

ORIGINAL RESEARCH

Congruencies in Increased Mortality Rates, Years of Potential Life Lost, and Causes of Death Among Public Mental Health Clients in Eight States

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Abstract

Introduction

Mortality rates are used as global measures of a population's health status and as indicators for public health efforts and medical treatments. Elevated mortality rates among individuals with mental illness have been reported in various studies, but very little focus has been placed on interstate comparisons and congruency of mortality and causes of death among public mental health clients.

Methods

Using age-adjusted death rates, standardized mortality ratios, and years of potential life lost, we compared the mortality of public mental health clients in eight states with the mortality of their state general populations. The data used in our study were submitted by public mental health agencies in eight states (Arizona, Missouri, Oklahoma, Rhode Island, Texas, Utah, Vermont, and Virginia) for 1997 through 2000 during the Sixteen-State Study on Mental Health Performance Measures, a multi-state study federally funded by the Center for Mental

Health Services in collaboration with the National Association of State Mental Health Program Directors.

Results

In all eight states, we found that public mental health clients had a higher relative risk of death than the general populations of their states. Deceased public mental health clients had died at much younger ages and lost decades of potential life when compared with their living cohorts nationwide. Clients with major mental illness diagnoses died at younger ages and lost more years of life than people with non-major mental illness diagnoses. Most mental health clients died of natural causes similar to the leading causes of death found nationwide, including heart disease, cancer, and cerebrovascular, respiratory, and lung diseases.

Conclusion

Mental health and physical health are intertwined; both types of care should be provided and linked together within health care delivery systems. Research to track mortality and primary care should be increased to provide information for additional action, treatment modification, diagnosis-specific risk, and evidence-based practices.

Introduction

Elevated mortality rates among individuals with mental illness have been reported in various studies (1-4). Causes of death, comorbidities, and medical problems of individuals with mental illness also have been assessed (5-7). Although research by McCarrick et al in 1986

highlighted high rates of chronic medical problems among individuals with chronic mental illness (8), very little focus has been placed on interstate comparisons and congruency of mortality and causes of death among public mental health clients. Mortality rates are used as global measures of a population's health status and as indicators for public health efforts and medical treatment. The federal Center for Mental Health Services (CMHS) and the National Association of State Mental Health Program Directors (NASMHPD) have suggested using statewide mortality statistics as outcome measures for public mental health clients (9).

The purpose of this article is to expand on previous work by examining the mortality of public mental health clients in eight states during selected years compared with the overall mortality of the general population in each state during the same years. Public mental health clients receive treatment and services through the public mental health authorities and agencies in their states. As needed and available, treatment and services are provided in outpatient settings, during inpatient hospitalizations, or both. In addition, the leading causes of death for public mental health clients in six of the states are compared with causes of death for the general populations of the states. Congruencies and differences among states' mortality rates and causes of death are also examined.

Methods

The data used in our study were submitted by public mental health agencies in eight states (Arizona, Missouri, Oklahoma, Rhode Island, Texas, Utah, Vermont, and Virginia) for 1997 through 2000 during the Sixteen-State Study on Mental Health Performance Measures, (9) a multistate project federally funded by the CMHS, Substance Abuse and Mental Health Services Administration (SAMHSA), Department of Health and Human Services (HHS), to compare the mortality of clients served by these public mental health systems. Only these eight of the 16 states were able to submit data on the deaths of their clients. Seven states included data on deaths of both their outpatient clients and their hospitalized inpatient clients. Virginia included data only on the deaths of hospitalized inpatients. For each year that data were submitted, multiple standardized measures of mortality were calculated for public mental health clients and the general population of each state, including age-adjusted death rates (AADRs),

standardized mortality ratios (SMRs), years of potential life lost (YPLL), and mean age at time of death. All eight states did not submit data for all years. Six states (Missouri, Oklahoma, Rhode Island, Texas, Utah, and Virginia) provided data about causes of death, and comparisons were made within and between these states.

Records of mental health clients were electronically linked and matched with death records from state vital statistics agencies by the public mental health agencies in six states: Arizona, Missouri, Oklahoma, Rhode Island, Texas, and Utah. The states used computer software developed by the Oklahoma State Mental Health Authority and statistical analysis software such as SPSS (SPSS Inc, Chicago, Ill) or SAS (SAS Institute Inc, Cary, NC) to match death records with records of clients receiving services during the year of their deaths. Virginia used deaths reported for clients in state psychiatric hospitals. Individual records were used for each deceased client by the seven states. Vermont AADRs and SMRs were based on mental health clients represented in the Vermont death records. Probabilistic population estimation (10) was used to establish an unduplicated client count and estimate the number of Vermont clients who died during the period or the overlap between clients served and death files. Vermont AADRs and SMRs were based on mental health clients represented in the Vermont death records. Vermont rates were calculated for a combination of 3 years to minimize the effects of annual fluctuations.

AADRs per 100,000 U.S. standard population were computed for each year in each state for deceased public mental health clients who had received public mental health system services during their year of death. These mental health client AADRs were compared with the yearly statewide AADRs published in the *National Vital Statistics Reports* from the National Center for Health Statistics, Centers for Disease Control and Prevention (CDC) (11-18). According to the reports, "Age-adjusted rates are used to compare relative mortality risks among groups and over time. However, they should be viewed as relative indexes rather than as actual measures of mortality risk" (15).

Because age is a major determinant of mortality, age adjustment, or standardization, is used to compare different populations and geographic areas. With this direct method of standardization, age-specific death rates from two populations — the state public mental

health population and the statewide general population — with different age structures can be applied to a third “standard” population. CDC uses the U.S. 1940 standard population for standardizing or adjusting 1997 and earlier years and the U.S. 2000 standard population for 1998 and later years (11-18). This methodology was used for our analyses of public mental health clients so that comparisons could be made with CDC’s findings. Clients were divided into 11 age groups: younger than 1 year; 1 to 4 years, 5 to 14 years, 15 to 24 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, 65 to 74 years, 75 to 84 years, and 85 years and older. Age-specific death rates were calculated for each age group of public mental health clients by dividing the number of deaths in that age group by the total number of clients served in that age group. To adjust or standardize, the age-specific death rate for each group was multiplied by the population percentage for that age group in the standard population used by CDC. These age-adjusted products for the age groups are added to create the AADRs for the served public mental health client population in the state each year. Similar procedures are used by CDC to calculate the AADRs published in the *National Vital Statistics Reports* (11-18) and are used in this article for the age-adjusted rates for each of the states.

The SMRs can be used to show the relative risk of death between mental health clients and state populations. SMRs were calculated for public mental health clients, who received at least one public mental health service in the year of their death, in each state and year for which data were submitted. The SMR is the ratio of the actual number of deaths in a population to the number of expected deaths based on an overall population, controlling for age and sex, which are major determinants of mortality. In this indirect method of standardization, yearly age-specific death rates for men and women in the general population of each state are applied to the public mental health population by age and sex of the state public mental health system to estimate the expected number of deaths for the service population during that year. The number of male clients and the number of female clients are determined in each of the 11 age categories mentioned previously for AADRs. The number of clients in each sex–age category is multiplied by the sex–age-specific death rate in that category for each state general population during the same year and then divided by 100,000. The quotients from all the sex–age categories are added to estimate the number of deaths expected per 100,000 public mental health clients during the year. The SMR is calculated by

dividing the actual number of client deaths by the expected number of deaths for the year. An SMR of greater than 1.0 indicates that the relative risk of death for mental health clients is higher than that of the general population of the state.

The mean number of years of potential life lost (YPLL) and mean age at time of death were calculated for public mental health clients. YPLL as a mortality measure provides information about the risk of premature death by using the difference between client age at death and the current life expectancy, or mean survival age for living cohorts of the same age and sex as each decedent during the year of death. The average YPLL for clients in each state during each year was estimated using current life expectancy tables for the U.S. population, which are developed and published annually by CDC (11-18). First, the number of YPLL per client was determined using the difference between the age at death and the current life expectancy age for living cohorts of the same age and sex found in the life expectancy table for the year of death. Then, the YPLL for all clients who died were added and divided by the number of deceased clients to calculate the mean YPLL for all public mental health clients who died each year in each of the seven states able to submit data on client age at time of death (Arizona, Missouri, Oklahoma, Rhode Island, Texas, Utah, and Virginia).

In addition, the YPLL and the mean age at time of death for public mental health clients with *major mental illness (MMI)* diagnoses — schizophrenia, major depressive disorders, bipolar disorders, delusional and psychotic disorders, and attention deficit/hyperactivity disorders — are compared with clients with non-MMI diagnoses using data submitted by six states. MMI diagnoses in this study include *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)* diagnosis codes 295 through 298 and 314 (19). The operational definition of MMI was developed and used during the previously mentioned Sixteen-State Study on Mental Health Performance Measures (9). Likewise, in this study, MMI is operationally defined using the listed diagnoses. Clients with the listed DSM-IV diagnoses are clients with MMI, and clients without these specific diagnoses but who have other DSM-IV diagnoses are considered clients with *other non-MMI diagnoses*.

The term *serious mental illness (SMI)* is used in other studies that are discussed later. By definition, SMI “generally applies to mental disorders that interfere with some

area of social functioning” (20). SMI has also been defined as a diagnosable mental, behavioral, or emotional disorder that meets criteria in the DSM-IV and results in functional impairment that substantially interferes with major life activities (19,21). MMI clients in this study have diagnoses that fall within the category of SMI.

We compared leading causes of death for public mental health clients and the statewide population for the six states that provided data about causes of death. The leading causes of death for public mental health clients were compiled for each state during each year using categories from CDC publications so that comparisons with CDC could be made (11-18,22). Natural causes and external causes, such as accidents and suicide, were included. Differences in accident and suicide rates between people with mental illness and general populations of states have been found in previous analyses (23).

Results

Public mental health clients in all eight states studied have a greater risk of dying than the general populations of their states. They have higher AADRs during every year submitted than the general populations of their states during the same year as shown in Table 1, which includes AADRs per 100,000 individuals for the public mental health client populations and the statewide populations by year.

The relative risk of death for public mental health clients is higher in all eight states during all years than for state general populations, as shown by the SMRs (Table 1). The actual numbers of deaths among public mental health clients ranged from 4.9 to 1.2 times higher than the expected number of deaths. Oklahoma and Texas had the highest SMRs, about three to five times higher actual numbers of deaths than expected deaths during several years. Arizona, Missouri, and Utah had actual numbers of deaths that were twice as high as expected deaths. In Virginia and Rhode Island, the actual number of deaths ranged from 1.8 to 1.2 times higher than expected deaths. The SMR for Vermont was 3.2.

Deceased public mental health clients had lost decades of potential years of life; averages varied from 13 to more than 30 years depending on the state and year (Table 2). For the years studied, nationwide life expectancies or

mean survival ages of living cohorts extended into the 70s and older (11-16,18). Public mental health clients died at younger ages than their cohorts. Clients’ average death ages ranged from 49 to 60 in six of the seven states; Virginia public mental health clients who were in state psychiatric hospitals had higher mean ages in the 70s at time of death than the clients in the six other states. Male public mental health clients died at younger mean ages than their female counterparts, except in Virginia during 2000 (Table 2). The longer average life for female clients ranged from 4 to 16 years in all states but Virginia. Vermont data were not available.

Clients with MMI diagnoses died at younger ages than clients with non-MMI diagnoses in 14 out of 16 comparisons made for the six states providing data (Table 3). Clients with MMI diagnoses died 1 to 10 years earlier on average (mean age at time of death) than clients with non-MMI diagnoses in the same state during the same year. In five states, clients with MMI diagnoses had shorter lives on average during all years compared, whereas in Missouri, they had shorter lives on average for 2 of 4 years.

The YPLL were generally higher for clients with MMI diagnoses than for clients with non-MMI diagnoses, with a median difference that was almost 2 years higher overall (Table 3). In four states, clients with MMI diagnoses had higher YPLL during all years compared. In Missouri during 2 of 4 years, clients with MMI diagnoses had higher YPLL. Utah clients with MMI diagnoses lost slightly fewer years (0.3 years) during 1999. Even though clients with MMI diagnoses in Utah during 1999 died at a slightly younger mean age than clients with non-MMI diagnoses, the clients with MMI diagnoses still had slightly lower YPLL. Data were not available for Arizona and Vermont.

Comparisons of the leading causes of death for public mental health clients in the six states that submitted data are shown in Figures 1 through 6, as are the leading causes of death statewide for each state and year and for the United States in 1999. Most public mental health clients died of natural causes in all six states. The leading causes of death for mental health clients are similar to those found nationwide and statewide; they include heart disease, cancer, and cerebrovascular, respiratory, and lung diseases. Heart disease was the leading cause of death among public mental health clients in all six states as well as in general state populations and the United States. Cancer was second in the general populations of the six

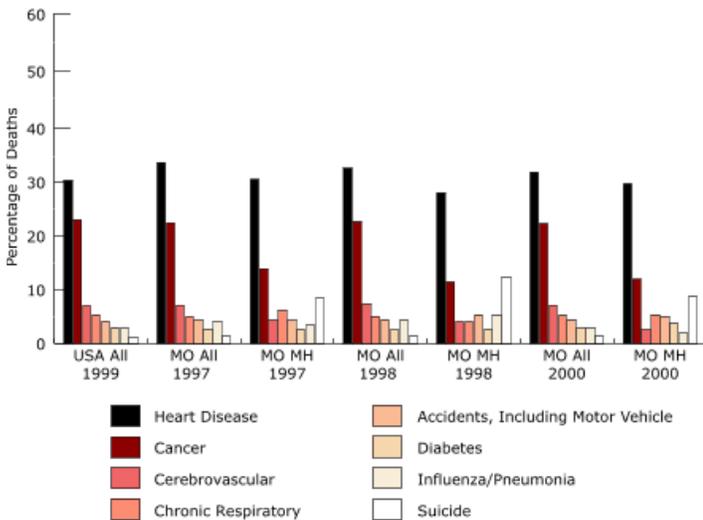


Figure 1. Leading causes of death in general populations (All) and public mental health clients (MH) nationwide and statewide in Missouri, 1997 to 2000.

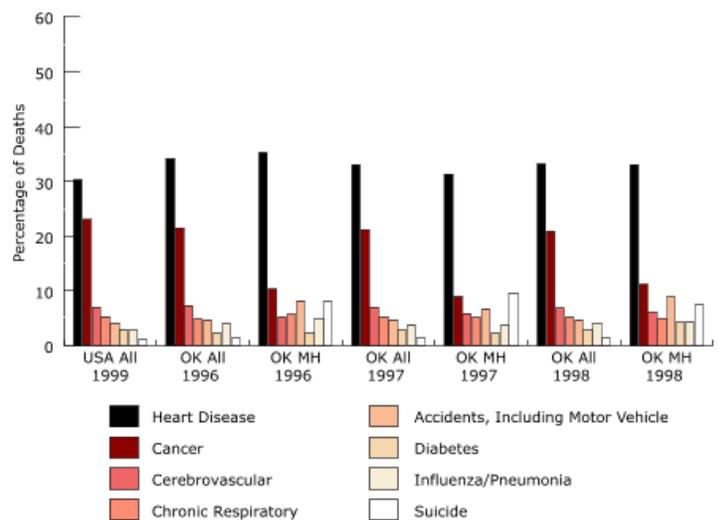


Figure 2. Leading causes of death in general populations (All) and public mental health clients (MH) nationwide and statewide in Oklahoma, 1996 to 1998.

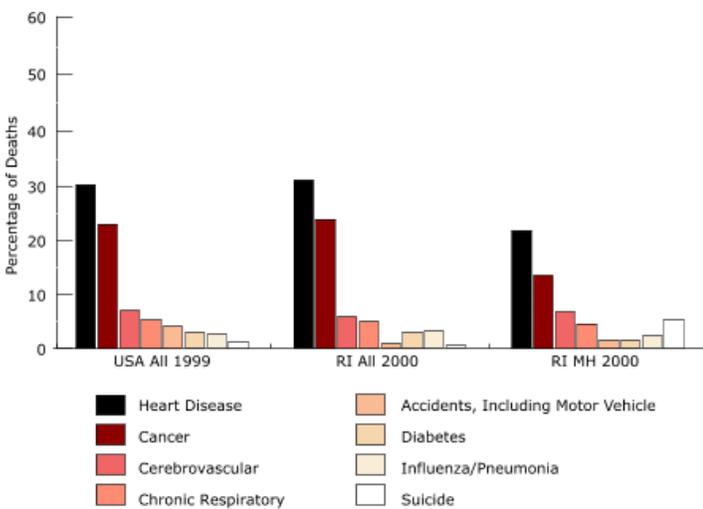


Figure 3. Leading causes of death in general populations (All) and public mental health clients (MH) nationwide and statewide in Rhode Island, 1999 and 2000.

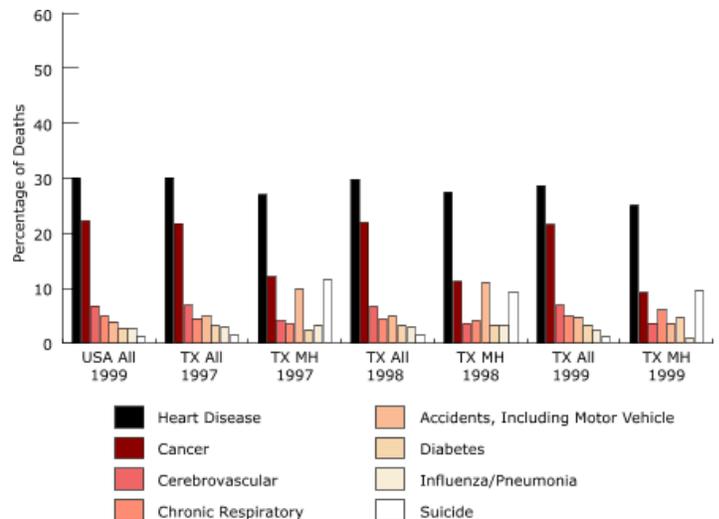


Figure 4. Leading causes of death in general populations (All) and public mental health clients (MH) nationwide and statewide in Texas, 1997 to 1999.

states and the United States. For public mental health clients, cancer was the second highest cause of death in three states for 2 of 3 years and in Rhode Island for the year shown. In Utah and Virginia, cancer was third as a cause of death among public mental health clients. Percentages of mental health clients who died of cancer were lower than for the general population in all six states for the years shown.

Although most public mental health clients died of natural causes, the percentages of mental health clients who died from accidents, including automobile accidents and suicide, are higher than those of the general populations in all states but Virginia, which only supplied data about clients in state psychiatric hospitals. Consequently, in five states the percentages of public mental health clients who die from natural causes are lower than those of the general population.

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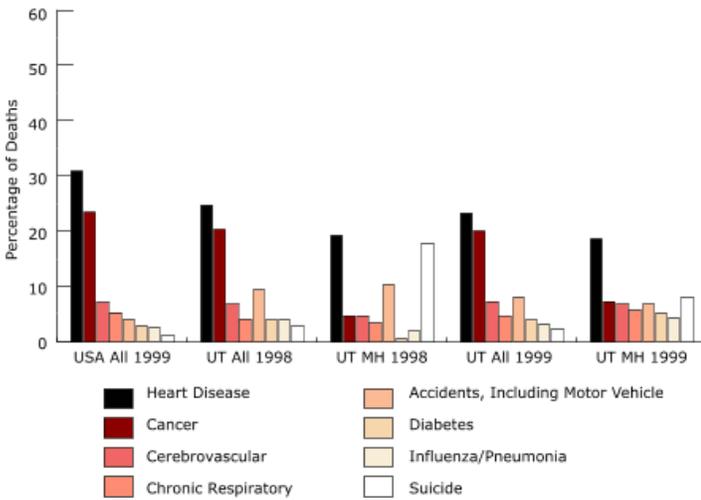


Figure 5. Leading causes of death in general populations (All) and public mental health clients (MH) nationwide and statewide in Utah, 1998 to 1999.

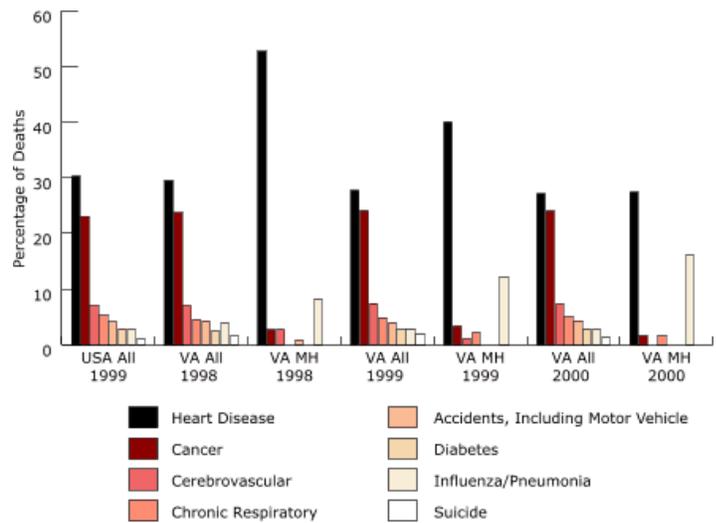


Figure 6. Leading causes of death in general populations (All) and public mental health clients (MH) nationwide and statewide in Virginia, 1998 to 2000.

In 1998, Utah had the highest percentage of public mental health clients who died from accidents and suicide of the six states. In addition, percentages of deaths from accidents, including automobile accidents, were higher for Utah's general population than the general populations of the other five states. The percentages of deaths by accidents are about twice as high as for the United States. In addition, the percentages of deaths from cancer were lower in Utah's general population than in the overall population of any other state in this study. Utah's public mental health clients also had lower percentages of death from cancer.

Discussion

High congruence was found among the mortality of public mental health clients in eight states as indicated by multiple standardized measures of mortality. The higher risk of death among these clients compared with the general populations of their states using the AADRs and SMRs are consistent with conclusions of other research. Most importantly, the findings in this study show that results are similar in several states. In all eight states, public mental health clients have higher AADRs and higher relative risks of dying as shown by SMRs considering age and sex. Even though the magnitude of AADRs and SMRs vary by state and year, the results show strong sim-

ilarities. CDC's *National Vital Statistics Reports* (11-18) and work by other researchers show differences in mortality and leading causes of death among state populations and years. Some interstate differences in mortality measures reported in this article might be attributed partially to differences among state populations. Therefore, in this study, mortality statistics were calculated and compared between mental health clients in each state and the general populations within the state during the same year.

In addition, parallels between the public mental health clients in all eight states were found in the YPLL and mean age at time of death. Public mental health clients lost decades of potential life and died at younger ages than their cohorts nationwide for the years studied. YPLL as a mortality measure provides insight into the risk of premature death for public mental health clients. Clients with MMI diagnoses (schizophrenia, major depressive disorders, bipolar disorders, delusional and psychotic disorders, and attention deficit/hyperactivity disorders) died at younger ages on average than most clients with non-MMI diagnoses. The YPLL for clients with MMI diagnoses were higher than clients with non-MMI diagnoses in more than 81% of the comparisons made.

All eight states did not submit data for all years, which may influence the generalizations of our study findings. Future similar analyses with additional data will increase

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the generalizability of our findings. Regardless, a review of the findings in this study raises the issue of determining what can be done to lower the mortality rates and risk of early death for people with mental illness, especially people with the most serious diagnoses. Twenty years ago, McCarrick et al reported higher rates of chronic medical problems among people with chronic mental illness, and chronic illness is known to increase risk of death. They suggested in their conclusions that “psychiatrists need to be adept at caring for physical illness, and primary-care physicians need to acquire skills in caring for the mentally ill” (8).

It was noted previously that clients in Virginia state psychiatric hospitals had a lower risk of death and longer lives than public mental health clients from the other seven states. These findings raise additional questions. Do differences in treatment and care exist between clients in hospital residences and clients residing and receiving treatment in communities? If so, the differences could influence mortality rates, life span, age at time of death, and subsequently YPLL. Are medical and other types of care for improving physical health provided to public mental health clients living in a hospital setting but not to clients in less-controlled environments? Although answering these questions directly is beyond the scope of this study, causes of death for public mental health clients and the health issues of people with mental illness suggest that treatment practices can be developed and used to help address the problem of premature death among people with mental illness.

Utah’s data highlight that differences exist among states. The general population of Utah is younger than the population of most states in the United States; one third of Utah’s general population was aged 17 years or younger, and one fourth was aged 18 to 34 years during the study years. According to the *National Vital Statistics Reports*, accidents are generally the leading cause of death among people younger than 34 years (11-18,22). The high proportion — almost 60% of Utah residents younger than 34 years — could have affected Utah’s data in this study. Age distribution and lifestyle among Utah residents may also affect the lower incidence of cancer in the state. To explain the lower percentages of cancer among deceased adults who had been served by the Massachusetts Department of Mental Health, Dembling et al (3) suggested that the development of cancer might be preempted by early death. A similar explanation could be applied to this

study’s data from multiple states, especially in view of the younger average ages at time of death for the public mental health clients.

Although the increased mortality rates found in this study are outcome results, health conditions and other factors related to people with mental illness have been described by other researchers and help explain these mortality findings; examples are cited in the following paragraphs. Most public mental health clients in all of the states died of natural causes and at younger ages than the general populations of their states. Leading causes of death for most public mental health clients were similar to those of individuals throughout the United States and in state general populations, especially heart disease, cancer, and cerebrovascular, respiratory, and lung diseases. People with mental illness have medical problems that lead to death, especially if they have inadequate medical treatment.

Researchers and clinicians continue to document comorbidity and medical treatment issues for individuals with mental illness. In 2004, researchers found that outpatient clients with serious mental illness were more likely to have comorbid medical conditions than the general population and have an increased risk for medical conditions, especially diabetes, lung disease, and liver conditions (7). Researchers from Australia found that physical comorbidity in people with schizophrenia accounts for 60% of premature deaths not related to suicide in this population (6). The prevalence of chronic bronchitis and emphysema was significantly higher among Maryland adult outpatients with serious mental illness than national comparison subjects (24). In addition, it was also found that the prevalence of cardiovascular disease was higher among the Maryland adults with serious mental illness who had major depressive episodes, minor depression, and moderate mental health. Other researchers found that after a confirmed myocardial infarction, Medicare clients “with comorbid mental disorders were substantially less likely to undergo coronary revascularization procedures than those without mental disorders” (25). In western Australia, psychiatric clients were found to have a higher fatality rate from cancer, even though they did not have a higher incidence rate of cancer (26); the higher fatality rates were attributed to screening and treatment deficiencies. In Vermont, “the incidence of cancer for adults with serious mental illness is more than twice the incidence for the general population” (27).

Researchers have studied the health risks of individuals with mental illness. Compared with other populations, people with mental illness have a higher prevalence of cardiovascular risk factors, including smoking, overweight and obesity, lack of moderate exercise, harmful levels of alcohol consumption, excessive salt intake, and poor diet (6,28). Lack of emotional support and social networks, lower socioeconomic status, and substance abuse are described as risk factors that affect mortality in people with serious mental illness (29).

According to the *Harvard Mental Health Letter*, people with psychiatric disorders have higher rates of medical illnesses, but they often do not seek needed medical care (30). Lifestyle, social consequences of mental illness, and difficulties in accessing health care are factors related to managing physical illness in those with mental illness (31). Lifestyle factors include long-term use of antipsychotic medication and sexual practices. Social consequences of mental illness include poverty, unemployment, poor housing, stigma, and low self-esteem. Difficulties accessing health care include doctors' focus on mental illness and not physical health, erratic compliance with health screening and treatment, and poor communication.

Some mental health practitioners and health care professionals are proposing ways to improve the physical health of individuals with mental illness, which could consequently help decrease mortality rates and rates of premature death. If primary care and mental health professionals pay attention to the physical ramifications of mental illness, the physical health of people with serious mental illness can be improved (32). Improved intervention practices could include engaging clients in preventive care, diagnosis, and management of serious physical illnesses and additional training for mental and physical health professionals to encourage communication about patient care (33). In Australia and Great Britain, health promotion programs and treatment improvements are being proposed for people with mental illness (33-35). In the United States, advance-practice nurses and consumer peer providers are being added to Assertive Community Treatment Programs to address physical health problems among people with serious mental illness (36).

The 1999 Surgeon General's report on mental health recognized "the inextricably intertwined relationship" between mental health and physical health (20). Research to track mortality and primary care among mental health

clients should be increased to provide information for additional action and treatment modification. More research about diagnosis-specific risk and evidence-based practices should be developed. Awareness among clients and providers of mental health services and primary care should be increased. Best evidence-based practices for the prevention and diagnosis of medical conditions among people with mental illness should be developed. Mental health clients should receive regular primary health care by a physician to monitor their physical health. Finally, the recommendation from the World Health Organization to integrate mental health care and primary health care should be followed (37). At the least, mental health care and physical health care should be better linked within health care delivery systems.

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Tables

Table 1. Age-Adjusted Death Rates (AADRs) and Standardized Mortality Ratios (SMRs) Comparing Actual Number of Deaths With Expected Number of Deaths of Public Mental Health Clients During a Year^a

| State and Year | AADR ^b | | Number of Deaths Among Public Mental Health Clients | | SMR ^c |
|-----------------------------|------------------------------|-----------|---|----------|------------------|
| | Public Mental Health Clients | Statewide | Actual | Expected | |
| Arizona | | | | | |
| 1999 | 1164.7 | 850.1 | 532 | 247 | 2.2 |
| 2000 | 1162.6 | 844.5 | 540 | 246 | 2.2 |
| Missouri | | | | | |
| 1997 | 1158.1 | 515.4 | 542 | 270 | 2.0 |
| 1998 | 1545.9 | 945.7 | 500 | 256 | 2.0 |
| 1999 | 1561.1 | 954.1 | 538 | 269 | 2.0 |
| 2000 | 1513.9 | 928.3 | 597 | 267 | 2.2 |
| Oklahoma | | | | | |
| 1997 | 2809.7 | 542.9 | 503 | 103 | 4.9 |
| 1998 | 3345.0 | 970.4 | 432 | 112 | 3.9 |
| 1999 | 2345.4 | 985.0 | 336 | 118 | 2.9 |
| Rhode Island | | | | | |
| 2000 | 1232.7 | 827.2 | 166 | 91 | 1.8 |
| Texas | | | | | |
| 1997 | 2295.5 | 489.9 | 1100 | 250 | 4.4 |
| 1998 | 3385.0 | 881.6 | 1130 | 230 | 4.9 |
| 1999 | 979.4 | 892.2 | 996 | 625 | 1.6 |
| Utah | | | | | |
| 1998 | 1044.7 | 784.8 | 148 | 68 | 2.2 |
| 1999 | 1126.0 | 787.1 | 180 | 81 | 2.2 |
| Vermont^d | | | | | |
| 1998-2000 | 2474 | 817.1 | NA | NA | 3.2 |
| Virginia^e | | | | | |
| 1998 | 1399.6 | 907.3 | 109 | 70 | 1.6 |
| 1999 | 1293.9 | 905.9 | 90 | 64 | 1.4 |
| 2000 | 1093.0 | 897.9 | 62 | 53 | 1.2 |

^aData analyzed were submitted by public mental health agencies in eight states for the years 1997 through 2000 for the Sixteen-State Study on Mental Health Performance Measures, funded by the Center for Mental Health Services in collaboration with the National Association of State Mental Health Program Directors (9). Only the eight states in this table (out of 16) were able to submit data on the deaths of their clients.

^bPer 100,000 population. The Centers for Disease Control and Prevention (CDC) uses the U.S. 1940 standard population for standardizing or adjusting 1997 and earlier years and the U.S. 2000 standard population for 1998 and later years (11-18). This methodology was used for our analyses of public mental health clients so that comparisons could be made with CDC's findings.

(Footnotes continued on next page)

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Table 1. (footnotes continued) Age-Adjusted Death Rates (AADRs) and Standardized Mortality Ratios (SMRs) Comparing Actual Number of Deaths With Expected Number of Deaths of Public Mental Health Clients During a Year^a

^cSMR = Actual number of deaths/Expected number of deaths. An SMR of greater than 1.0 indicates that the relative risk of death for mental health clients is higher than that of the general population of the state.

^dVermont rates were calculated for a combination of 3 years to minimize the effects of annual fluctuations. Probabilistic population estimation was used to establish an unduplicated client count and estimate the number of Vermont clients who died during the period or the overlap between clients served and death files. Vermont AADRs and SMRs were based on mental health clients represented in Vermont death records (10). NA indicates data not available.

^eVirginia reported data only for clients in state psychiatric hospitals.

Table 2. Mean Age at Time of Death for Public Mental Health Clients and Mean Number of Years of Potential Life Lost (YPLL) per Public Mental Health Client Who Died During a Year in Which a Service Was Received^a

| State and Year | Mean Age at Time of Death, y | | | Mean Number YPLL Per Deceased Mental Health Client ^b |
|-----------------------------|----------------------------------|-----------------------------------|-------------------------------------|---|
| | All Clients Who Died During Year | Male Clients Who Died During Year | Female Clients Who Died During Year | |
| Arizona | | | | |
| 1999 | 48.9 | 47.5 | 52.3 | 32.2 |
| 2000 | 49.6 | 48.5 | 52.7 | 31.8 |
| Missouri | | | | |
| 1997 | 58.3 | 54.4 | 61.8 | 26.3 |
| 1998 | 56.9 | 53.6 | 60.6 | 27.3 |
| 1999 | 58.0 | 54.1 | 61.3 | 26.8 |
| 2000 | 56.4 | 53.1 | 59.4 | 27.9 |
| Oklahoma | | | | |
| 1997 | 59.9 | 54.6 | 65.0 | 25.1 |
| 1998 | 59.9 | 53.2 | 65.3 | 25.1 |
| 1999 | 58.9 | 52.0 | 64.6 | 26.3 |
| Rhode Island | | | | |
| 2000 | 60.2 | 53.4 | 65.5 | 24.9 |
| Texas | | | | |
| 1997 | 55.0 | 52.4 | 58.1 | 28.5 |
| 1998 | 55.0 | 53.3 | 56.6 | 28.8 |
| 1999 | 54.0 | 50.8 | 57.3 | 29.3 |
| Utah | | | | |
| 1998 | 55.1 | 47.2 | 63.8 | 29.3 |
| 1999 | 58.4 | 53.7 | 63.2 | 26.9 |
| Virginia^c | | | | |
| 1998 | 72.4 | 70.6 | 74.8 | 15.5 |
| 1999 | 74.4 | 72.5 | 76.9 | 14.0 |
| 2000 | 75.0 | 75.0 | 75.0 | 13.5 |

(Footnotes continued on next page)

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Table 2. (footnotes continued) Mean Age at Time of Death for Public Mental Health Clients and Mean Number of Years of Potential Life Lost (YPLL) per Public Mental Health Client Who Died During a Year in Which a Service Was Received^a

^aData analyzed were submitted by public mental health agencies in seven states for the years 1997 through 2000 for the Sixteen-State Study on Mental Health Performance Measures, funded by the Center for Mental Health Services in collaboration with the National Association of State Mental Health Program Directors (9). Vermont did not submit age at time of death for individual clients.

^bThe YPLL for all clients who died was added and then divided by the number of deceased clients to calculate the mean YPLL for all public mental health clients who died each year in each state.

^cVirginia reported data only for clients in state psychiatric hospitals.

Table 3. Mean Age at Time of Death and Mean Years of Potential Life Lost (YPLL) for Public Mental Health Clients With Major Mental Illness (MMI) Diagnoses and Clients With Other Non-MMI Diagnoses^a

| State and Year | Mean Age at Time of Death, y | | Difference in Mean Age at Time of Death (Clients With MMI – Clients With Other Non-MMI Diagnoses), y | Mean YPLL ^c | | Additional YPLL Among Clients With MMI Diagnoses ^b |
|---------------------|---|---|--|---|---|---|
| | Clients With MMI Diagnoses ^b | Clients With Other Non-MMI Diagnoses ^b | | Clients With MMI Diagnoses ^b | Clients With Other Non-MMI Diagnoses ^b | |
| Missouri | | | | | | |
| 1997 | 59.6 | 56.2 | +3.4 | 25.1 | 28.2 | -3.1 |
| 1998 | 57.1 | 56.5 | +0.6 | 27.0 | 27.7 | -0.7 |
| 1999 | 56.9 | 59.9 | -3.0 | 27.6 | 25.4 | +2.2 |
| 2000 | 54.3 | 59.2 | -4.9 | 29.5 | 25.7 | +3.8 |
| Oklahoma | | | | | | |
| 1997 | 56.7 | 62.8 | -6.1 | 27.2 | 23.1 | +4.1 |
| 1998 | 56.6 | 63.2 | -6.6 | 27.3 | 22.9 | +4.4 |
| 1999 | 53.7 | 64.3 | -10.6 | 29.7 | 22.7 | +7.0 |
| Rhode Island | | | | | | |
| 2000 | 59.1 | 61.7 | -2.6 | 25.4 | 24.3 | +1.1 |
| Texas | | | | | | |
| 1997 | 54.3 | 57.2 | -2.9 | 28.9 | 27.1 | +1.8 |
| 1998 | 54.6 | 56.6 | -2.0 | 29.0 | 27.9 | +1.1 |
| 1999 | 53.8 | 55.1 | -1.3 | 29.4 | 28.9 | +0.5 |
| Utah | | | | | | |
| 1998 | 53.0 | 57.0 | -4.0 | 30.5 | 28.0 | +2.5 |
| 1999 | 57.8 | 58.8 | -1.0 | 26.7 | 27.0 | -0.3 |
| Virginia | | | | | | |
| 1998 | 65.5 | 75.6 | -10.1 | 21.0 | 12.9 | +8.1 |
| 1999 | 67.5 | 77.2 | -9.7 | 19.0 | 12.0 | +7.0 |
| 2000 | 70.0 | 76.5 | -6.5 | 16.4 | 12.6 | +3.8 |

(Footnotes continued on next page)

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Table 3. (footnotes continued) Mean Age at Time of Death and Mean Years of Potential Life Lost (YPLL) for Public Mental Health Clients With Major Mental Illness (MMI) Diagnoses and Clients With Other Non-MMI Diagnoses^a

^aData analyzed were submitted by public mental health agencies in six states for the years 1997 through 2000 for the Sixteen-State Study on Mental Health Performance Measures, funded by the Center for Mental Health Services in collaboration with the National Association of State Mental Health Program Directors (9). Only the six states included in this table (out of 16) were able to submit data on the causes of death for their clients.

^bDiagnoses of MMI include *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV), schizophrenia, major depressive disorders, bipolar disorders, delusional and psychotic disorders, and attention deficit/hyperactivity disorders. *Other non-MMI diagnoses* are DSM-IV diagnoses other than those designated as MMI.

^cThe YPLL for all clients who died was added and then divided by the number of deceased clients to calculate the mean YPLL for all public mental health clients who died each year in each state.
