 9), the highest proportion of elderly citizens live in urban clusters, followed by rural areas.

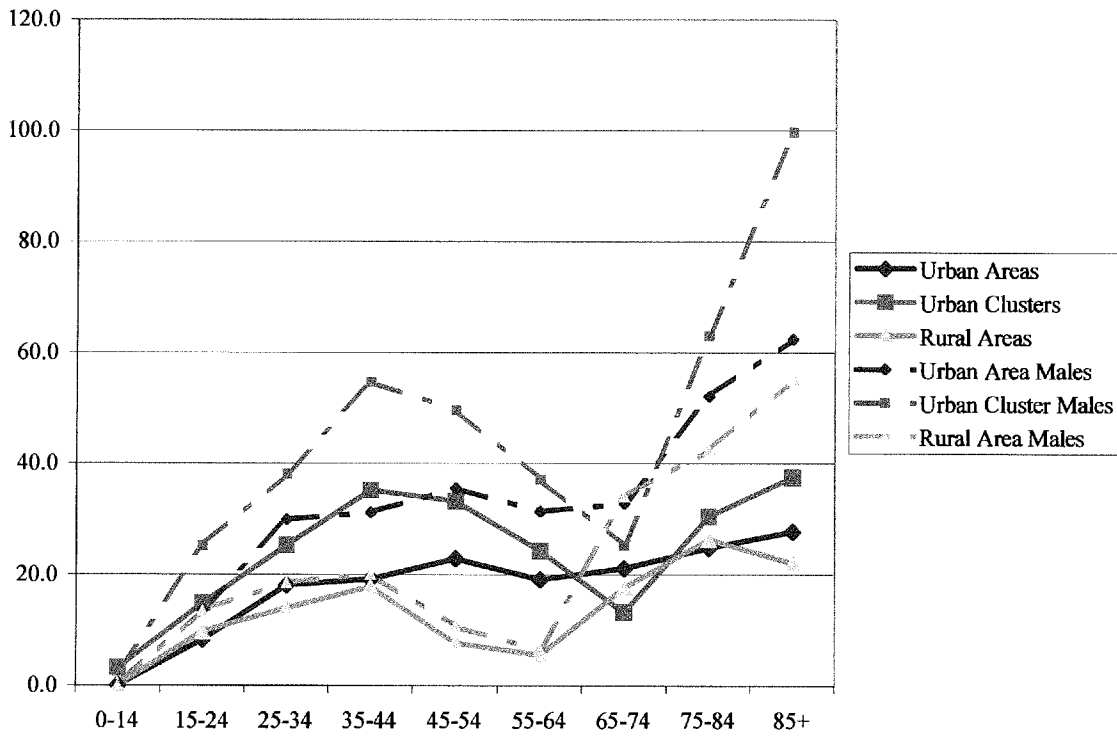


**Figure 10 - Line Graph of Suicide Rates by Age Group, Male Gender and County Population Size, Oregon (2001)**



In the metro counties, the crude suicide rates of older age groups' were not as high as those of middle-aged residents. However, in middle population counties and least populated counties crude suicide rates for the elderly mirror the total population trend of increasing with age.

**Figure 11 - Suicide Rates in Oregon by Age Group, Male Gender and Census Bureau Definition of Urban and Rural (2001)**



In the Census Bureau definition of urban/rural, the urban clusters consistently have higher crude rates throughout all age categories except those 65-74 years.

**Table 16 – Demographic Characteristics of Oregon Suicide Victims With Significant Disease That The ME Concluded Led to Suicide, By County Population Levels, 2001 (N=77)**

Characteristics	Metro Counties	Middle Population Counties	Least Populated Counties
N=77 – People With Significant Disease That ME Concluded Led To Suicidal Decision	N=27	N=23	N=27
Male	19 (70)	18 (78)	22 (81)
Female	8 (30)	5 (22)	5 (19)
Average Age (±SD)	67.9 (14.4)	72.4 (12.3)	70.8 (17.5)
Methods Used			
Firearm	12 (44)	15 (65)	22 (82)
Asphyxiation	8 (30)	1 (4)	1 (4)
Poisoning	4 (15)	7 (30)	4 (15)
Other	3 (11)	0	0
Types of Firearms Used:			
Handguns	9 (75)	14 (93)	14 (64)
Shotguns	2 (17)	0	1 (5)
Hunting Rifles	1 (8)	1 (7)	6 (27)
Military Rifles	0	0	0
Unspecified	0	0	1 (5)
Proportion of Cases to Total # of Suicides	27/173 or 15.6%	23/189 or 12.2%	27/168 or 16.0%

**Table 17 – Demographic Characteristics of Oregon Suicide Victims with Significant Disease That The ME Concluded Led to Suicide, by Census Bureau Definitions of Urban and Rural, 2001 (N=77)**

	Urban Areas	Urban Clusters	Rural Areas
	N=47	N=19	N=11
Male	35 (74)	14 (74)	10 (91)
Female	12 (26)	5 (26)	1 (9)
Average Age (±SD)	70.1 (14.3)	69.0 (18.8)	70.6 (10.7)
Methods Used			
Firearm	26 (55)	15 (79)	8 (73)
Asphyxiation	9 (19)	0	1 (9)
Poisoning	9 (19)	4 (21)	2 (18)
Other	3 (6)	0	0
Types of Firearms Used:			
Handguns	20 (77)	11 (73)	6 (75)
Shotguns	2 (8)	0	1 (13)
Hunting Rifles	4 (15)	3 (20)	1 (13)
Military Rifles	0	0	0
Unspecified	0	1 (7)	0
Proportion of Cases to Total # of Suicides	47/287 or 16.4%	19/151 or 12.6%	11/74 or 14.9%

Tables 16 and 17 describe the characteristics of this group of elderly people by the county definition of urban and rural and by the Census Bureau definition of urban and rural. These tables show a remarkable consistency of the proportion of these cases to the rest of the suicide cases in the group. Firearm usage increases with rurality; in Table 16, 82% of all suicides in the least populated counties used a firearm. Handgun usage, however, decreased with rurality, from 75% to 64%.

In Table 17 firearms were used in the rural areas 73% of the time, and increased in urban clusters to 79%. Handgun usage, however, was relatively constant (73-77%) between the groups.

No matter which definition of urban and rural used, the proportion of these (mostly) elderly suicides remained relatively stable between 12-16% of the total suicides.

**Table 18 - Poisson Regression Analysis on County-Level Oregon Suicide Victims, Modeling for Rate and Controlling for Age Category, County Population Group, Gender and Method of Suicide and Controlling for Overdispersion, 2001 (N=512)**

	Relative Risk	95% CI Lower	95% CI Upper	p value
0-14	0.25	0.03	2.12	0.20
15-24	0.61	0.44	0.31	0.00
25-34	0.95	0.75	1.21	0.70
<b>35-44*</b>	1.00	---	---	---
45-54	1.32	1.07	1.63	0.01
55-64	0.92	0.69	1.22	0.55
65-74	1.48	1.16	1.89	0.00
75-84	1.79	1.42	2.26	<.0001
85+	2.86	2.19	3.74	<.0001
Least Pop Counties	1.35	1.13	1.60	0.00
Middle Pop Counties	1.16	0.98	1.38	0.08
<b>Metro Counties</b>	1.00	---	---	---
Female	0.39	0.31	0.50	<.0001
<b>Male</b>	1.00	---	---	---
Other	0.25	0.16	0.41	<.0001
Asphyxiation	0.45	0.36	0.56	<.0001
Poisoning	0.44	0.35	0.55	<.0001
<b>Firearms</b>	1.00	---	---	---
<b>*Bold denotes referent category</b>				

To understand the effects of age groupings, gender, method and place of residence for suicide victims, I ran a Poisson regression analysis on the county-level groupings of suicide victims, as shown in Table 18.

This regression analysis shows that only the oldest age groups of people (>75 years of age) were more likely to commit suicide than the referent group (35-44). Younger age groups and 55-64 year olds were less likely than the referent group to commit suicide.

People in rural counties were the most likely to suicide in relation to the referent metro counties. Female risk for suicide is far less than male risk, as expected. Firearms

were also the most likely method for use in committing suicide, with all other choices less than half as likely.

**Table 19- Poisson Regression Analysis of Oregon Suicide Victims, by Census Bureau Definitions of Urban/Rural, Modeling for Rate and Controlling for Age Group, Census Bureau Urban/Rural Measure, Gender and Method, and Controlling for Overdispersion, 2001 (N=512)**

	Relative Risk	95% CI Lower	95% CI Upper	p value
0-14	0.30	0.06	1.40	0.13
15-24	0.54	0.40	0.73	<.0001
25-34	1.15	0.69	1.08	0.20
<b>35-44*</b>	1.00	---	---	---
45-54	1.02	0.83	1.24	0.86
55-64	0.99	0.77	1.27	0.91
65-74	1.31	1.03	1.67	0.03
75-84	1.81	1.48	2.23	<.0001
85+	2.68	2.10	3.41	<.0001
Rural Areas	0.99	0.81	1.21	0.93
Urban Clusters	1.69	1.48	1.93	<.0001
<b>Urban Areas</b>	1.00	---	---	---
Female	0.34	0.27	0.44	<.0001
<b>Male</b>	1.00	---	---	---
Other	0.19	0.11	0.31	<.0001
Asphyxiation	0.45	0.37	0.55	<.0001
Poisoning	0.40	0.32	0.50	<.0001
<b>Firearms</b>	1.00	---	---	---
<b>* Bold denotes referent category</b>				

The Poisson regression analysis was repeated using the Census Bureau’s definitions of urban and rural. Table 19 shows that, in relation to 35-44 year olds, 0-34 year olds are all significantly less likely to commit suicide, while 65 and older age groups are more likely to commit suicide. People in urban clusters are 1.7 times more likely to commit suicide than those in urban areas. Rural areas do not significantly differ in relative risk to urban areas. Females are about one third less likely to commit suicide than males. As in Table 18, in relation to firearms, all other methods for suicide are less than half as likely.

## ***V. DISCUSSION***

### **Urban/Rural Status as Exposure to the Outcome of Suicide**

Researchers of suicide have shown increased rates of suicides in the rural parts of the United States. Those studies used county-based population denominators and showed that, as the county population decreased, the rates of suicide were higher. It is unclear why this occurred.

Based on the results in Table 12, I rejected the null hypothesis of my first research question and accepted the alternative hypothesis: that there *were* statistically significant differences in the rates between the most populated and least populated counties. The rates climbed gradually but modestly from an age-adjusted rate of 14.4/100,000 in the metro counties to an age-adjusted rate of 17.2/100,000 in the least populated counties ( $p < .001$ ).

Similarly, in the Census Bureau's definition of urban and rural, as shown in Table 13, I rejected the null hypothesis that the rates were not significantly different ( $p < .001$ ). However, a surprising result appeared doing this analysis: it was not the most rural areas that had the highest rates, but the urban cluster areas. The difference in rates between the urban areas (AAR 14.4) and urban clusters (AAR 21.3) was significant at  $p < .001$ . I tested for significance between the urban areas and the rural areas, and it was also significantly different at  $p = .0074$ . Moreover, this finding persisted when age, gender and method were controlled for.

The urban cluster areas defined by the census bureau represent smaller communities within counties that could have been classified either urban, middle density

or rural in the Table 11 analysis. Some of these small towns were, consequently, defined as “rural” while some were defined as “urban” simply because of the county in which they were situated.

As seen from Figure 2, above, there are only three urban cluster areas included in the most urban counties (Multnomah, Clackamas and Washington), but there are 21 urban cluster areas in the middle population-size counties (all six counties had some urban cluster areas within them) and 41 urban cluster areas in 21 of the rural counties. Most urban cluster areas are in middle or low population-size counties. Those counties, as shown in Table 11, have higher rates of suicide than the most urban counties.

What is different about urban clusters which might account for their increased rate of suicide? One hypothesis for the explanation of higher suicide rates in rural parts of the U.S. is that rural residents lack access to mental health treatment. These urban cluster areas are, for the most part, closer to urban areas than the rural places in Oregon and, at least by this hypothesis, have access to medical care (if proximity to health care is a valid measure of access to health care). These results, for Oregon, seem to contradict, first, the hypothesis that the highest rates are in the rural areas, and second, the hypothesis that geographic access to medical care has anything to do with the higher suicide rates. To validate this finding, this study needs to be extended over time. Further studies in other geographic locations (other states in the U.S.) are also necessary to validate this finding. According to the Census Bureau, the median 1999 income for households within the urbanized areas and rural areas was about \$40,000 per year. Urban cluster median household income was \$32,000. More studies need to be conducted on who the populations are in urban clusters to better understand why they are at increased risk.



## Firearm Usage

Reclassifying these cases from county-based to the Census Bureau's urban/rural categories also resulted in a difference interpreting the method of suicide in urban and rural places.

Using the Census Bureau definition of urban and rural as shown in Table 13, I accepted the null hypothesis that methods for suicide did not differ between urban and rural areas ( $p=.261$ ).

However, a statistically significant difference *was* shown in the methods used by victims between the three county categories in Table 12 and, therefore, I rejected the null hypothesis that no difference existed between methods based on the county's population ( $p=.005$ ). Table 12 showed that firearm usage increased from 45% of all victims in the most urban counties to 60% in the least densely populated counties.

There was a significant geographic difference in the *types* of firearms used by suicide victims based on county location. Handgun usage increased with population size, to a high of 74% in the most urban counties from 63% in the least densely populated counties. The difference was significant at  $p=.012$ . However, the proportions of hunting rifle and shotgun usage were similar in all three county types.

Using the Census Bureau definition of urban and rural (as shown in Table 13), 52% of the suicides in urban areas used a firearm and increased only to 62% in the rural areas. The other three categories of methods (asphyxiation, poisoning and other) also were in the same proportion in all areas. There was no significant difference among these groups regarding methods, which is a surprising result given the strong indicators to the contrary in the county model.

However, among the firearm victims, the differences between the geographic areas in the type of firearm used were statistically significant ( $p=.02$ ). While handguns were used in 73% of all firearm suicides in the urban areas, only 59% of all firearm suicide victims in the most rural area used handguns.

Given that firearm suicides outnumber any other type of suicide no matter how you define urban and rural, the next logical question is “Why were handguns the most prevalent choice?”

Handguns, as described above, are probably the weapon of choice because they are readily available. According to the Bureau of Alcohol, Tobacco and Firearms’ Annual Firearms Manufacturing and Exportation Report there were 2,232 federally licensed firearms dealers (FFLs) in Oregon in 2001,<sup>10</sup> or 67 FFLs per 100,000 people in Oregon. Nationally, in 2001, there were 102,913 FFLs. As of 6/30/2003 there were only 13,602 McDonald’s Restaurants in the U.S.<sup>11</sup> FFLs are 7.5 times more ubiquitous than the other symbol of American society, McDonald’s. Firearms are present in 39.2% of Oregon homes.<sup>12</sup>

The table below shows the number of guns manufactured or imported into the U.S. in one year.<sup>13</sup>

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<sup>10</sup> Department of the Treasury, Bureau of Alcohol, Tobacco and Firearms, *Firearms Commerce in the United States, 2001-2002*, Exhibit 13 (2001), available online at [http://www.atf.gov/pub/fire-explo\\_pub/firearmscommerce/index.htm](http://www.atf.gov/pub/fire-explo_pub/firearmscommerce/index.htm).

<sup>11</sup> According to a financial press release from McDonald’s Corporation available online at: <http://www.mcdonalds.com/corporate/press/financial/2003/07292003/index.htm>.

<sup>12</sup> BRFSS 2001 (Behavior Risk Factory Surveillance Survey), Oregon Health Division.

<sup>13</sup> Ibid, Exhibit 3.

**Table 20 - Firearms Manufactured or Imported into the United States in One Year**

Firearms Manufactured Or Imported	Handguns	Hunting weapons	Machine guns
Manufactured In One Year	995,446 pistols 335,784 revolvers	1,569,685 rifles 1,106,995 shotguns	22,490
Imported In One Year	465,903 handguns	298,894 rifles 331,985 shotguns	
TOTAL=5,127,182	1,797,133 or 35% of total	3,307,559 or 65% of total	22,490 or less than 1% of total

However, these numbers show that handguns are only 35% of the total number of firearms available for purchase. Yet they are used more than half the time in suicide cases. Although handguns are available, they are not as available as hunting weapons are. Availability is evidently not the sole reason handguns are used in suicide.

Another hypothesis has been that those in rural areas who commit suicide do so because the firearms they use for hunting are readily available. If firearm access increases in the rural parts of the country because of hunting, then shouldn't hunting weapons be used more often in the commission of suicides, especially amongst suicide victims in rural areas? This study clearly shows that, in Oregon, hunting weapons are used half as often as handguns in the commission of suicide in any group measured by population density.

Of the firearm users, the majority of suicide victims in any group chose a handgun. Half as many chose either a shotgun or a hunting rifle. Handguns are easy to use for the purpose of self-destruction. Hunting rifles or shotguns are cumbersome, long weapons whose triggering mechanisms are remote from the barrel of the weapon. They are clumsy to use for the purpose of self-destruction. I conclude that handguns are the weapon of choice for suicide victims because they are readily available *plus* efficacious.

## **Age and Suicide**

Although adolescent suicide is disturbing, the risk of completed suicide increases with age. In Tables 18 and 19, both Poisson regression analyses showed that the relative risk for suicide was significantly higher in the elderly than in middle-aged people. Table 14 shows the age-specific rates of suicide; people over 75 years of age have higher rates than any other age group. Table 15 shows the trend in age-specific rates since 1995. Figures 9 and 10 show that there are a greater proportion of elderly in less populated Oregon than in urban Oregon. It is important, therefore, to do an age adjustment of rates in order to compare these areas.

Additionally, this study identified a group of older, sicker individuals who chose to end their own life. While my count is not definitive (as some county medical examiners did not fill out reports at all about their suicide victims), it allows for a slight examination of suicide in the elderly.

Many folks who are elderly who committed suicide had a terminal illness or chronic disease that has become an impediment to quality of life. These are mostly males and they live in all areas of Oregon, although as I show in Figures 10 and 11 the rates increase dramatically in the more rural areas of the state.

Prevention efforts for suicide should be focused on two groups in Oregon. The first group is the middle-aged suicide victims (both male and female) between the ages of 35-55. The greatest numbers of suicides occur in these age-ranges. The second group of concern identified in this research project is the elderly male population in Oregon 75 and older. In all geographic locations their rates increase, but especially in the rural counties, or alternatively, the urban cluster areas identified above.

## ***VI. LIMITATIONS***

### **Investigator Bias**

I abstracted all the records reported in this report. A likely consequence of having a single investigator would be changing of abstraction techniques, either consciously or unconsciously, throughout the abstraction process. To minimize this, I tried to put several safeguards into place. First, the demographic variables were available from either the death certificate in the file or within the database at the Health Division in Portland. The initial data entry involved copying information from the medical examiner file to the Access Database. I checked my efforts at data entry with the files from the vital statistics records when I pulled all the death certificates in October 2003. This was an important step in verifying the validity of my data. Additional suicides had been coded, since my initial data entry, in the vital statistics records, and one former suicide case had been recoded to an accidental death. However, the demographic information that I had abstracted was correct, as compared to the death certificates.

### **Determination of Suicide**

The determination of suicide is made exclusively by the medical examiner in each county. This research was enhanced or limited by the strengths or weaknesses of each county's medical examiner.

There may be differing conclusions between counties about what constitutes a suicide. However, whenever a medical examiner in this State is in doubt as to the conclusion to put on the death certificate, the State's lead medical examiner, Dr. Karen

Gunson, will step in and make the decision. If the decision is challenged and taken to court by a family member or an insurance company, Dr. Gunson will review the case and make the final determination.

Further, training courses provided by the State Medical Examiner's office are available for medical examiners in Oregon. A book on death investigation by Dr. William Brady, M.D. is provided to every county medical examiner, as well as ongoing police and medical examiner training by Eugene Jacoby, the State Deputy Medical Examiner. These courses help to unify decisions made in individual counties as to the necessary parameters to conclude that a case is a suicide.

Finally, suicide tends to be an emotionally charged subject. There is usually great interest on the part of loved ones in whether the death certificate says "suicide" or not. If a medical examiner declares a case to be suicide, and family members are convinced it is not a suicide, the cases do get reviewed by the State Medical Examiner, Dr. Karen Gunson. However, more cases in 2001 were changed to suicide from undetermined death than were changed from suicide to accidental death. Suicides, especially firearm suicides, are fairly straightforward cases, most of the time.

## ***VII. FUTURE STUDIES***

In clinical trials, if a research subject indicates suicidal intent, that subject is released for ethical reasons from the clinical trial. This makes it very difficult to find characteristics of suicidal people that may prove useful in future studies. Gathering data after the fact is a necessary result of this restriction of research. Other studies, however, have come up with novel ways to address this methodological challenge. One group in Texas, for

instance, has studied nearly lethal suicides of young people over a 10-year period.

However, even this study is biased in that people who survive suicide differ characteristically from people who don't. For example, people who don't survive are often firearm victims, while people who survive are often those who use another less sure method.

An inter-disciplinary review of suicide cases, not merely epidemiological review, is clearly needed. Epidemiologists have uncovered a relationship between less densely populated areas and increasing suicide rate (especially in elderly white men). But to determine the cultural differences between elderly white men who live in urban settings and elderly white men who live in rural settings, more work needs to be done by others involved in sociology and psychology. Population density, although a useful tool for uncovering geographic differences, is only one step in explaining the high suicide rates in Oregon.

## VIII. LITERATURE CITED

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- <sup>1</sup> National Center for Health Statistics (NCHS) Vital Statistics System. Produced by: Office of Statistics and Programming, National Center for Injury Prevention and Control, CDC. Available online at: <http://www.cdc.gov>.
- <sup>2</sup> Goldsmith SK, Pellmar TC, Kleinman AM, Bunney WE. 2002. *Reducing Suicide – A National Imperative*. Washington, D.C.: The National Academies Press.
- <sup>3</sup> Oregon Center for Health Statistics, available online at [www.dhs.state.or.us](http://www.dhs.state.or.us).
- <sup>4</sup> Regional Variations in Suicide Rates – United States, 1990-1994. 1997. *MMWR*, 46(34): pp. 789-793.
- <sup>5</sup> Boardman AP, Grimbaldeston AH, Handley C, Jones PW, Willmott S. The North Staffordshire Suicide Study: A Case-Control Study Of Suicide In One Health District. 1999. *Psychological Medicine*, 29, pp. 27-33.
- <sup>6</sup> Cantor CH, Slater PJ. A Regional Profile of Suicide in Queensland. 1997. *Australian and New Zealand Journal of Public Health*, 21(2): pp. 181-6.
- <sup>7</sup> Conwell Y, Duberstein PR, Cox C, et al. Relationships of Age and Axis I Diagnoses in Victims of Completed Suicide: A Psychological Autopsy Study. 1996. *Am J Psychiatry*, 153(8): 1001-1008.
- <sup>8</sup> Humphrey JA, Palmer S. The Effects of Race, Gender, and Marital Status on Suicides among Young Adults, Middle-Aged Adults, and Older Adults. 1990-91. *Omega*, 22(4): 277-285.
- <sup>9</sup> Isometsä E, Heikkinen M, Henriksson M, et al. Differences Between Urban and Rural Suicides. 1997. *Acta Psychiatr Scand*, 95: 297-305.
- <sup>10</sup> Kellermann AL, Somes G, Rivara FP, et al. Injuries and Deaths Due to Firearms in the Home. 1998. *The Journal of Trauma: Injury, Infection, and Critical Care*, 45(2): p. 263-267.
- <sup>11</sup> Kondrichin SV, Lester D. 1998. Suicide in Belarus. *Crisis*, 19(4): 167-171.
- <sup>12</sup> Oregon Department of Human Services, Center for Health Statistics. 1997. *Suicide and Suicidal Thoughts by Oregonians*. Portland, OR: State of Oregon Printing Press.
- <sup>13</sup> Ferrada-Noli M. Social Psychological Variables in Populations Contrasted by Income and Suicide Rate: Durkheim Revisited. 1997. *Psychological Reports*, 81: 307-316.



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- <sup>14</sup> Pollock LR, Vesey P, Hollis J, Williams JMG. Suicide in Rural Britain. 1996. *The Lancet*, 347:403-04. (Letter to the Editor)
- <sup>15</sup> Qin P, Agerbo E, Mortensen P. Suicide Risk in Relation to Socioeconomic, Demographic, Psychiatric, and Familiar Factors: A National Register-Based Study of All Suicides in Denmark, 1981-1997. 2003. *American Journal of Psychiatry*, 160(4): 765-772.
- <sup>16</sup> Saunderson T, Haynes R, Langford I. 1998. Urban-rural variations in suicides and undetermined deaths in England and Wales. *Journal of Public Health Medicine*, 20(3): 261-267.
- <sup>17</sup> Zacharakis CA, Madianos MG, Papadimitriou GN, Stefanis CN. 1998. Suicide in Greece 1980-1995: patterns and social factors. *Society of Psychiatry and Psychiatric Epidemiology*, 33: 471-476.
- <sup>18</sup> Phillips MR, Liu H, Zhang Y. Suicide and Social Change in China. 1999. *Culture, Medicine and Psychiatry*, 23: 25-50.
- <sup>19</sup> Pritchard C, Baldwin DS. Elderly Suicide Rates in Asian and English-Speaking Countries. 2002. *Acta Psychiatr Scand*, 105: 271-275.
- <sup>20</sup> Yip PS, Callana C, Yuen HP. 2000. Urban/rural and gender differentials in suicide rates: East and west. *Journal of affective disorders*, 57(1-3): 99-106.
- <sup>21</sup> Miller M, Azrael D, Hemenway D. 2002. Household Firearm Ownership and Suicide Rates in the United States. *Epidemiology*, 13: pp. 517-524.
- <sup>22</sup> Tueth MJ. 1994. High Suicide Rate in Elderly White Men. *American Family Physician*, 49(2): 333-34 (Letter to the Editor).
- <sup>23</sup> Murphy GE. 1992. *Suicide in Alcoholism*. New York: Oxford University Press.
- <sup>24</sup> Wilkinson D, Gunnell D. 2000. Youth suicide trends in Australian metropolitan and non-metropolitans areas, 1988-1997. *Australian and New Zealand Journal of Psychiatry*, 34(5): 822-828.
- <sup>25</sup> Singh GK, Siahpush M. 2002. Increasing Rural-Urban Gradients in US Suicide Mortality, 1970-1997. *American Journal of Public Health*, 92(7): 1161-1167.
- <sup>26</sup> Brady, William J. *Outline of Death Investigation*. Oregon State Publishing House. 1982.
- <sup>27</sup> Rosner B. *Principles of Biostatistics*, 5<sup>th</sup> Edition. 2000. Pacific Grove, CA: Duxbury.

## IX. APPENDIX

**Table A-1- Crude and Age-Adjusted Suicide Rates (With 95% CI) for Victims' County of Incident, 2001 (N=512)**

County Name	County of Incident (Count)	Denominator	Crude Rate (per 100,000)	Age-Adjusted Rate	Lower CI	Upper CI
Baker	1	16,700	6.0	9.0	0.0	26.7
Benton	3	79,000	3.8	3.9	0.0	8.2
Clackamas	46	345,150	13.3	13.2	9.4	17.1
Clatsop	8	35,850	22.3	23.0	6.9	39.1
Columbia	11	44,300	24.8	24.8	10.0	39.5
Coos	18	62,950	28.6	28.7	15.1	42.4
Crook	3	19850	15.1	14.6	0.0	31.2
Curry	4	21550	18.6	12.3	0.0	26.0
Deschutes	16	122,050	13.1	12.7	6.4	18.9
Douglas	20	101,200	19.8	19.9	11.0	28.9
Gilliam	1	1900	52.6	73.9	0.0	218.8
Grant	3	7800	38.5	32.9	0.0	71.1
Harney	1	7600	13.2	13.3	0.0	39.3
Hood River	7	20,600	34.0	34.9	9.0	60.8
Jackson	31	184,700	16.8	16.0	10.3	21.7
Jefferson	8	19,400	41.2	43.7	13.2	74.1
Josephine	14	76,850	18.2	17.6	8.0	27.2
Klamath	17	64,200	26.5	26.8	13.9	39.6
Lake	2	7500	26.7	37.1	0.0	88.5
Lane	63	325,900	19.3	19.1	14.3	23.8
Lincoln	9	44,650	20.2	20.5	6.6	34.4
Linn	21	103,500	20.3	20.5	11.7	29.4
Malheur	2	32000	6.3	5.9	0.0	14.0
Marion	35	288,450	12.1	12.3	8.2	16.3
Morrow	2	11150	17.9	18.4	0.0	44.0
Multnomah	68	666,350	10.2	9.8	7.5	12.2
Polk	6	63,600	9.4	7.7	1.4	13.9
Sherman	1	1900	52.6	54.9	0.0	162.5
Tillamook	5	24,600	20.3	16.0	1.6	30.5
Umatilla	8	70,900	11.3	11.5	3.5	19.5
Union	4	24550	16.3	15.2	0.1	30.3
Wallowa	1	7100	14.1	9.2	0.0	27.1
Wasco	10	24,150	41.4	41.3	15.3	67.4
Washington	49	455,800	10.8	11.3	8.1	14.5
Wheeler	0	1550	0.0			
Yamhill	14	86,400	16.2	16.9	8.0	25.8

**Table A-2 - Crude and Age-Adjusted Suicide Rates (With 95% CI) for Oregon by Victims' County of Residence, 2001 (N=512)**

County Name	County of Residence (Count)	Denominator	Crude Rate (per 100,000)	Age-Adjusted Rate	Lower CI	Upper CI
Baker	3	16700	18.0	24.5	0	52.3
Benton	4	79000	5.1	5.2	0.1	10.4
Clackamas	39	345150	11.3	11.1	7.6	14.6
Clatsop	6	35850	16.7	16.8	3.1	30.5
Columbia	10	44300	22.6	22.9	8.6	37.1
Coos	18	62950	28.6	28.8	15.1	42.5
Crook	3	19850	15.1	14.6	0	31.2
Curry	3	21550	13.9	6.4	0	13.7
Deschutes	18	122050	14.7	14.3	7.7	20.9
Douglas	19	101200	18.8	18.3	9.9	26.8
Gilliam	1	1900	52.6	73.9	0	218.8
Grant	4	7800	51.3	42.7	0	85.5
Harney	0	7600	0.0			
Hood River	6	20600	29.1	30	6	54
Jackson	28	184700	15.2	14.6	9.1	20.1
Jefferson	8	19400	41.2	42.1	12.7	71.5
Josephine	17	76850	22.1	21.1	10.7	31.5
Klamath	17	64200	26.5	26.8	13.9	39.6
Lake	1	7500	13.3	19.1	0	56.7
Lane	65	325900	19.9	19.7	14.9	24.5
Lincoln	8	44650	17.9	18.7	5.3	32.1
Linn	21	103500	20.3	20.7	11.8	29.6
Malheur	2	32000	6.3	5.9	0	14
Marion	37	288450	12.8	12.8	8.7	17
Morrow	2	11150	17.9	18.4	0	44
Multnomah	79	666350	11.9	11.3	8.8	13.8
Polk	2	63600	3.1	3	0	7.1
Sherman	0	1900	0.0			
Tillamook	4	24600	16.3	13.1	0	26.4
Umatilla	8	70900	11.3	11.5	3.5	19.5
Union	1	24550	4.1	5	0	14.8
Wallowa	1	7100	14.1	9.2	0	27.1
Wasco	7	24150	29.0	28.4	6.9	49.9
Washington	53	455800	11.6	12	8.7	15.3
Wheeler	0	1550	0.0			
Yamhill	17	86400	19.7	20.2	10.6	29.8

## Appendix B

<b>Sample Notes of Terminal and/or seriously ill suicide victims</b>	
87 yo Male (Lane County)	"I can not take care of myself."
71 yo Female (Multnomah County)	"The pain in the back and stomach is too much to bear. And I am getting weaker every day. Love Mom. It's time to be with Jerry."
64 yo Male (Washington County)	"To Whom It May Concern, I intend to take my life today. I will use all of the pills that I have left and if that fails, I will use my handgun."
46 yo Male (Washington County)	"To Whom It May Concern, I have chosen to take my own life due to failing physical and mental health. Please notify my brothers."
73 yo Male (Jackson County)	"I cannot stand the pain anymore. The Salvation Army will come and take all the belongings. Just call them. My cremation has been paid for by Rogue Valley Funeral Alternatives."
88 yo Male (Polk County)	"Winifred, the pain is too much. (details about bill payments follows).
81 yo Male (Multnomah County)	"The clock just indicated 2 a.m. I haven't slept the last two nights. The pain in my left leg is as severe as a bad toothache from hip to ankle...My obligations are all taken care of and your mom is gone. I maintain that if I have no obligations...."
48 yo Male (Washington County)	(He suffered a relapse of Parkinson's disease and was despondent.) Left note: "Greta, I love you."
78 yo Female (Lane County)	"I can't stand the pain in my head, sorry, I love you all."
77 yo Female (Jackson County)	"Dearest friends & family I'm looking forward to seeing what's beyond the curtain. I can't stand the pain of breathlessness and exhaustion. I have had a good life with just enough bumps to make it a rich life, good-bye.."