Depression in Manitoba:
Patterns of Health Care Use;
A Comparison of Administrative and Survey Data

By Eilish Cleary

Submitted to the Faculty of Graduate Studies
In Partial Fulfillment of the Requirements
For the Degree of

MASTERS OF SCIENCE

Department of Community Health Sciences
Faculty of Medicine
University of Manitoba
Winnipeg, Manitoba

THE UNIVERSITY OF MANITOBA

FACULTY OF GRADUATE STUDIES
*****
COPYRIGHT PERMISSION

"Depression in Manitoba: Patterns of Health Care Use; A Comparison of Administrative and
Survey Data"

BY

Eilish Cleary

A Thesis/Practicum submitted to the Faculty of Graduate Studies of The University of

Manitoba in partial fulfillment of the requirement of the degree

Of

MASTER OF SCIENCE

Eilish Cleary © 2005

ABSTRACT

Depression in Manitoba: Patterns of Health Care Use

A Comparison of Administrative and Survey Data

By Dr. Eilish Cleary

Information about disease prevalence comes from different sources and using different methodologies. How then do results on the same disease compare? This study looks at the prevalence of depression and the associated patterns of health care use. A database of consenting Manitoba respondents to the 1996/97 Statistics Canada National Population Health Survey was linked to the Manitoba Population Health Research Data Repository.

The administrative database was found to yield a significantly higher one year depression prevalence (5.8% 95%CI =5.4-6.3) than the survey (4.1% with 95%CI=3.7-4.5), but the sources did not necessarily capture the same people (Kappa =0.26, 95%CI=0.23-0.30). The survey found a higher prevalence of depression in young people than did the administrative data (79% vs. 44% were <50 years). 25% of those with a diagnosis of depression were over 70 years old as compared with 7% of those who self-reported depression in the survey. Depressed people were more likely than those not depressed to be female no matter what definition was used. The group that met both definitions had a significantly higher number of females than all the other groups (83.3% Vs 16.67%). Compared to non-depressed people (4.8, 24.8; visits per person for one and five years), there was a higher visit rate to all physicians for those who

had depression in the administrative dataset (10.4, 37.4; visits per person for one and five years) and the survey data (6.8, 33.6; visits per person for one and five years). Those people who were categorized as depressed in both data sets had the highest all physician visit rate, almost three times the rate of those without depression (13.2, 57.7 visits per person for one and five years). The five year hospitalization rates showed a trend toward a higher rate for depressed people as defined by survey or administrative definition compared to those not depressed, but this did not reach statistical significance. However those people who met both definitions of depression had more than one and a half times the rate of hospitalizations (1.87 per person over five years) than those not depressed (1.04 per person over five years).

Different methodologies appear to identify different populations of depressed people. The fact that "depressed" people use the health care system in similar ways, no matter what source is used to identify the diagnosis supports the face validity of both sources. It also leads to a hypothesis that population depression prevalence is underestimated when only a single methodology is employed; thereby leading to the conclusion that population prevalence has been underreported to date. Increasing use of large linked data sets will be invaluable to furthering our understanding of this debilitating condition.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1. Overview

Depression is common in Manitoba. A report published recently by the Manitoba Centre for Health Policy described an overall treatment prevalence of 6.75% (6.70-6.82) for depression in a one year period and 18.2%(18.09-18.29) in a five year period[1]. This data was based on the numbers of people (age>10), in Manitoba, who attended their doctor in a one or five year period. Other prevalence studies, in different locations, have given quite different results. Two large surveys in the United States, the Epidemiological Catchment Area study (ECA) and the National Comordidity Study (NCA) gave one year prevalence estimates of major depression of 3.7% and 10.3% respectively[2, 3]. In Canada large population based national surveys such as the National Population Health Surveys (NPHS) and the Canadian Community Health Surveys (CCHS) have found that 4.5% and 8% of their study populations, respectively, had major depression[4, 5]. The prevalence of depression is further discussed in Chapter 2, however the point of importance is that these studies used a range of measurement tools, over different periods of time, and applied to different populations. There has been an evolution in the epidemiological methods used in mental health. Most significant studies have determined their prevalence estimates from survey data. Many of the earlier studies used a tool called the Diagnostic Interview Schedule (DIS). More recently, the Composite International Diagnostic Interview (CIDI), which has a

short and long form, has been used in many of the larger studies, particularly in Canada. The recent Manitoba study used an administrative database. Such databases are increasingly capable of anonymously linking routinely collected vital statistics and administrative and social data for each individual resident in the province. Good administrative data is important for measuring health care utilization and can contain significant information on disease epidemiology. If administrative data is linked to surveys of representative population samples there is potential to compare data of an individual collected from different sources. This offers the potential to validate methods of determining disease prevalence, and combining the data sources offers richer and more complex information.

As a validation step for the Manitoba study, individuals who were defined as having been depressed according to an administrative definition were compared to those who had a high probability of depression as determined by the 1996 National Population Health Survey[4]. The results showed that the prevalence was higher in the administrative data than in the survey and that there was poor agreement between the two groups. The results show that many individuals who had been treated for depression were not shown to have a high probability of depression in the survey. Likewise, many individuals that had a high probability of being depressed according to the survey were not identified as having been treated for depression in the administrative database. With a disease as common as depression, almost one person in five receiving treatment in a five-year period, it is extremely important to understand as much

as possible about the disease in order to ascertain if the health system is meeting the need to allow programs be appropriately developed. Validation studies, such as these, are valuable therefore, to ensure that we use the data optimally. Results such as these, which have poor agreement, warrant further study to explore the implications.

In addition to depression prevalence, the Manitoba study also looked at healthcare use by those it defined as depressed. Depressed people as compared to the non-depressed study population made substantially higher use of physician and hospital services. This thesis study was set up to explore how healthcare use compares between people who are defined as having depression by different methods, taking advantage of the ability to link an individual's use of the healthcare system and their results from a large well designed population based health survey.

1.2. The Setting

This study was conducted at the Manitoba Centre for Health Policy (MCHP) in Winnipeg, Manitoba, Canada. MCHP is a unit of the Department of Community Health Sciences in the University of Manitoba. This Centre conducts specialized health research to inform evidence-based decision making by health care planners and policy makers. MCHP houses the Population Health Research Data Repository, a comprehensive database which is an invaluable source of information for conducting studies such as this one. All data is anonymised in the database. In accordance with MCHP policy, approval

for this study was obtained from the University of Manitoba Human Research Ethics Board and the Health Information Privacy Committee was notified of the use of the data.

1.3. The Disease and Diagnosis

Defining Depression

The term depression covers a spectrum of mood disorders that can range from being mild and transitory to a persistent state of incapacitation. One end of the spectrum can be difficult to distinguish from normal reaction and at the other end there is an overlap into severe psychotic disorders. In the classification of mental disorders using the Diagnostic and Statistical Manual of Mental Disorders (DSM-1V)[6] major depression is defined as a period of at least two weeks characterized by at least five severe and persistent depressive symptoms. The symptoms must not represent a normal grief reaction or be secondary to an organic cause such as a physical illness or drug exposure. As well as feelings of sadness, symptoms can include; changes in sleep pattern; loss of energy; change in appetite; difficulty concentrating; feelings of worthlessness; and suicidal thoughts.

Diagnosing Depression

The criteria indicated by DSM –IV described in the preceding paragraph are those accepted for the diagnosis of major depression. In practice the

diagnosis is made both formally and informally, usually by a physician. Many formal tools are available to assist in the evaluation of symptoms and in some instances can help quantify the severity of the disease. These assessment tools can either be completed by the patient (self-report) or by an interviewer (observer-report) and all yield a score indicating the likelihood of depression. Informal diagnoses are made often in the context of evaluation of a patient who may present with vague or somatic symptoms. The physician may explore the symptomatology associated with depression. The strict definition given in DSM-IV may or may not be employed and a judgment is made based on the knowledge and experience of the physician.

1.4. The Significance of this Study

Depression is a chronic disease with frequent relapses. More than 50% of people who have an episode of major depression experience a recurrence[7]. As shall be shown in the literature review, depression is associated with high morbidity and mortality thus giving rise to considerable personal suffering. There is also a considerable economic burden not only for individuals and families affected but also at a societal level. Understanding as much as possible about this disease is therefore extremely important both to improve care and support for affected individuals and their families and also to ensure health spending is efficient and effective.

1.5. The Purpose of this Study

Depression is a very common disorder. However, despite many studies, some of which have already been referred to in this introduction, an accurate population-based prevalence is not easy to determine. All of the common methodologies used have some weaknesses and due to the number of different methods of determining depression, comparisons are difficult. A validation performed as a preliminary step to this study used two different methods to explore prevalence in a subset of the Manitoba population. The survey-based definition yielded a lower prevalence as compared to the administrative definition. There was little agreement between the two depressed populations indicating that both methods pick up different people. What is the significance of this finding? Do the definitions capture individuals at different stages of the spectrum that exists in depressive disorders? Is one group more severely affected than another is? Should a cumulative value be used combining both methods? How many other methods should then be employed in order to make sure we don't miss other depressed people?

In order to explore the implications of the results of the validation, this study looked at other factors associated with depression. As will be outlined in the literature review, many studies indicate that people with depression tend to use the health care system frequently. Do either of our depressed populations have this intense usage? Is one definition superior to the other in terms of matching more closely to the accepted trends of health utilization behavior of

depressed populations? If both have high usage, should we consider both definitions to be valid and thus describe a higher prevalence?

This study therefore developed the following specific objective: to explore and compare the health care utilization of people with two different definitions of depression. In order to meet this objective the following questions were set:

1) What is the physician visit rate and the hospital separation rate for people in the Manitoba population of the 1996 National Population Health Survey who meet our administrative definition for depression?

2) What is the physician visit rate and the hospital separation rate for people in the Manitoba population of the 1996 National Population Health Survey who have a high probability of depression as defined by the survey tool.

3) How do the rates for both groups' compare to the rates for those people in the same survey population who don't meet either definition of depression?

4) Do the rates differ for people who meet both definitions as compared to those who meet only one definition?

CHAPTER TWO: BACKGROUND AND LITERATURE REVIEW

2.1. Prevalence of Depression

It is not easy to accurately measure the true prevalence of depression. Indeed the use of the phrases "true extent" and "true prevalence" are in themselves problematic in that both the definition of depression and the clinical presentation describes a spectrum of disorder without absolute categorization of entity or severity. For the purposes of clarity, for this study, use of the term "true prevalence" is used to reflect the prevalence of depression in a population, whether diagnosed as such, or not, that results in significant impairment either to the individual or to society. The difficulty in measuring this involves not only the considerable variation in clinical presentations but also the many inconsistencies between screening and diagnostic tools as well as in coding methods. There have been many studies estimating the prevalence of depression throughout the world. Most significant studies have determined their prevalence estimates from survey data. These surveys used a range of measurement tools, over different periods of time, and were applied to different populations. In the United States two large surveys, the Epidemiological Catchment Area Study (ECA) and the National Comordidity Study (NCA) gave one year prevalence estimates of major depression of 3.7% and 10.3% respectively[2, 3]. Another American study found that the overall prevalence of clinically depressive symptoms seen in primary care patients to be as high as 20.9% although only 1.2% cited depression as a reason for the visit[8]. In

Canada large population based national surveys such as the National

Population Health Surveys (NPHS) and the Canadian Community Health

Surveys (CCHS) have given prevalence estimates between 4.5% and 5.2% with

considerable variation with age, gender and province[9, 10]. In an analysis of

the 1994/95 National Population Health Survey, Stephens et al found that 6% of

the Canadian population had depression in the previous 12 months[11].

Univariate analysis of the same data by Marie Beaudet showed that the

prevalence of depression was higher among women than men which is

consistent with most epidemiological reports of depression from many

countries[12]. She also found that the prevalence of depression tended to

decline with age in both sexes. Scott B Patten in his analysis of the 1994 NPHS

and the subsequent 1996/97 component described an annual incidence

proportion of between 1.3 and 7.1%, varying considerably with age and sex[13].

Other Canadian studies such as the Mental Health Supplement to the Ontario

Health Survey, an Edmonton study from the 1980's, a more recent Calgary

study and an early Stirling County study determined prevalence rates between

4.1 and 12.7 %[14-17]. A report published recently by the Manitoba Centre for

Health Policy described an overall treatment prevalence in Manitoba of 6.75%

(6.70-6.82) for depression in a one year period and 18.2%(18.09-18.29) in a five

year period[1]. Some of these results are presented in tabular form in Appendix

II. This data was based on the numbers of people (age>10) who attended their

doctor in a one or five year period.

As noted earlier the considerable methodological differences between

the various studies describing depression prevalence make comparison difficult. This may lead to an underestimate of the true extent of this disease. Therefore, as a preliminary validation step in preparation for this study, the prevalence of depression in Manitoba was examined using two different definitions [18]. One definition was derived from administrative database using a combination of physician billings and pharmaceutical information. The other definition was based on a diagnostic tool; the Composite International Diagnostic Interview-Short Form (CIDI-SF) administered during the 1996 National Population Health Survey. Using the two definitions in the same population, the Manitoba subset of the 1996 NPHS, it was found that the survey yielded a lower prevalence. A significant point of interest was the fact that little agreement was found between the two definitions. There was also a difference in the age profile of persons being diagnosed using the definitions with a greater number of older people showing up in the administrative data that in the survey. The conclusion was that the methods used to determine depression prevalence might actually capture different populations of depressed people and that the true prevalence of depression was actually higher than found by one method alone. These results are included in the Results Section, see also Appendix II.

2.2. Morbidity and Mortality Associated with Depression

Depression is associated with significant morbidity and mortality. Unipolar depression is identified as the fourth-ranked cause of disability and premature death worldwide and is estimated to become the leading cause of

disease burden in developed countries by the year 2020[19].

The impacts of depression for an individual can be direct or indirect. Direct effects can lead to poor quality of life, personal economic cost [20] and risk of suicide. A major 1998 BMJ review article found that the all-cause death risk from major depression was 1.4 times that expected[21]. The mortality from unnatural causes was nearly seven times that expected, accounting for 84% of the excess deaths. The unnatural deaths were predominantly as a result of suicide, the mortality risk being 21 times higher than expected. Indirect increases of morbidity and mortality result from the long-known association between mental illness and poor physical health.

In 1934 the BMJ published a report on physical disorders in admissions to a mental hospital[22] and since then there have been many studies and review articles throughout the world confirming this[23-26]. A particularly strong association has been described between cardiovascular disease and depression [27, 28]. The Canadian research in this area has been consistent with other countries. In Stephen's analysis on mental health in Canada[11], he found that the number of chronic physical problems was closely associated with depression. Having three or more (self reported) physical health problems gave an odds ratio of 1.63 (SE .119, p<0.001) of having depression Vs none. A study in Alberta found the prevalence of depression to be elevated in those subjects who reported one or more long-term medical conditions. The association was not due to confounding by age, sex, social support, or recent life events[29]. In a 2001 research report, a longitudinal analysis of the 1994/5 and 1996/7 found

that having a long-term physical illness approximately doubled the risk of major depression. Migraine headaches, sinusitis and back problems were the condition most strongly associated in that report[30].

Depression is a chronic disease with frequent relapses. More than 50% of people who have an episode of major depression experience a recurrence[7], and up to 80% of patients with major depression are not fully recovered when followed up 15 years later[31, 32].

2.3. Health Care Use in Depression

Depression can present in many ways and therefore is not always easy to diagnose. Nevertheless, this disease is one of the mental disorders most amenable to treatment[33]. Canadian Clinical Practice Guidelines have been developed to assist in managing this disease[34]. People with depression tend to be intense users of the healthcare system, but despite frequent contact with health care providers, depression can remain undiagnosed and under treated [35, 36]. An Australian study found that not only were those with major depression significantly greater users of the health care system but that only one fifth were taking antidepressants at the time of the study[37]. In Sweden bivariate analysis showed that depressive symptoms were associated in elderly medical inpatients with an increased risk of hospital readmission, nursing home placement, and death[38]. In Canada, only 43% of people identified by the 1994 National Population Health Survey (NPHS) as having experienced a major depressive episode (MDE) in the previous 12 months, reported talking to a

health professional about emotional or mental health in the same period. Only 26% of them were considered to have received treatment (note: treatment was defined as four or more contacts with a health professional about mental health and did not refer to pharmaceuticals[9]). Another Canadian study described less frequent antidepressant use in young subjects despite a higher prevalence of depression in this group. Younger people were less likely to see a physician about their depressive symptoms and when they did, were less likely to be told they were depressed[39].

As previously described, mentally ill people are at higher risk of comorbid illness. In this area also they are less likely to receive appropriate diagnosis and treatment [26, 40, 41]. Redelmeier found that patients with diabetes, emphysema, and severe mental disorders were less likely than patients without these conditions to receive lipid lowering medications and other treatments. Much of this work focused on schizophrenia; however, it is likely that similar trends are seen in depression.

Mental illness is costly to the health care system. In Manitoba, the consolidated mental health care expenditure per user with severe mental illness (ICD-9-CM 295-299) was $3,973.9 (1991/92 data)[42]. Between 5-6% of Manitobans had access to at least one prescription per year for an antidepressant with a province-wide expenditure of $11 per resident per year[43].

2.4. Summary

In summary, the literature indicates that depression is a common chronic condition with significant morbidity and mortality. It is often underdiagnosed and undertreated. In addition, people with depression are frequent users of the health care system both due to their mental health condition and due to comorbid illnesses. This impacts not only at the individual and family level but there are also significant implications for society in terms of loss of productivity and considerable health care costs. Adding to our knowledge and understanding of depression can help Manitoba plan programs strategically to improve care.

CHAPTER THREE: METHODOLOGY

3.1. Data Sources

The National Population Health Survey (NPHS) was designed to collect information on the health of the Canadian population and related socio-demographic information. The first cycle began in 1994 and continues every second year. Initially it contained both cross-sectional and longitudinal components. In 2000 the study became longitudinal only, with the Canadian Community Health Survey taking over the cross-sectional component. The NPHS includes surveys of households and health care institutions. The National Population Health Survey (NPHS) household component was carried out in 1996 and included household residents in all provinces, with the principal exclusion of populations on Indian Reserves, Canadian Forces Bases and some remote areas in Quebec and Ontario. In each household, some limited information was collected from all household members. One person aged 12 years and over, in each household, was randomly selected for a more in-depth interview. In Manitoba and Alberta a child less than 12 years was also selected.

The questionnaire included components on health status, use of health services, risk factors and demographic and socio-economic status. The selected person in each household was followed at two-year intervals as part of the longitudinal component.

In Manitoba the 1996 survey responses has been linked, subject to the consent of the respondent, to the administrative database allowing more extensive analyses. This database is very large and comprehensive because in Manitoba, all residents are covered for medically necessary health services under the Manitoba Health Services Insurance Plan (MHSIP). The number of persons enrolled in this plan closely matches the provincial population as determined by census; thus, this administrative data is considered an accurate reflection of health service utilization by the population. Every resident has a unique personal health insurance number (PHIN). This number is recorded when health services are accessed. Physician claims for billing purposes use a code that is unique to that physician. Claims from fee-for-service physicians also include a single diagnosis from the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM). This diagnosis refers to the primary reason for the visit. Salaried physicians submit "shadow billing claims" for record keeping. Hospital separation records can list up to 16 diagnoses. Information on pharmaceutical use in Manitoba is obtained from the Drug Programs Information Network (DPIN). This was added to the Population Health Information System (POPULIS) in 1995 providing an administrative database of prescriptions dispensed to Manitoba residents. This allows population based studies of patterns of pharmaceutical use and expenditures. The WHO Anatomical Therapeutic Chemical (ATC) classification system for human

medicines is used. This classification system divides drugs into categories according to the physiological system for which they are usually prescribed.

3.2. Study Population

The group of Manitoba respondents to the 1996 NPHS who gave permission for linkage to the Manitoba administrative database was used as the study population (n= 9944). Two different definitions of depression were applied to this population:

1.   The data from the 1996 NPHS permits classifying respondents as to their risk of major depression in the preceding 12 months. The instrument used to determine risk was the Composite International Diagnostic Interview Short Form (see Appendix III) [44]. This is an abbreviated questionnaire derived from the validated Composite International Diagnostic Interview (CIDI)[45] which was developed by Kessler and Mroczek. A subset of questions cover a cluster of symptoms for a depressive disorder as listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM111-R). Subjects are scored on a scale according to their responses. The scale was a probability estimate i.e. if the score was 0.9 then that subject was considered to have a 90% probability of having a major depressive episode (MDE) in the preceding 12 months. Based on the scores three groups were identified: no risk: 0; possible risk: 0.01 to 0.89 and probable risk: 0.90. For the purposes of this study we classified people

as being depressed according to our survey definition using the probable risk of depression of greater or equal 0.90, as per the scale. All others, those with a derived definition score of less than 0.89, were defined as being not depressed.

2. A definition of depression was derived from analyses of the administrative data using a combination of diagnostic codes and pharmaceutical information. The administrative definition includes:

    a) people who have over the year a single diagnosis of the following ICD-9 codes: 296,309,311,300-4 (the latter is a hospital diagnosis only. This will be discussed further in the Instrument, Tools and Limitations Section)

    b) People who have an ICD-9 code of 300 in that year if they also have a code for an antidepressant use. Certain antidepressants (paroxetine and citalopram) were excluded as they are frequently prescribed for anxiety. Please see Appendix IV.

Definition of Health Care Utilization

Health care utilization by the study population was examined using the following definitions for the time periods of one year prior and five years post survey. These definitions are described according to the Manitoba Centre for Health Policy Concepts Dictionary (http://www.umanitoba.ca/centres/mchp).

1. Ambulatory Visit Rates: This refers to most contacts between a patient and physician except for inpatients in hospital. It includes all regular

office visits, consultations, outpatient department and emergency room visits and for consultations, as well as for follow-up care. The visits can be visits to patients in Personal Care Homes (PCH) or in their own homes.

2. General Practitioner (GP) / Family Practitioner (FP) visit rates: Services are provided by a general practitioner or a family practitioner and are ambulatory in nature. I.e. this definition does not include inpatient care. This is a subset of the ambulatory visit rate.

3. Specialist Visits: Ambulatory specialist contacts are visits provided by specialist physicians including the use of specialists initiated by the patient's family doctor, another specialist, or by the patient. This is also a subset of the ambulatory visit rate.

4. Consult Rates: A consultation occurs when one physician requests another to examine a patient due to the "complexity, obscurity or seriousness" of the patients illness. Most of these services are provided by specialists; however, it refers only to the first visit and therefore is seen as a measure of access to specialist. Separating out consult from other specialist visits accommodates some of the differences arising from service delivery patterns between urban and rural parts of the province. In rural areas specialists are more likely to be referred to for an opinion, rather than utilized for ongoing care as is more typically the case in urban areas.

5. Total Hospital Separation: This represents the end point of an
    inpatient hospital contact, which consists of one or several days of
    care. It therefore reflects the number of completed in-hospital stays
    over the time period. Separations can result from discharge, death or
    transfer to another facility.

3.3. Linkage and Analysis

The cohorts used required at least one year of coverage during the 5
year the study period. Overall rates were based on the existence of depression
diagnosis and/or drugs with corresponding diagnosis as outlined in the
preceding section. Linkage with NPHS data NPHS data required participation in
the NPHS and linkable to the administrative data for the date of the survey.
This required inclusion in the cohort definition - at least 1 year of coverage by
the end of the study period.

All linkage and analysis was performed using SAS^R programming on
MCHP secure systems. A Kappa coefficient was calculated to determine the
congruence between the administrative data and survey data. This calculation
uses a term called the proportion of expected agreement that verifies if
agreement exceeds chance levels. It does not assume either data to be a more
correct measure. Positive predictive values, sensitivity and specificity were
calculated using the administrative data as a gold standard. Positive predictive
value is defined as the probability that the result is a true positive i.e. really has
the disease. It is determined by the sensitivity and specificity of the test and by

the prevalence of the condition for which the test is used. Sensitivity is the proportion of truly diseased persons in a screening population who are identified as diseased by the screening test. Specificity is the proportion of non-diseased persons who are so identified by the screening test. A Tukey's Studentized Range (HSD) Test was used to determine statistically significant differences between categories of depression with respect to age profile. A Chi square analysis was used to compare the categories for sex difference. All rates were calculated for crude rate and also directly adjusted rates as compared to the Manitoba population. Statistical significance was determined at the 99% confidence interval level ($p < 0.001$).

3.4. Instruments, Tools and Limitations

The World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) is a validated fully structured diagnostic interview which is designed to be used to generate diagnoses according to the definitions and criteria of both the DSM and ICD systems[45].

The Composite International Diagnostic Interview Short-Form (CIDI – SF) was developed in order to provide for a quick screen for commonly occurring psychiatric conditions. Initially it was designed to screen for DSM-111-R disorders[44]. It has subsequently been revised to generate DSM-1V diagnoses. The essential difference between the classification criteria is the DSM-1V requirement that symptoms result in a clinically significant or functional impairment. In this report we refer to the version used in the 1994

National Population Health Survey and which was repeated in 1996. This version is based on the DSM-111-R criteria. This may lead to some overestimation as compared to the more recent classification system.

A study by Slade and Andrews in Australia found that the prevalence of major depression can decrease by 19% with the inclusion of the clinical significance criterion [46]. Validation work has been done both in developing this version and in community and clinical samples [47, 48]. 25% of subjects in a community study had false positive results on the CIDI-SF as compared with the full CIDI.

In the classification of mental disorders using the Diagnostic and Statistical Manual of Mental Disorders (DSM-1V)[6], major depression is defined as a period of at least two weeks characterized by at least five severe and persistent depressive symptoms. The symptoms must not represent a normal grief reaction or be secondary to an organic cause such as a physical illness or drug exposure.

The CIDI-SF does not include questions that exclude organic causes and thus it is possible that this could increase number of false positives. 13% of the false positives in Patten's validation of the CIDI in a community sample had key symptoms attributed to an organic etiology[48]. In a clinical sample the CIDI-SF was found to be highly sensitive (98.4) but not highly specific (72.7%)[47]. This means that the tool is good at picking up people who may be depressed but that the results will also include a percentage of people who are not (false positives).

In addition CIDI-SF seems to pick up a broader category of affective disorders. Comparison of the NPHS data relative to the Ontario Health Survey[49] resulted in an overestimation of major depression by approximately 50%.

Most of the validation of the CIDI-SF has been done using survey data. This report will link survey data to administrative data in order to further explore validity. Research has shown that the reliability of diagnostic information in administrative data is consistently high[50, 51].

Some threats to validity exist. Diagnoses are reported through a unique number (PHIN) for each resident in Manitoba. In order to bill for services provided, physicians must record the reason for that visit. As only one diagnosis is recorded per consultation, there may be underestimation of the true frequency and range of diagnoses.

There may also be inaccuracy in the coding of diagnoses, which is not necessarily performed by the physician. Some physicians do not bill for services as they are paid by salary. Shadow billing does occur, but is of variable quality.

More specifically of interest to this report, mental health salaried physicians working within the Provincial Mental Health Institutions are excluded because they are reported by the Manitoba Health Management Information System (MHMIS). The quality of this database is inconsistent across the regions and so has not been used. As a result of this exclusion, such physician mental health services will be underestimated. The MHMIS

also collects information on regional mental health services but usually by staff other than physicians.

Yet another weakness stems from the fact that in Manitoba, particularly in some Northern and predominantly Aboriginal communities, primary care is often provided by a nurse and again will not appear in the physician data. To a certain extent this might be mitigated for this report by the fact that the 1996 NPHS did not include an on reserve component. Hospital data records up to 16 diagnoses per admission and thus will pick up the diagnosis of depression more easily once made.

Diagnoses in Manitoba are recorded by the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). This system, based on the WHO ICD-9, was developed in the United States in order to provide a way to classify morbidity data for indexing of medical records, medical case reviews, and ambulatory and other medical care programs, as well as for basic health statistics. The clinical diagnostic standard classification for mental health disorders is the Diagnostic and Statistical Manual of Mental Disorders (DSM-1V).

This dual system results in diagnoses being made according to one set of criteria and recorded in the administrative data set in another less discriminating coding system, thus reducing specificity. In addition physician diagnoses are limited to the first three digits of the coding system and so categories of disease are quite broad. The hospital record can go beyond three digits to subclassify. This could lead to a bias as a result of

overrepresentation of certain diagnoses in hospitalized patients. An example of this would be major depression, which would be coded by a family physician according to the ICD-9-CM as an affective psychosis resulting in a three-digit code of 296. A person with an affective psychosis admitted to a hospital could be classified as either depressed 296.2 / .3 or as having bipolar disorder 296 .4 to .8. A specific diagnosis of bipolar disorder for example would not show up unless the person was admitted to hospital, potentially causing an undue association between hospitalization and bipolar disorder. For the purposes of this study the 296 code will be used for defining depression even though we are aware that this code is not specific.

Validation studies have shown the pharmaceutical database to be a valid and reliable source of prescription data for most of Manitobans but somewhat under-represents prescriptions dispensed to people with First Nation Status[43, 52]. This limitation will not have a major impact on this report because, as described earlier, the NPHS survey did not include people living on a First Nation Reserve. Prescriptions dispensed to First Nation study participants living off reserve could be estimated. This study proposes to look at diagnostic categories to look for associations between depression and physical disease. However, a cause/effect relationship cannot easily be determined. Depressive symptoms are inextricably linked with risk factors for many chronic diseases. For example, poor motivation and altered eating habits are common in depression and may lead to a lack of exercise or an unhealthy diet. There may also be added risk factors such as smoking or

increased alcohol consumption. Unwanted effects associated with medication may also play a part. Detailed exploration in this area is beyond the scope of this study.

In summary, although some limitations with our instrumentation are present, there is sufficient validity and reliability; meaningful results can be achieved providing careful interpretation is used.

3.5. Ethical Considerations

This study was submitted for and received the approval of the Health Research Ethics Board (HREB) and The Health Information and Privacy Committee (HIPC). Participants in the 1996 NPHS were asked for their permission and consent to link with provincial health information. Only those subjects who gave their consent were included.

The linkage was completed at Manitoba Health and the anonymised linked database using an encrypted personal health identification number was used for this study. No patient names, addresses or telephone numbers are contained in the database. All data files were accessed and analyzed within the secure environment of the Manitoba Centre for Health Policy (MCHP). This centre has strict security measures in place to protect privacy and confidentiality. No permanent data set will be retained beyond the duration of this study.

CHAPTER FOUR: RESULTS

4.1. Prevalence of Depression

Table 1 shows the prevalence of depression as defined by our administrative definition in both the general population and in the NPHS subset. The prevalence of depression in the general population (12 years and up) in a one year period (1996/7) was 5.74 % (95% CI=.5.67-5.78). In a five year period (1995/6-1999/2000) the prevalence of depression was 16.47% (95% CI= 16.4-16.51). Using the same definition for the Manitoba subset of the 1996/7 NPHS sample population (12 years and up), it was found to be a representative sample of the population with no significant difference in prevalence for either the one or five year periods.

A difference was found in the prevalence of depression as determined by the administrative and survey definitions. The NPHS probability of depression scale yielded a one-year depression prevalence of 4.10% (CI=3.71-4.50). This was significantly lower than that found using the administrative definition (5.84% with a 95%CI =5.38-6.30). This means that in this selected population, there is a difference in prevalence when comparing two methodologies. In order to compare to the general Manitoba population, a weighting procedure had to be employed. This is because the NPHS oversampled young people, and so is not entirely representative of the provincial demographics. The results show that even after weighting, the

survey still gave a statistically lower prevalence (4.82% with 95% CI = 4.0-5.65) as compared with the administrative definition. (5.74% with 95% CI= 5.69-5.78).

TABLE 1. Prevalence of depression as determined by administrative claims in the Manitoba population and administrative and survey definitions in the 1996/7 NPHS subset

Source	No. Of Individuals	Population	Percent	Upper and lower (95%) CI
Manitoba population I year	57357	998462	5.74	5.69-5.78
Manitoba population 5 year	171679	1042320	16.47	16.4-16.51
NPHS subset 1 year	581	9944	5.84	5.38-6.30
NPHS subset 5 years	1684	9944	16.93	16.19-17.66
Depressed in Survey	408	9944	4.10	3.71-4.50
Depressed in Survey (weighted adjustments in brackets)	408 (38,146)	9944 (79,0734)	4.82	4.0-5.65

4.2. Agreement of Definitions

The NPHS population was analyzed to compare the number of depressed persons as defined by the administrative definition ("diagnosed with depression") and those who had a 90% probability of depression in the survey ("depressed in survey"). A cross tabulation was performed to see how many people in the survey met one of the definitions, how many met neither and how many met both. The level of agreement between the two definitions was explored.

These results are presented in Tables 2 and 3.

Table 2. Cross tabulation of the linked survey and administrative data using the administrative definition and the depressive scale in the NPHS.

	No Diagnosis of Depression	Diagnosed Depressed	
Not depressed in Survey	9104 (91.55)	431 (4.33)	9535 (95.89%)
Depressed in Survey	259 (2.6)	150 (1.51)	409 (4.11%)
	9363 (94.16%)	581 (5.84%)	9944 (100)

Table 2 shows that of the 409 respondents depressed by the survey definition, and the 581 respondents who showed up in our administrative database as depressed, only 150 people showed up in both. This means that 431 depressed individuals according to our administrative definition were not identified as being depressed in the survey. Also 259 people who were diagnosed by the survey as being depressed had not been diagnosed and treated for it in our health care system. In total 690 (6.94%) were depressed according to one or other definition.

Table 3. Agreement between the administrative definition of I year prevalence of depression and NPHS mental health scales for depression.

Kappa	95% CI Kappa	Concordance	Sensitivity	Specificity	Positive predictive value	Negative predictive value
0.26	0.23-0.30	93.06	0.37	0.95	25.82	97.23

Table 3 shows a low level of agreement between the two groups (Kappa = 0.26), with low sensitivity and low positive predictive value (36%, 26% respectively) in using the survey definition to diagnose depression as compared to our administrative database. This means that there the survey does not pick up all those who were identified as being depressed in the health system. The

survey definition is more specific and has a better negative predictive value (95%, 97% respectively) so if the survey identified a person as not being depressed, there was a high probability that the individual would not show up as depressed in our health system.

4.3. Categories of Depression

Following this initial validation step, four groups were defined and explored in terms of age and sex distribution. The time frame used for the administrative claims was the 12 months preceding the survey in order to concur with the survey time frame so the actual numbers do vary from those used in the prevalence and agreement calculations. All rates are age and sex adjusted according to the Manitoba 1996 population. Crude rates are also presented in the tables. Confidence limits are also given with statistical significance indicated as appropriate. Rates are given for one-year and five-year utilization.

A) Not depressed: no depression in claims or in survey data (n=9194)

B) Diagnosed depressed: meets the administrative definition for depression (n=394)

C) Depressed in survey: high probability of depression in NPHS (n=295)

D) Depressed by diagnosis and in survey: meets administrative definition *and* survey definition (n=114)

4.3.1. Age Distribution According to Definition of Depression

The four groups show a considerable variation by age with the survey picking up a larger number of people in the younger age groups and the administrative data reflecting an older age group. Using the administrative definition 44% of the depressed population are less than 50 years old contrasting to 79% when the survey definition is used. 25% of the people with a diagnosis of depression were over 70 years as opposed to 7 % of those depressed in the survey. The results are presented in Figure 1 and Table 4. Statistical analysis in presented in Table 5. An analysis of variance procedure showed a statistical difference between the groups. The results show that being depressed by any definition had a different age profile than the general public, that is, depression is not equally spread across all age groups. In addition the age profile of those diagnosed with depression is significantly different than those self-reporting depression in the survey. Note that for descriptive purposes Table 4 and Figure 1 was displayed in age groupings of 10 years. The statistical analysis was performed on larger groupings of 25 years in order to ensure adequate numbers in each cell for analysis.

Figure 1: Age Distribution by Category of Depression
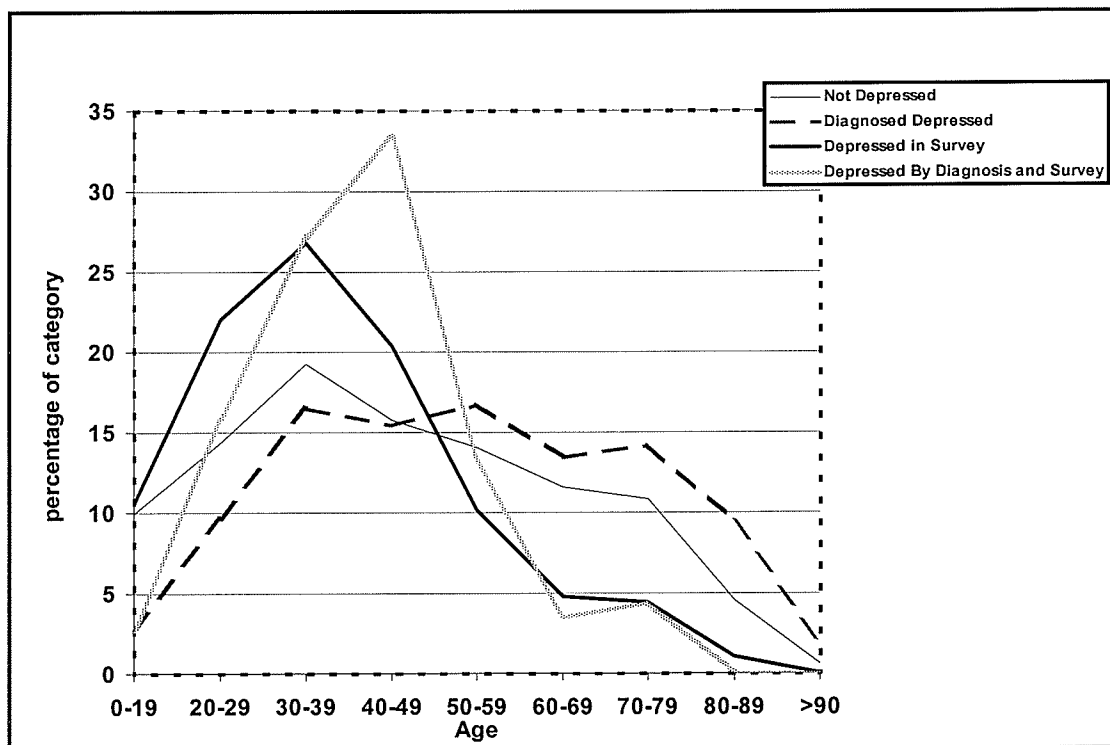
Table 4: Distribution by age according to category of depression
Results given as percentage of category

Age group	A:Not depressed (n=9141)	B:Diagnosed depressed (n=394)	C:Depressed in Survey (n=295)	D:Depressed by diagnosis and survey (n=114)	Total (n= 9944)
12-19	9.91	2.79	10.51	2.61	9.56
20-29	14.34	9.64	22.03	15.79	14.4
30-39	19.29	16.5	26.78	27.19	19.49
40-49	15.78	15.48	20.34	33.33	16.1
50-59	14.06	16.75	10.17	13.16	13.12
60-69	11.59	13.45	4.75	3.51	11.3
70-79	10.84	14.21	4.41	4.39	10.71
80-89	4.57	9.39	1.02	0	4.61
>90	0.62	1.78	0	0	1

Table5: Analysis of Variance between Categories of Depression by Age

Group Comparison		Difference between means	Simultaneous 95%CL	
B	-A	7.55	4.92	10.17***
B	-D	11.57	6.15	16.99***
B	-C	15.64	11.71	19.56***
A	-D	4.02	-0.78	8.82
A	-C	8.09	5.07	11.1***
D	-C	4.07	-1.5	9.69

***indicates comparisons significant at 0.05 level (3df)

4.3.2 Sex Distribution According to Category of Depression

Table 7 and Figure 2 show the results of the distribution by sex according to category of depression. A Chi Square analysis shows a highly significant difference (120.2, p< 0.001) between the depressed versus the non-depressed groups in terms of the sex distribution with considerably more females in each of the depressed groups. There was no significant difference in sex distribution between the depressed by survey definition (males = 30.51%, females= 69.49%) as compared to the administrative definition (males=28.93%, females=71.07%). The group that met both definitions had a significantly higher number of females than all the other groups. Five times as many females as males belonged to this group (males=83.33, females=16.67%, p<0.05).

Figure 2: Sex Distribution as Percent of Category of Depression
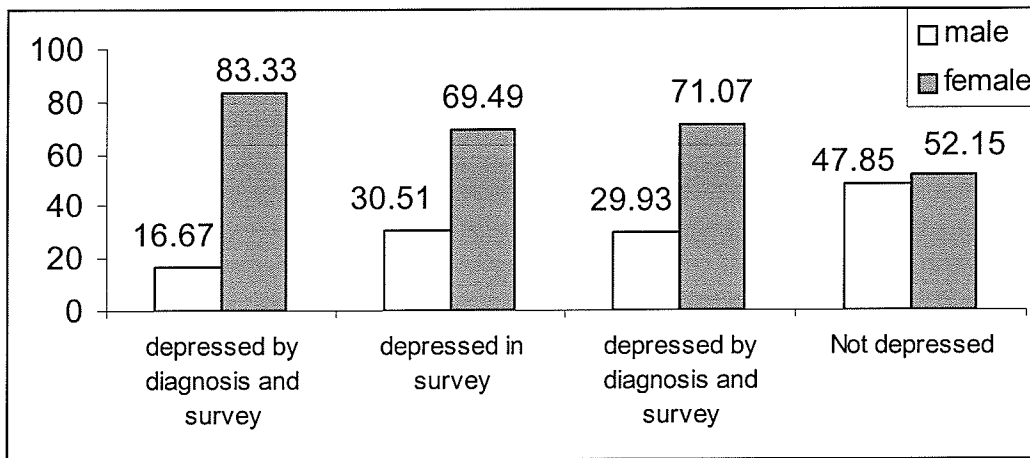
Table 6: Categories of Depression by Sex

	Not Depressed	Diagnosed Depressed	Depressed in Survey	Depressed in Survey and Diagnosis
Male	A	B	C	D
Number	4374	114	90	19
Percent of Category	47.85	28.93	30.51	16.67
Female				
Number	4767	280	205	95
Percent of Category				

4.4. Physician and Hospital Utilization by Category of Depression

The four groups were then explored in terms of physician and hospitalization. The time frame used for the administrative claims was the 12 months preceding the survey in order to concur with the survey time frame so the actual numbers vary slightly from those used in the prevalence and

agreement calculations. All rates are age and sex adjusted according to the Manitoba 1996 population. Crude rates are also presented in the tables. Confidence limits are also given with statistical significance indicated as appropriate. Rates are given for one-year and five-year utilization.

Depression Categories

A) Not depressed: no depression in claims or in survey data (n=9194)

B) Diagnosed depressed: meets the administrative definition for depression (n=394)

C) Depressed in survey: high probability of depression in NPHS (n=295)

D) Depressed by diagnosis and in survey: meets administrative definition *and* survey definition (n=114)

4.4.1 Ambulatory Visit Rate by Category of Depression

Figure 3: Ambulatory Visit Rate by Category of Depression
Age /Sex Adjusted Average Visit Rate per person for one and five years

Table 7: 1 Year Ambulatory Visits

Crude and Age Sex Adjusted Rates per person with Confidence Intervals.

Group	Population	Crude rate	Lower CI (99) crude rate	Upper CI (99) crude rate	Directly adjusted rate	Lower CI (99) Directly adjusted rate	Upper CI (99) Directly adjusted rate
Not Depressed	9141	4.32	4.19	4.44	4.79	4.62	4.97
Depressed by Diagnosis	394	10.30	9.35	11.40	10.39*	9.17	11.77
Depressed in Survey	295	6.73	5.57	8.15	6.77*	5.45	8.41
Depressed by Diagnosis and in Survey	114	12.14	10.19	14.47	13.18*	9.62	18.80

* denotes statistically significant difference to those "not depressed", $p < 0.001$

The one-year rates show that people with depression by either the administrative or the survey definitions had a statistically higher ambulatory visit rate than people with no depression. In addition, those who met the administrative definition had a statistically higher number of ambulatory visits than those who were depressed in the survey. Those people who met both definitions had the highest rate of visits, almost three times higher than those without depression.

Table 8: 5 Year Ambulatory Visits

Crude and Age Sex Adjusted Rates per person with Confidence Intervals.

Group	Population	Crude rate	Lower CI (99) crude rate	Upper CI (99) crude rate	Directly adjusted rate	Lower CI (99) Directly adjusted rate	Upper CI (99) Directly adjusted rate
Not Depressed	9141	23.00	22.46	23.55	24.81	24.12	25.51
Depressed by Diagnosis	394	39.30	35.77	43.19	37.37*	33.38	41.84
Depressed in Survey	295	31.84	26.94	37.64	33.63*	28.43	39.78
Depressed by Diagnosis and in Survey	114	48.90	40.52	59.01	57.69*	41.07	81.02

* denotes statistically significant difference to those "not depressed", p<0.001

The five-year ambulatory visit rates show that having a diagnosis of depression by any definition resulted in a statistically significant higher number of visits than people without depression. There was no significant difference in the visits between the population depressed by the administrative and survey definitions. The highest number of visits was in those people who met both definitions leading to more than twice the number of visits than the non-depressed population.

4.4.2 General Practitioner Visit Rates by Category of Depression

Figure 4: General Practitioner Visit Rate

Age /Sex Adjusted Average Visit Rate per person for one and five years

Table 9: 1 Year General Practitioner Visits

Crude and Age/ Sex Adjusted Rates per person with Confidence Intervals.

Group	Population	Crude rate	Lower CI (99) crude rate	Upper CI (99) crude rate	Directly adjusted rate	Lower CI (99) Directly adjusted rate	Upper CI (99) Directly adjusted rate
Not Depressed	9141	3.63	3.52	3.74	4.01	3.86	4.16
Depressed by Diagnosis	394	8.48	7.67	9.36	8.75*	7.58	10.09
Depressed in Survey	295	5.17	4.51	5.93	5.03	4.03	6.27
Depressed by Diagnosis and in Survey	114	9.64	7.96	11.68	10.59*	7.17	15.64

* denotes statistically significant difference to those "not depressed", p<0.001

The 1-year GP visit rates show those who met the administrative definition and those who met both definitions had a higher visit rate than those who were not depressed. There was no statistical difference in visit rates between people who were depressed by survey and those who were not depressed. The highest visit rate was for those who met both definitions and was 2 1/2 times the visit rate of those people not depressed.
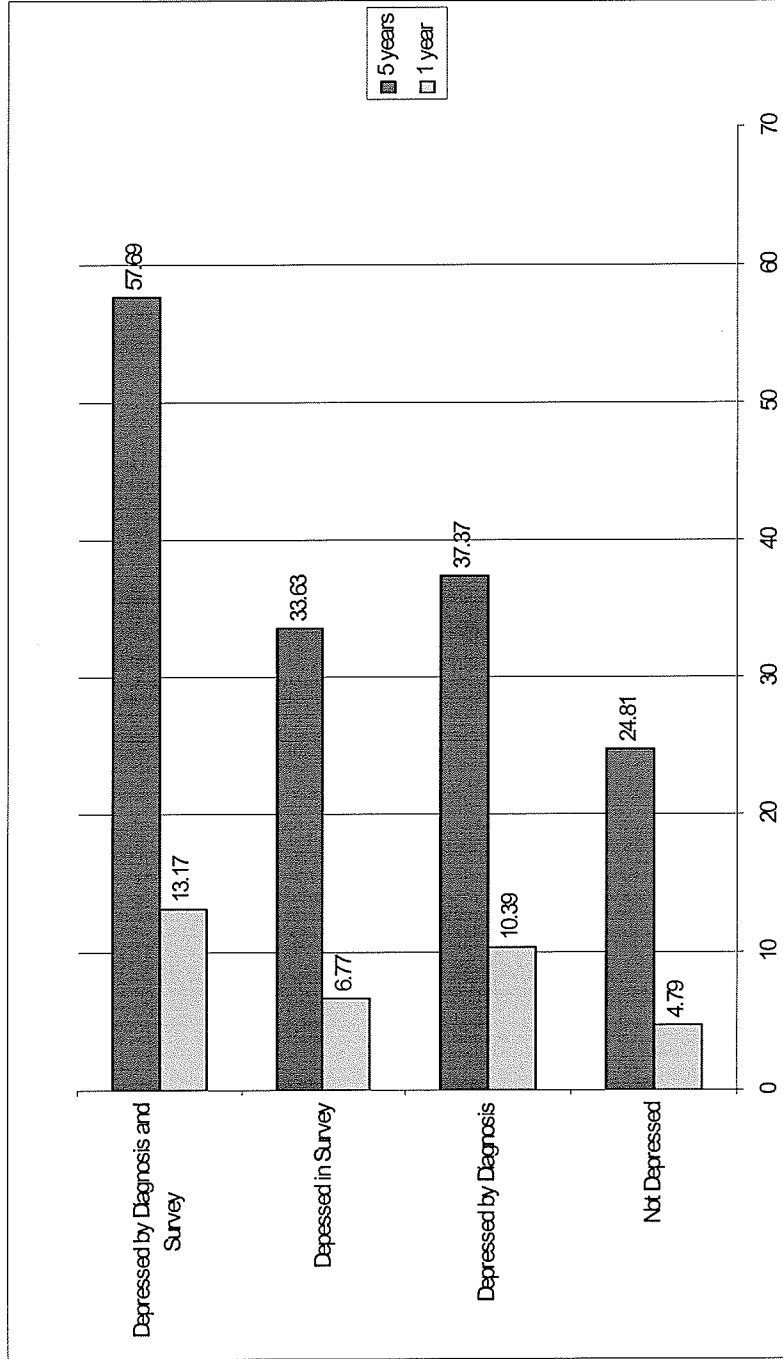
Table 10: 5 Year General Practitioner Visits

Crude and Age/ Sex Adjusted Rates per person with Confidence Intervals.

Group	Population	Crude rate	Lower CI (99) crude rate	Upper CI (99) crude rate	Directly adjusted rate	Lower CI (99) Directly adjusted rate	Upper CI (99) Directly adjusted rate
Not Depressed	9141	19.21	18.77	19.67	20.81	20.22	21.42
Depressed by Diagnosis	394	33.01	30.02	36.31	31.92*	28.37	35.91
Depressed in Survey	295	24.58	21.75	27.79	24.91	20.65	30.05
Depressed by Diagnosis and in Survey	114	36.70	30.24	44.55	45.13*	30.48	66.83

* denotes statistically significant difference to those "not depressed", p<0.001

The 5-year GP visit rates show those who met the administrative definition and those who met both definitions had a higher visit rate than those who were not depressed and those depressed in the survey. There was no statistical difference in visit rates between those who were depressed in the survey and those who were not depressed. The highest visit rate was for those who met both definitions and was over twice the visit rate of those people not depressed.

4.4.3 Specialist Visit Rates by Category of Depression

Age /Sex Adjusted Average Visit Rate per person for one and five years

Figure 5: Specialist Visit Rates

Table 11: 1 Year Specialist Visits

Crude and Age/ Sex Adjusted Rates per person with Confidence Intervals.

Group	Population	Crude rate	Lower CI (99) crude rate	Upper CI (99) crude rate	Directly adjusted rate	Lower CI (99) Directly adjusted rate	Upper CI (99) Directly adjusted rate
Not Depressed	9194	0.68	0.63	0.73	0.79	0.72	0.86
Depressed by Diagnosis	394	1.82	1.38	2.41	1.64*	1.23	2.20
Depressed in Survey	295	1.57	0.85	2.88	1.74*	1.01	2.99
Depressed by Diagnosis and in Survey	114	2.49	1.67	3.70	2.58*	1.69	3.94

* denotes statistically significant difference to those "not depressed", p<0.001

The 1-year specialist visit rates show that being depressed according any of the definitions used was associated with a significantly higher rate of visits than not being depressed. All definitions yielded a visit rate of at least twice as high as those not depressed. There was no statistically significant difference in specialist visit rates between those the three depressed categories.
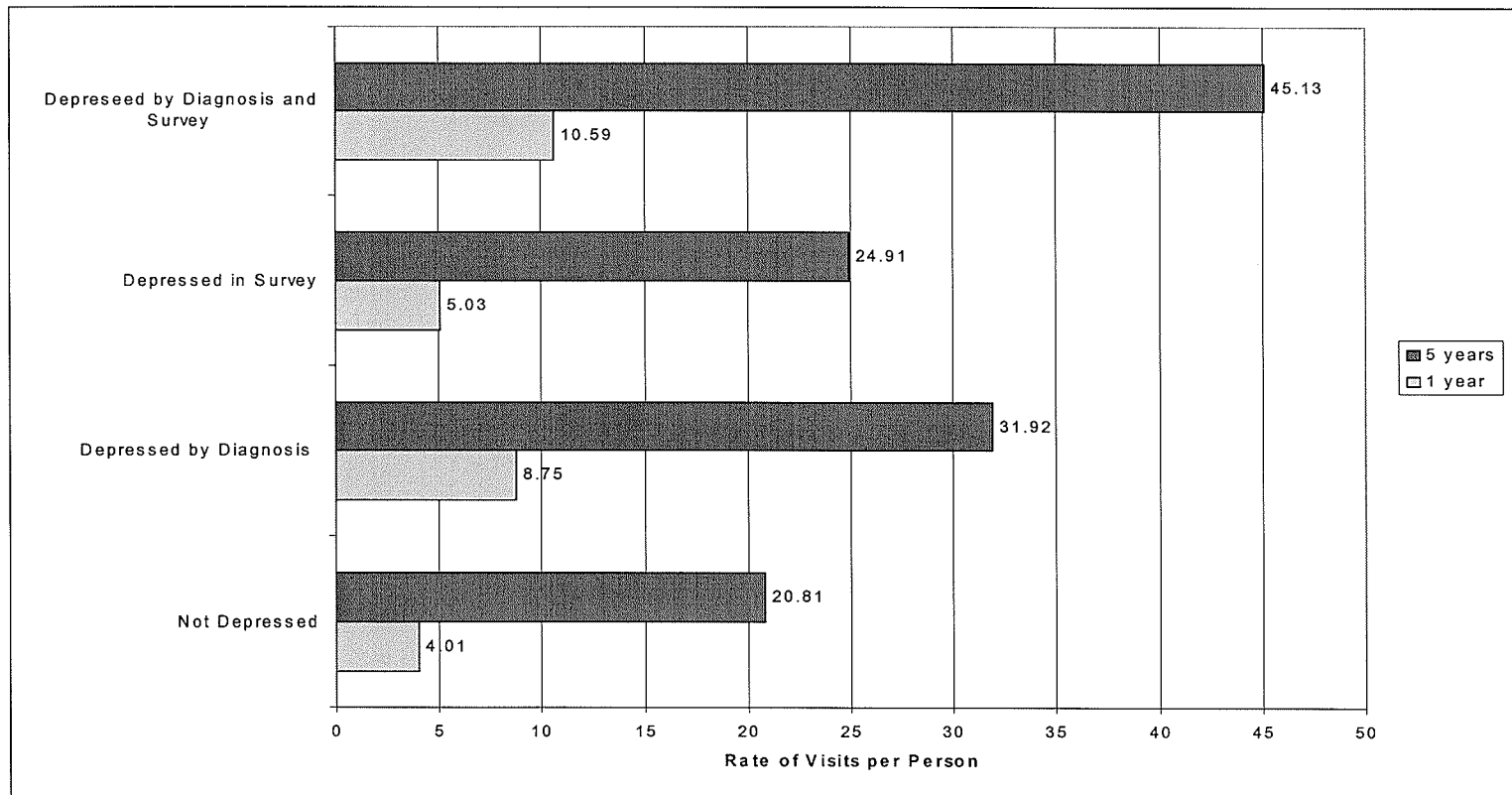
Table 12: 5 Year Specialist Visit

Crude and Age/ Sex Adjusted Rates per person with confidence intervals.

Group	Population	Crude rate	Lower CI (99) crude rate	Upper CI (99) crude rate	Directly adjusted rate	Lower CI (99) Directly adjusted rate	Upper CI (99) Directly adjusted rate
Not Depressed	9141	3.62	3.42	3.83	3.84	3.57	4.12
Depressed by Diagnosis	394	6.03	4.93	7.37	5.26*	4.17	6.64
Depressed in Survey	295	7.20	4.26	12.16	8.57*	5.31	13.82
Depressed by Diagnosis and in Survey	114	12.03	8.00	18.11	12.25*	7.40	20.28

* denotes statistically significant difference to those "not depressed", p<0.001

The 5 year specialist visit rates show that being depressed according any of the definitions used was associated with a significantly higher rate of visits than not being depressed. Those depressed according to the survey had a higher visit rate than those diagnosed depressed but this was not statistically significant. Meeting both definitions resulted in the highest visit rate and was significantly higher than the rate for those who met the administrative definition alone.

4.4.4 Consult Visit Rates by Category of Depression

Figure 6: Consult Visit Rates
Age /Sex Adjusted Average Visit Rate per person for one and five years

Table 13: 1 Year Consult Visits

Crude and Age/ Sex Adjusted Rates per person with Confidence Intervals.

Group	Population	Crude rate	Lower CI (99) crude rate	Upper CI (99) crude rate	Directly adjusted rate	Lower CI (99) Directly adjusted rate	Upper CI (99) Directly adjusted rate
Not Depressed	9141	0.23	0.21	0.24	0.24	0.22	0.26
Depressed by Diagnosis	394	0.46	0.37	0.58	0.45*	0.33	0.60
Depressed in Survey	295	0.41	0.29	0.56	0.42	0.25	0.68
Depressed by Diagnosis and in Survey	114	0.68	0.50	0.95	0.78*	0.61	1.00

* denotes statistically significant difference to those "not depressed", p<0.001

The 1 year consult rates show that being diagnosed with depression alone and/or meeting both administrative and survey definitions was associated with a higher number of consult visit rates than those not depressed with the combined category yielding three time a higher rate. Meeting the survey definition alone resulted in a higher number of visits but this was not statistically significant. There was no difference between the administrative and survey definitions in terms of visit rates.
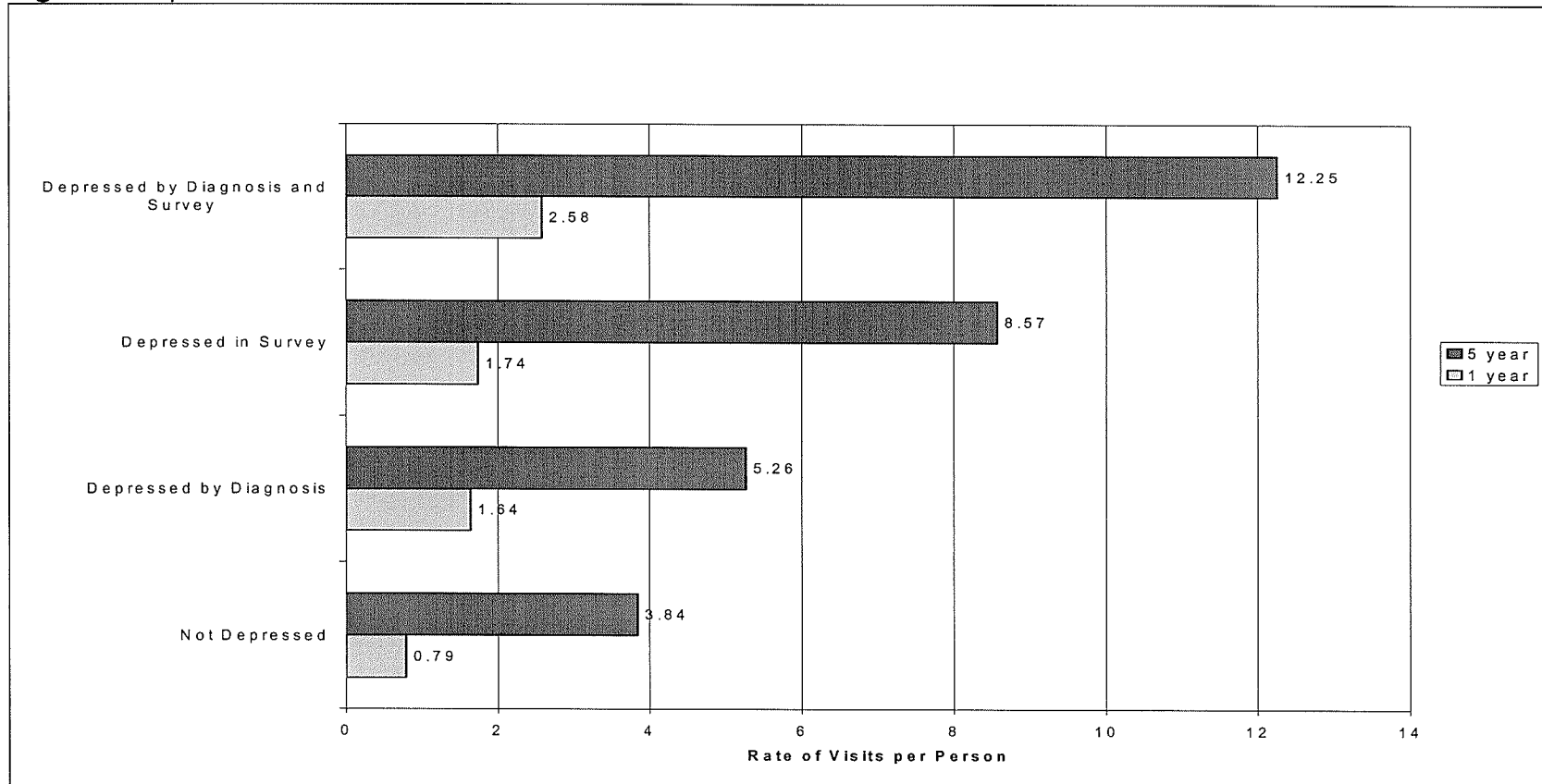
Table 14: 5 Year Consult Visits

Crude and Age/ Sex Adjusted Rates per person with confidence intervals.

Group	Population	Crude rate	Lower CI (99) crude rate	Upper CI (99) crude rate	Directly adjusted rate	Lower CI (99) Directly adjusted rate	Upper CI (99) Directly adjusted rate
Not Depressed	9141	1.32	1.27	1.37	1.33	1.27	1.39
Depressed by Diagnosis	394	2.16	1.88	2.48	1.92*	1.63	2.26
Depressed in Survey	295	1.87	1.53	2.28	2.05*	1.57	2.69
Depressed by Diagnosis and in Survey	114	2.86	2.32	3.57	4.13*	3.47	4.91

* denotes statistically significant difference to those "not depressed", $p<0.001$

The 5 year consult rates show a significantly higher visit rate for all categories of depression than no depression. There was no difference in rates between the administrative and survey categories but the combined definition was significantly higher than either definition alone.

4.4.5 Hospital Utilization by Category of Depression

Figure 7: Total number of hospital separations

Age /Sex Adjusted Average Separation Rate per person for one and five years
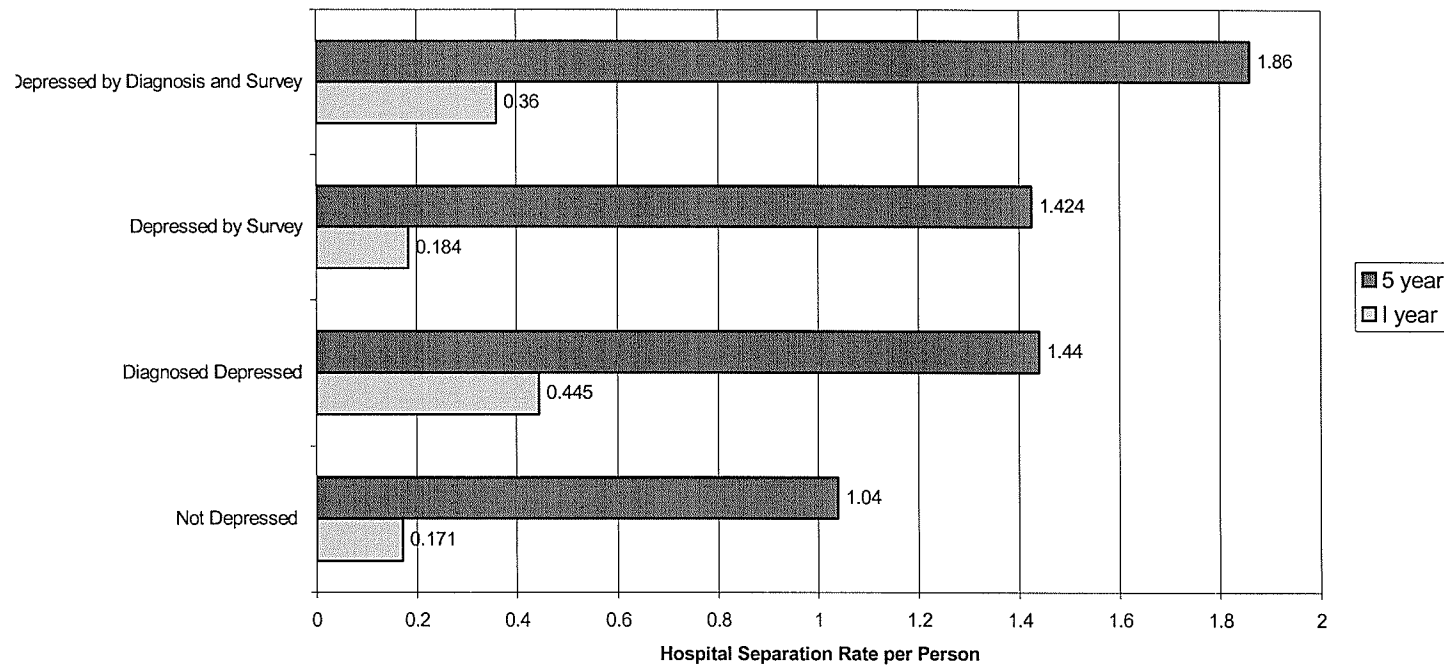
Table 15: 1 Year Hospitalization Separation Rates

Crude and Age/ Sex Adjusted Rates per person with Confidence Intervals.

Group	Population	Crude rate	Lower CI (99) crude rate	Upper CI (99) crude rate	Directly adjusted rate	Lower CI (99) Directly adjusted rate	Upper CI (99) Directly adjusted rate
Not Depressed	9194	0.13	0.12	0.15	0.17	0.15	0.19
Depressed by Diagnosis	394	0.38	0.28	0.50	0.44*	0.32	0.63
Depressed in Survey	295	0.19	0.12	0.29	0.18	0.06	0.39
Depressed by Diagnosis and in Survey	114	0.40	0.25	0.66	0.36	0.16	0.78

* denotes statistically significant difference to those "not depressed", p<0.001

The 1 year hospitalization separation rate was significantly greater for those with a diagnosis of depression but not for the other two categories of depression.

Table 16: 5 Year Hospitalization Separations
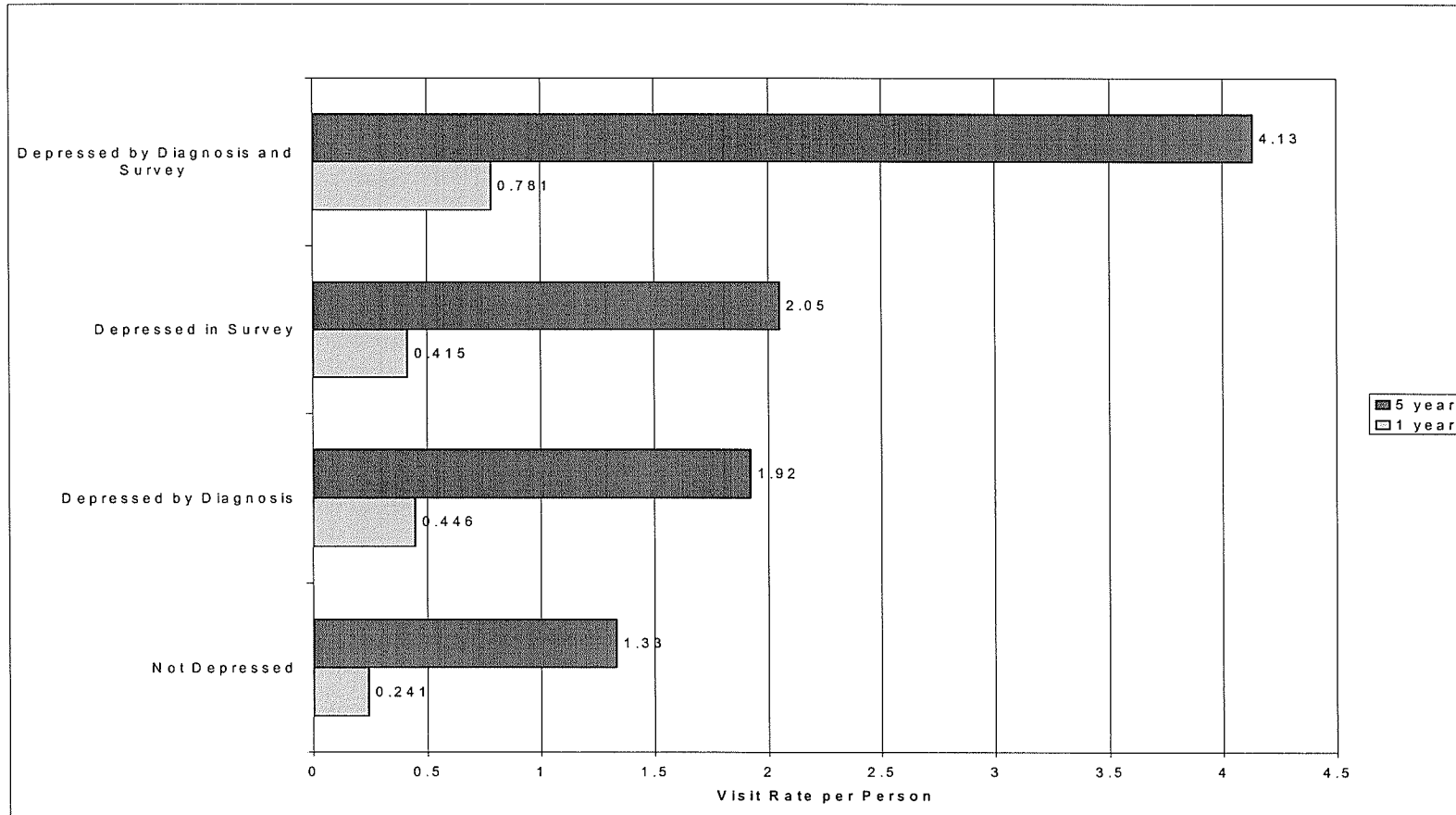
Crude and Age/ Sex Adjusted Rates per person with Confidence Intervals.

Group	Population	Crude rate	Lower CI (99) crude rate	Upper CI (99) crude rate	Directly adjusted rate	Lower CI (99) Directly adjusted rate	Upper CI (99) Directly adjusted rate
Not Depressed	9194	0.77	0.72	0.81	1.05	0.98	1.12
Depressed by Diagnosis	394	0.13	0.10	0.16	1.44	1.07	1.93
Depressed in Survey	295	0.79	0.59	0.11	1.42	0.88	2.31
Depressed by Diagnosis and in Survey	114	0.89	0.63	0.13	1.87*	1.30	2.69

* denotes statistically significant difference to those "not depressed", p<0.001

The 5 year hospitalization separation rate for persons with both definitions of depression appeared to be higher than for those not depressed but was not statistically significant. Meeting both definitions resulted in a significantly higher hospital separation rate with more than one and a half times the rate of those not depressed.

CHAPTER FIVE: DISCUSSION

The majority of large population based prevalence estimates of depression have been based on survey data. Surveys have a lot of advantages not least of which is that they can be carefully designed for the target population thus improving the quality of information obtained. They do also have some limitations because they can be costly and labour intensive and differing methodologies can make comparison difficult between different surveys[53, 54].

Administrative databases likewise have advantages and disadvantages. They are increasingly being used because of their efficiency and comprehensiveness but the quality and accessibility of data can vary. There have been reliability and validity studies with regard to the use of these large databases for epidemiological purposes[55, 56].

With respect to depression, one Canadian study in Alberta looked at the prevalence of mental disorders in the pediatric population based on physician billing data and found that the estimates of depression prevalence were lower than those obtained by survey of similar populations[57]. Some recent studies have used linked data from surveys and administrative databases to take advantage of their respective strengths. In Manitoba, such linkages have been analyzed to estimate the burden of chronic diseases, such as hypertension, diabetes mellitus and atherosclerotic related conditions[58, 59].

In the U.S. there has been increasing use of administrative data based information generated through Medicare and the Health Maintenance Organizations (HMO's) combined with diagnostic interviews for depression particularly in geriatric populations[60, 61]. In Manitoba to date there has been no information from such linkage in order to validate depression prevalence.

From our results we can see that the prevalence obtained from the survey is lower than that from our administrative definitions. As noted in the introduction, prevalence of depression determined previously by other researchers have varied widely. It is difficult to compare these results due to differences in methodologies and populations involved. In the present study we have the opportunity to compare the same population using different methodologies. This provides us with the opportunity to compare prevalence and also to validate the tools used.

Despite the similarities in overall prevalence, further analysis has shown significant differences between the two sets of results. Using the administrative definition 44% of the depressed population are less than 50 years old contrasting to 79% when the survey definition is used. 25% of people with a diagnosis of depression were over 70 years as opposed to 7% of those depressed in the survey.

Could this be due to the sensitivity of the CIDI-SF as a diagnostic tool in the older population, or a difference in diagnostic patterns? Perhaps the older population accepts symptoms related to depression as normal or else as a result of other physical problems which would be more common than in

younger age groups. For example tiredness, sleeping difficulties and lack of concentration may be attributed to the aging process rather than a mental health condition. The results could indicate physicians diagnose depression differently among age groups.

Most of the large population based surveys in Canada and US have shown significantly higher prevalence rates in the younger age groups[14]. Several studies have shown that studies targeted at the older population will yield a higher prevalence[60, 62, 63]. Our results would support those findings. The fact that the survey definition yielded a lower prevalence would seem to negate some of the concerns expressed in the limitations section that the survey tool used tends to *overestimate* depression.

Our findings also supported the literature in finding a significant difference among males and females in terms of depression with depression of any category being more common in women. Using either the administrative or survey definition, females were twice as likely to be depressed, however there was no significant difference between the two groups. One explanation could be that females are genuinely depressed more commonly than males and that the data simply reflects their contact with physicians. It could also mean that men do not attend or are not diagnosed with depression as frequently as women. This latter view is supported by the finding that those people who met both definitions were five times more likely to be female. This would seem to indicate that women are more likely to seek help if they feel depressed. The similarity in the results

between men and women in the survey and administrative data would appear to validate the survey as a tool for picking up both male and female depressed respondents.

The results leave no doubt that people with depression visit physicians more often than those without depression irrespective of the definition used, and that this usage is sustained over time, up to at least the five years included in this study.

The ambulatory physician visit rate includes almost all contacts with physicians apart from inpatient care and, despite some of the data limitations described earlier, is a good measure of access to and usage of physicians. Depressed people are more likely to access and use the services of physicians than those not depressed even if they do not receive a formal diagnosis of depression. However, those who have a diagnosis of depression had a statistically higher ambulatory visit rate than those diagnosed in the survey in the 1 year prior to the survey.

This in a way is not surprising because by virtue of having a diagnosis they would be captured in the data. What is interesting is that over the subsequent five years the difference became insignificant. This would appear to validate the survey tool as a method of measuring depression prevalence.

Another point of interest is the finding that meeting both definitions resulted in almost three times the usage rate than those without depression. Why this should be is unclear. Does this represent an "extremely depressed" group? Does this population need and access more care perhaps because of

the high association with comorbid illness as discussed in the literature review? While, these may be factors in the explanation, however, the implication is clear, that the depressed population is not a homogenous group.

Specialist Visit Rates and Physician Consult rates are subsets of the Ambulatory Visit rate. The difference is that the Consult rate measures the first visit only whereas the Specialist visits include follow up visits. As some people may visit a specialist for ongoing care, the Consult rate is thought to be a better indication of access to specialist care. In both of these categories the findings were similar to those described above.

Over five years all categories of depression led to a higher usage of services with no statistical difference between the administrative and survey definitions; and the highest use was by those people who met both definitions. These results indicate that access to specialist care is available and utilized by depressed people even if they have not had a formal diagnosis of depression.

This is in contrast to the general practitioner visit rate which measures ambulatory services provided by general/family practitioners. In this category those who had a diagnosis of depression had a higher number of visits than those not depressed over both the one year and five year period. Those who met both definitions had the highest rates, as before. People who met the survey definition had no significantly higher visit rate than those not

depressed for either the 1 or 5 years. It appears therefore that despite feeling the symptoms of depression, many are not going to see their family doctor.

Perhaps this group is more likely to bypass primary care and self refer directly to a specialist? Zung found in his large study of primary care patients that only 1.2% (out of 20.9% meeting depression criteria) cited depressive symptoms as a reason for their physician visit[8]. As mentioned in the literature review, physical problems e.g. back pain and migraine are common in depressed people[30].

A back specialist would, not unreasonably, focus on a back problem and symptoms of depression may go unnoticed. The fact that the self-diagnosed depressed population has a high number of consult visits reflects their complex needs. They are being referred on- but not it would appear back to their family doctor nor probably to a psychiatrist where they may be more likely to receive a diagnosis of depression and appropriate treatment. This alone is a strong argument for having family doctors as "gate keepers" to specialist care, apart from the obvious benefits for resource allocation.

Looking at the hospital usage to compare our definitions gave less clear results than for ambulatory visits. There did appear to be a trend overall of greater usage than for those not depressed, but the low numbers in the categories and the low number of separations gave rise to wide confidence intervals and the differences did not reach statistical significance. The "depressed by diagnosis" category however, had a higher separation rate in the year preceding the survey than those not depressed. The high separation

rate was maintained over the five years post survey. Those who met both definitions had a significantly higher hospital separation rate than those not depressed with more than one and a half times the rate of those not depressed.

CHAPTER SIX: CONCLUSION

In Manitoba, we have a wealth of data in the area of health care. Sometimes this information comes from different sources. Looking at one data set can sometimes fail to give a good description of the whole picture. Accessing and linking multiple data sources allows valuable insight into health care needs and usage with regard to specific health conditions.

This study looked specifically at the prevalence of depression using different definitions. It was found that no matter what definition was used, depression is a major problem in our society. Different definitions also captured different populations of depressed people, raising the concern that the true prevalence of depression is possibly much greater than previously identified. A significant number of individuals who self-reported depression did not have a formal diagnosis, which may represent an unmet need. Depression is a disease associated with significant morbidity and mortality placing a huge burden on individuals with the disease and their families. This disease also has a major economic impact both in terms of lost earnings and health care spending. Our results provided evidence that depressed people visit physicians far more than people who are not depressed and this was the case no matter what definition of depression was used. The visit patterns did vary depending on the definition used, with the people who did not have a diagnosis of depression by a physician being less likely to have visited their family physician. In addition to having a higher ambulatory visit rate, those

people who had a formal diagnosis had a higher number of hospital separations over both the one and five year periods than people without depression. We have seen that depression is often undertreated. Perhaps adequate treatment will eliminate some of these hospital stays, thus reducing the emotional and financial burden to the patient and allowing for reallocation of resources to primary care and preventative practices.

An interesting group emerged in our findings- those who met both the survey and administrative definitions. This group was by far the highest users of physicians of all categories and also had the highest number of hospital separations. Why this should be is unclear. Perhaps this category represents the depressed population with the greatest morbidity in terms of both their depression and comorbid physical and/or mental conditions. Or perhaps they are not responding well to their current treatment method and continuing to have symptoms for which they are seeking help. What ever the explanation, this may be an important group to target in planning care.

There are a number of recommendations arising as a result of this study. One, is with regard to the need for improving the accuracy of recording reasons for physician visits. Some of the problems associated with the present methods have been outlined. The quality of the administrative data available is highly dependant on this factor and therefore efforts should be made to optimize the input. A second recommendation is to increase the awareness of health planners and policy makers as to the impact of depression on health systems, with a view to enhancing programs. A third

recommendation would be to continue to explore the linkages and connections between administrative data and survey data such as is described in this study. If more is understood about the epidemiology and patterns of disease, more perhaps can be done to target interventions. This is important because depression is a complex problem and increasing our understanding of it can help us plan appropriate care and provide the necessary supports for this common, debilitating and sometimes fatal condition. No study can provide all of the answers but each one helps us progress towards achieving a healthier community.

References

1. Martens, P., et al., *Patterns of Regional Mental Illness Disorder Diagnoses and Service Use in Manitoba: A Population-Based Study.* 2004, Manitoba Centre for Health Policy, University of Manitoba, Winnipeg, Manitoba.

2. Kessler R. C, et al., *Lifetime and 12-month prevalence of DSM-111-R psychiatric disorders in the United States: results from the national comorbidity study.* Arch Gen Psychiatry, 1994. **51**: p. 8-19.

3. Robins LN and Regier D A, *Psychiatric disorders in America: the epidemiologic catchment area study.* 1991, New York: Free Press.

4. Statistics Canada, *National Population Health Survey.* 1996, Statistics Canada: Ottawa,On.

5. Statistics Canada, *2000-2001 Canadian Community Health Survey: Cycle 1.1 : Data Dictionary for the Share File.* 2002, Statistics Canada: Ottawa,ON.

6. American Psychiatric Association, *Diagnostic and Statistical Manual of Mental Disorders.* 3rd Rev. ed. 1987, Washington, DC: American Psychiatric Association.

7. Spaner, D., R.C. Bland, and S.C. Newman, *Major Depressive Disorder.* Acta Psychiatr Scand, 1994((suppl) 396): p. 7-15.

8. Zung WW, Broadhead WE, and Roth ME, *Prevalence of depressive symptoms in primary care.* Journal of Family Practice, 1993. **37**(4): p. 337-44.

9. Beaudet, M.P. and B. Diverty, *Health Reports.* 1996, Statistics Canada. p. 11-24.

10. Statistics, C., *Canadian Community Health Survey: Mental health and well-being 2002.* 2003.

11. Stephens, T., C. Dulberg, and N. Joubert, *Mental health of the Canadian population: a comprehensive analysis.* Chronic Dis Can, 1999. **20**(3): p. 118-26.

12. Beaudet, M.P., *Depression.* Health Reports, 1996. **7**(4): p. 11-23.

13. Patten, S.B., *Incidence of major depression in Canada.* Cmaj, 2000. **163**(6): p. 714-5.

14. Bland, R.C., S.C. Newman, and Orn H. , *Epidemiology of psychiatric disorders in Edmonton.* Acta Psychiatr Scand, 1988. **77**(338 suppl): p. 1S-80S.

15. Offord, D.R., et al., *One Year Prevalence of Psychiatric Disorder in Ontarians 15 to 64 Years of Age.* Can J Psychiatry, 1996(41): p. 559-563.

16. Murphy JM, et al., *Stability of prevalence. Depression and anxiety disorders.* Arch Gen Psychiatry, 1984. **41**(10): p. 990-7.

17. Patten, S.B., *Major depression prevalence in Calgary.* Cnan J Psychiatry, 2000. **45**(10): p. 923-6.

18. Cleary, E., *Validation of Depression Definition*, in *Patterns of Regional Mental Illness Disorder Diagnosis and Service Use in Manitoba:A Population-Based Study*. 2004, Manitoba Centre For Health Policy,University of Manitoba: Winnipeg, Manitoba. p. Appendix 3.

19. Murray CJL, L.A., eds, *Summary: The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries and Risk Factors in 1990 and Projected to 2020*. 1996, Harvard School of Public Health on behalf of the World Health Organization and World Bank, Harvard University Press: Cambridge, Massachusetts.

20. Judd LL, P.M., Wells KB, Rappaport MH, *Socioeconomic burden of subsyndromal depressive symptoms and major depression in a sample of the general population*. Am J Psychiatry, 1996(153): p. 1411-7.

21. Harris, E.C. and B. Barraclough, *Excess mortality of mental disorder*. Br J Psychiatry, 1998. **173**: p. 11-53.

22. Philips RJ, *Physical disorder in 164 consecutivr admissions to a mental hospital: the incidence and significance*. BMJ, 1934. **2**: p. 363-366.

23. Schulz R, B.S., Ives DG, Martire LM, Ariyo AA, Kop WJ., *Association between depression and mortality in older adults:the Cardiovascular Health Study*. Arch Intern Med, 2000(160): p. 1761-1768.

24. Phelan M, S.L., Morrison S, *Physical health of people with severe mental illness*. BMJ, 2001(322): p. 443-444.

25. Osborne, D.P.J., *The Poor Physical Health of people with Mental Illness*. West J Med, 2001. **175**: p. 329-332.

26. Felker, B., et al., *The association between depressive symptoms and health status in patients with chronic pulmonary disease*. Gen Hosp Psychiatry, 2001. **23**(2): p. 56-61.

27. Arve, S., S. Lauri, and A. Lehtonen, *Clinical pathway of elderly persons with lowered mood in the health care services*. Scand J Caring Sci, 2000. **14**(3): p. 191-8.

28. Ford DE, M.L., Chang PP, et al, *Depression is a risk factor for coranary heart disease in men: the precursers study*. Arch Intern Med, 1998(158): p. 1422-1426.

29. Gagnon, L.M. and S.B. Patten, *Major depression and its association with long-term medical conditions*. Can J Psychiatry, 2002. **47**(2): p. 149-52.

30. Patten, S.B., *Long-term medical conditions and major depression in a Canadian population study at waves 1 and 2*. J Affect Disord, 2001. **63**(1-3): p. 35-41.

31. Judd, L.L., et al., *A prospective 12- year study of subsyndromal depressive symptoms in unipolar major depressive disorders*. Arch Gen Psychiatry, 1998. **55**(694-700).

32. Kilow LG, Andrews Gavin, and Neilson MD, *The long-term outcome of depression*. Br J Psychiatry, 1988. **153**: p. 752-7.

33. Canadian Mental Health Association, *Depression: An overview of the literature*. 1995, Canadian Mental Health Association: Ottawa.

34. Canadian Psychiatric Association, *Canadian clinical practice guidelines for the treatment of depressive disorders.* Canadian Journal of Psychiatry, 2001. **46**(Supp 1).

35. Manderscheid RW, R.D., Narrow WE et al, *Congruence of service utilization estimates fom the Epidemiologic Catchment Area project and other sources.* Arch Gen Psychiatry, 1993(50): p. 108-114.

36. Narrow WE, R.D., Rae DS et al, *Use of services by persons with mental and addictive disorders:findings from the National Institute of Mental Health Epidemioloic Catchment Area Program.* Arch Gen Psychiatry, 1993(50): p. 95-107.

37. Goldney RD, F.L., Wilson DH, Cheok F, *Major depression and its associated morbidity and quality of life in a random, representative Australian community sample.* Aust NZJ Psychiatry, 2000. **34**(6): p. 1022-9.

38. Bula, C.J., et al., *Depressive symptoms as a predictor of 6-month outcomes and services utilization in elderly medical inpatients.* Arch Intern Med, 2001. **161**(21): p. 2609-15.

39. Patten, S.B., B. Sedmak, and M.L. Russell, *Major depression: prevalence, treatment utilization and age in Canada.* Can J Clin Pharmacol, 2001. **8**(3): p. 133-8.

40. Redelmeier, D.A., S.H. Tan, and G.L. Booth, *The treatment of unrelated disorders in patients in patients with chronic medical diseases.* New England Journal Of Medicine, 1998(338): p. 1516-1520.

41. Felker, B., J.J. Yazel, and D. Short, *Mortality and medical comorbidity among psychiatric patients: a review.* Psychiatr Serv, 1996. **47**(12): p. 1356-63.

42. Tataryn, D.J., C. Mustard, and S. Derksen, *The utilization of medical services for mental health disorders Manitoba : 1991-1992.* Manitoba Centre for Health Policy and Evaluation ; July [94-07] 1994. 1994, Winnipeg: Manitoba Centre for Health Policy and Evaluation Dept. of Community Health Sciences Faculty of Medicine University of Manitoba. xi, 109, [45].

43. Metge, C.J., *Analysis of patterns of pharmaceutical use in Manitoba, 1996 : key findings : a POPULIS project.* 1999, [Winnipeg, Man.]: Manitoba Centre for Health Policy and Evaulation. x, 94.

44. Kessler, R.C., et al., *The World Health Organization Composite Diagnostic Interview Short-Form (CIDI-SF).* Int J Methods Psychiatric Res, 1998(7): p. 171-85.

45. Wittchen, H.U., *Reliability and validity studies of the WHO--Composite International Diagnostic Interview (CIDI): a critical review.* J Psychiatr Res, 1994. **28**(1): p. 57-84.

46. Slade Tim and Andrews Gavin *Empirical Impact of DSM-IV Diagnostic Criterion for clinial Significance.* Journal of Mental and Nervous Diseases, 2002. **190**(5): p. 334-337.

47.   Patten, S.B., *Performance of the Composite International Diagnostic Interview Short Form for major depression in community and clinical samples.* Chronic Dis Can, 1997. **18**(3): p. 109-12.

48.   Patten, S.B., et al., *Performance of the composite international diagnostic interview short form for major depression in a community sample.* Chronic Dis Can, 2000. **21**(2): p. 68-72.

49.   Offord DR, B.M., Campbell D, Goering P, Lin E, Wong,M, Racine YA, *One Year Prevalence of Psychiatric Disorder in Ontarians 15 to 64 Years of Age.* Can J Psychiatry, 1996. **41**: p. 559-563.

50.   Roos LL, N.J., Cagegorge SM, *Using administrative data for longitudinal research:comparisons with primary data collection.* Journal of Chronic Disease, 1987(40): p. 41-49.

51.   Roos LL, R.N., Cagegorge SM, Nicol JP, *How good are the data? Reliability of one health care data bank.* Medical Care, 1982(20): p. 266-276.

52.   Kozyrskyj, A., *Validation of a new prescription database in Manitoba:An opportunity to ealuate pharmacist participation in drug utilization review.*, in *Department of Community Health Sciences.* 1996, University of Manitoba: Winnipeg.

53.   Deyo, R.A., et al., *Analysis of Automated Administrative and Survey Databases to Study Patterns and Outcomes of Care.* Spine, 1994. **19**(185): p. 2083S-2091S.

54.   Regier Darrel A., et al., *Limitations of Diagnostic Criteria and Assessment Instruments for Mental Disorders.* Arch Gen Psychiatry, 1998. **55**: p. 109-115.

55.   Roos, L.L., et al., *How good are the data? Reliability of one health care data bank.* Medical Care, 1982(20): p. 266-276.

56.   Roos Leslie L. , et al., *Registries and administrative data: Organisation and accuracy.* Medical Care, 1993. **31**: p. 201.

57.   Spady Donald W., et al., *Prevalence of Mental Disorders in Children Living in Alberta, Canadan as Determined from Physician Billing Data.* Arch Pediatr Adolesc Med., 2001. **155**: p. 1153-1159.

58.   Robinson Renee J, et al., *estimating the burden of Disease: comparing administrative data and self-reports.* Medical Care, 1997. **35**: p. 932-947.

59.   Muhajarine Nazeem, et al., *Comparison of Survey and Physician Claims Data for Detecting Hypertension.* Journal of Clinical Epidemiology, 1997. **50**(6): p. 711-718.

60.   Williams SJ., et al., *Identifying depressive symptoms among elderly Medicare HMO enrollees.* HMO Practice, 1995. **9**(4): p. 168-73.

61.   Fischer, L.R., et al., *Geriatric depression, antidepressant treatment, and healthcare utilization in a health maintenance organization.* Journal of the American Geriatric Society, 2002. **50**(2): p. 307-12.

62.   van Marwijk H, et al., *Prevalence of depressive symptoms and depressive disorder in primarey care patients over 65 years of age.* Family Practice, 1994. **11**(1): p. 80-4.

63.   Mulsant BH and Ganguli M, *Epidemiology and diagnosis of depression in late life.* Journal of Clinical Psychiatry, 1999. **60**(Suppl 20): p. 9-15.

Appendix I:

VALIDATION OF DEPRESSION

DEFINITION

(DR. EILISH CLEARY, WITH THE ASSISTANCE OF CHARLES BURCHILL, JENNIFER MAGOON AND DR. PATRICIA MARTENS)

It is not easy to accurately measure the true prevalence of depression, largely due to the considerable variation in clinical presentations, but also because of inconsistencies between screening and diagnostic tools as well as in coding methods. In order to validate the prevalence data in Manitoba, we compared the survey data available from the 1996/97 National Population Health Survey (NPHS) with the provincial administrative database data.

Coding of Disease

Administrative Data: Disease coding in the administrative data is generated at a three-digit level for physician visits. For hospital visits there are additional sub-classifications, which allow a more precise reflection of diagnoses.

As a result of the broad categories created by coding at a three-digit level, and also because of the discordance between the ICD-9-CM system used in Manitoba for claims and the DSM-IV system actually used by most providers in case management, it was necessary to develop a working definition of depression for retrieving information from the database. The administrative definition used for the analysis therefore includes the following people:
1) Those who have a single diagnosis of ICD-9-CM codes of 296, 309, 311, 300.4 (in hospital), 2) Those with a diagnosis of 300 and with a code

for anti-depressant use within 12-month period. Individuals on paroxetine

and citalopram were excluded as these are frequently prescribed for anxiety.

Those with only an antidepressant drug code but no recorded diagnostic

code were likewise excluded. Data were examined for 1 and 5 year periods.

The one-year period was the fiscal year 1996/7. Two five year periods were

examined—a five year period centered around the 1996/97 NPHS survey

time frame, plus a five-year period following the survey. Those under age 12

were excluded.

Survey data: Using the data from the 1996/97 NPHS it is possible to classify

respondents as to their risk of major depression in the preceding 12 months.

The instrument used to determine risk was the Composite International

Diagnostic Interview Short Form, an abbreviated questionnaire derived from

the Composite International Diagnostic Interview (CIDI) which was developed

by Kessler and Mroczek. A subset of questions cover a cluster of symptoms

for a depressive disorder as listed in the Diagnostic and Statistical Manual of

Mental Disorders (DSM111-R). Subjects are scored on a scale according to

their responses. The scale was a probability estimate; that is, if

the score was 0.9 then that subject was considered to have a 90% probability

of having a major depressive episode (MDE) in the preceding 12 months.

Based on the scores three groups were identified: no risk: 0; possible risk:

0.01 to 0.89 and probable risk: 0.90 or higher. While we used the Derived

Depression Score to define the depressed population from the NPHS, we

also looked at some other measures in the mental health section of the

NPHS that could have captured individuals with depressive symptoms. We included the six item Distress Scale which rates symptoms that could be related to both anxiety and depression. High distress was defined as a score of five or greater. The Chronic Stress Scale is a 15- item scale which assesses a variety of potential stresses including social, personal and financial aspects. The score is reported as being high (4-15) or low (0-3). In addition, we also looked at those respondents who had visited a health professional for reasons of mental health in the previous 12 months. The 1996 NPHS included persons age 12 and up.

Analysis

To determine the congruence between the administrative data and survey data, Kappa Coefficients were calculated. This calculation uses a term called the proportion of expected agreement that verifies if agreement exceeds chance levels. It does not assume either data source to be a more correct measure. We also calculated the positive predictive value, sensitivity and specificity and concordance using the administrative data as the gold standard.

Results

Appendix Table 3.1 shows the prevalence of depression as defined by our administrative definition in both the general population and in the NPHS subset. These have all been age-adjusted to create fair comparisons between the overall Manitoba population and the NPHS sub-sample. The one-year

prevalence of depression in the general population age 12 in 1996/97 was 5.74% (95% CI 5.69-7.85, n=57,357 out of a base population 998,462). In a five-year period (1997/98-2001/02) the prevalence of depression was 16.47% (95% CI 16.40-16.51, n=171,679 out of a base population of 1,042,320). The base population increased for the five-year period due to yearly fluctuation of the Manitoba population. When we looked at the NPHS sample population itself, but using the administrative claims data definition, we found that 5.84% (95% CI 5.38-6.30, n=581/9,944) had a diagnosis of depression over a one-year period (1996/97). This subset had a five-year prevalence of depression of 16.90% (95% CI 16.19-17.66, n=1,684/9,944) for the years 1997/98-2001/02. Therefore, the NPHS sample itself was not statistically different than the overall population of Manitoba. Using the survey-derived definition of "depressed", the NPHS prevalence is given in Appendix Table 3.1. The prevalence of depression from the survey tool is 4.80% (95% CI 4.00-5.65), which is not statistically different from the administratively-derived prevalence of 5.84% (5.38-6.30) for the same population (i.e., the NPHS subset 1 year value).

Appendix Table 3.1: Prevalence of depression as determined by administrative claims in the Manitoba population and in the 1996/97 NPHS subset

Source	No. Of Claims	Population	Per cent	Upper and lower (95%) CI
Manitoba population 1 year	57,357	998,462	5.74	5.69-5.785
Manitoba population 5 year	171,679	1,042,320	16.47	16.4-16.51
NPHS subset 1 year	581	9,944	5.84	5.38-6.30
NPHS subset 5 years	1,684	9,944	16.90	16.19-17.66
Depressed by Survey (crude)	408	9,944	4.10	3.71-4.489
Depressed by Survey (weighted)	409	9,944	4.80	3.998-5.65

Appendix Table 3.2 shows the results of the cross-tabulation of the linked survey and administrative data using the administrative definition and the depressive scale in the NPHS. Of the 409 (4.11%) respondents who were defined as "depressed" by the survey definition, and the 581 (5.84%) respondents who showed up in our administrative database as depressed, only 150 people showed up in both. This means that 431(4.33%) depressed individuals according to our administrative definition were not identified as being depressed in the survey. 259 (259%) people who were diagnosed by the survey as being depressed had not been diagnosed and treated for it in our health care system.

Appendix Table 3.2: Cross-tabulation of NPHS data and administrative data

	Not depressed administrative	Depressed administrative	Total
Probably not depressed (NPHS)	9,104 (91.55%)	431 (4.33%)	9,535 (95.89%)
Probably depressed (NPHS)	259 (2.6%)	150 (1.51%)	409 (4.11%)
Total	9,363 (94.16%)	581 (5.84%)	9,944 (100%)

Appendix Table 3.3 shows the distribution by age according to definition of depression. Using the administrative definition 44% of the depressed population are less than 50 years old contrasting to 79% when the survey definition is used. 25% of the people with a diagnosis of depression were over 70 years as opposed to 7 % of those depressed in the survey.

Appendix Table 3.3: Distribution by age according to category of depression

Age group	Not depressed	Diagnosed depressed	Depressed in survey	Depressed by diagnosis and survey
0-19	9.91	2.79	10.51	2.61
20-29	14.34	9.64	22.03	15.79
30-39	19.29	16.50	26.78	27.19
40-49	15.78	15.48	20.34	33.33
50-59	14.06	16.75	10.17	13.16
60-69	11.59	13.45	4.75	3.51
70-79	10.84	14.21	4.41	4.39
80-89	4.57	9.39	1.02	0
>90	0.62	1.78	0	0

Appendix Table 3.4 shows the agreement between the administrative definition of 1 year prevalence of depression (n=581, 5.84% in administrative claims data) and NPHS mental health scales for depression, high distress scores, chronic distress scores and persons who talked to a health professional in the Manitoba subset of the 1996/7 NPHS sample population.

Although not reported here, the various definitions using administrative claims data referred to earlier (i.e., differing five-year periods of time) had lower Kappa scores than are reported here, and were therefore considered less valid than those reported.

Appendix Table 3.4: Agreement between the administrative definition of I year prevalence of depression (n=581,5.84%) and NPHS mental health scales for depression, high distress scores and chronic distress scores in the Manitoba subset of the 1996/97 NPHS sample population								
NPHS scales	No.'s	Kappa	95% CI Kappa	Concordance %	Sensitivity	Specificity	Positive predictive value	Negative predictive value
High Probability of being depressed	409	0.26	0.23-0.30	93.06	0.37	0.95	25.82	97.23
High distress score	1,279	0.17	0.14-0.19	85.78	0.17	0.96	0.96	38.38
Chronic distress	447	0.06	0.03-0.09	90.81	0.12	0.94	9.81	95.83
Talked to a health professional in past 12 months about mental health	628	0.4	0.36-0.43	93.13	0.42	0.96	45.27	96.1

The results show a low level of agreement (Kappa = 0.26) between the two definitions of depression. There is low sensitivity and low positive predictive value (36%, 26% respectively) in using the survey definition to diagnose depression as compared to our administrative database. The definition is more specific and has a better negative predictive value (95%, 97% respectively) so if the survey identified a person as not being depressed, there was a high probability that the individual would not show up as depressed in our health system. As with the Depression scale we found low levels of agreement between a high distress score and a high level of chronic distress and the administrative definition for depression. There was also low sensitivity and poor positive predictive value for using these scales to identify depression. Of all of the measures looked at in the NPHS, the question "have you consulted a health professional for reasons of mental health in the past 12 months" had the best

level of agreement with the administrative definition for depression with a Kappa score of 0.39. The sensitivity and positive predictive value of this question as a measure of depression was low however.

Discussion

The majority of large population-based prevalence estimates of depression have been based on survey data. There is an increasing trend to link data from surveys and administrative databases in order to take advantage of their respective strengths. In Manitoba to date there has been no information from such linkage in order to validate depression prevalence. From our results we can see that the prevalence obtained from both the survey data and the administrative data are very similar to each other.

Despite the similarities in overall prevalence rates, there are significant differences between the two sets of results. In looking at the age profiles we can see that using the administrative definition 42.69% of depressed NPHS population is 50 years old or over as opposed to 20.53% of the same population using the depression scale in the survey. The other striking difference between the two sets of results is the fact that out of the 409 respondents depressed by the survey definition, and the 581 respondents who showed up in our administrative database as depressed, only 150 people showed up in both. This means that 431 depressed individuals according to our administrative definition were not identified as being depressed in the survey. Also 259 people who were diagnosed by the survey as being depressed had not been diagnosed and

treated for it in our health care system. There is therefore low sensitivity and low positive predictive value (36%, 26% respectively) in using the survey definition to diagnose depression as compared to our administrative database. The definition is more specific and has a better negative predictive value (95%, 97% respectively) so if the survey identified a person as not being depressed, there was a high probability that the individual would not show up as depressed in our health system.

It is not easy to fully explain the reason for these findings. Certainly there are some methodological difficulties in deriving an administrative definition, many of which are out lined in Chapter 2 of the report. Likewise there are problems inherent to any survey. When we consider that the administrative definition represents those people who have been seen and diagnosed by a physician with depression, and that the methodological difficulties would in general lead to an underestimation rather than an overestimation, our results could indicate that while the health care system is failing to pick up and adequately diagnose young people who self-report depression on the survey, that the survey is also failing to pick up some depressed people, particularly in the older age group. The implications are then that depression is even more common than has been reported by most of the major surveys, and that the health care system faces a large unmet need.

It is also clear that many people do not answer surveys accurately. This is made clear by the finding that out of the 581 respondents who were depressed according to our administrative definition, and therefore had been diagnosed by

a doctor as being depressed, only 263 of them answered that they had

consulted a health professional in the previous 12 months for reasons

of mental health. 318 people denied that they had. There may be many

reasons for this, including embarrassment and forgetfulness, or as has been

postulated that because they have been treated that they are no longer feeling

depressed. This latter point is not thought to be a major factor, however,

as the survey question referred to depressive symptoms in the previous 12

months and thus the time span allowed for symptoms was the same as that

for the administrative definition.

While the time frames used for the results presented here were not exactly

overlapping, the fiscal year being used for the administrative definition, we

subsequently did go back and compare the exact time frame periods and

obtained similar results. In addition the prevalence results for both the 1-

year and the 5-year time periods were remarkably stable. The results presented

for the five year period are those centered around the survey, however similar

results were obtained when we looked at the 5 years following the survey. This,

and the fact that at the population level, the prevalence results were so similar

using either definition seems to imply that either definition is probably valid

although both would tend to underestimate depression prevalence. However, it

is also evident that although a population prevalence estimate is relatively

similar no matter what the source—survey data or administrative claims data—

researchers must be cautious when attributing the diagnosis to an individual

person. In other words, studies which propose to study the individual effects of

depression may be problematic when the Kappa scores are so low. It is clear, however that there are many unanswered questions in this complex area and further probing is necessary to further our understanding so that we can then plan appropriate care and provide the necessary supports for this common, debilitating and sometimes fatal condition.

Appendix II:

Prevalence of Major Depression in Community Surveys

Study	N	Tool*	Age	12 month Prevalence
USA				
Epidemiological Catchment Area (Robins et al 1980s)	>20,000	DIS	18+	3.7%
National Comorbidity Survey (Kessler et al, 1990/91)	8098	CIDI	15-54	10.3%
Canada				
Edmonton (Bland et al,1990)	3258	DIS	18-65	4.6%
NPHS 1998/9 (Statistics Canada)	>24,000	CIDI	12+	4.3%
Ontario (Offord et al 1996).	9953	CIDI	15-64	4.1%
Calgary (Patten, 2000)	2542	CIDI	15-64	14.7%

* Most significant studies have determined their depression prevalence estimates from survey data. Many of the earlier studies used a tool called the Diagnostic Interview Schedule (DIS). More recently, the Composite International Diagnostic Interview (CIDI), of which there have modified versions developed. Both of these are structured interviews, administered by trained interviewers, and scored on predetermined scales to give probabilities of depression over different time periods.

Appendix III:

NPHS Measurement of Major Depressive Episode

The NPHS measures a major depressive episode (MDE) with a subset of questions from the Composite International Diagnostic Interview. These questions cover a cluster of symptoms for a depressive disorder, which are listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R). The question numbers refer to those used in the NPHS questionnaire. There are three possible paths through these questions: "yes" to 2, then 3 to 13; "no" to 2, "yes" to 16, then 17 to 26; and "no" to 2 and "no" to 16.

2.   During the past 12 months, was there ever a time when you felt sad, blue, or depressed for two weeks or more in a row?
(Yes - go to 3; No - go to 16)

16.   During the past 12 months, was there ever a time lasting two weeks or more when you lost interest in most things like hobbies, work, or activities that usually give you pleasure? (Yes - go to 17; No - end) 3. /17. For the next few questions, please think of the two-week period during the past 12 months when 3. these feelings were worst / 17. you had the most complete loss of interest in things. During that time how long did these feelings usually last? (All day long; Most of the day; About half of the day; Less than half the day)

4./18.   How often did you feel this way during those two weeks?

(Every day; Almost every day; Less often)

5.   During those two weeks did you lose interest in most things?

(Yes; No)

6./19.   Did you feel tired out or low on energy all of the time? (Yes; No)

7./20.   Did you gain weight, lose weight, or stay about the same?

(Gained weight; Lost weight; Stayed about the same; Was on a diet)

8./21.   About how much did you gain/lose?

9./22.   Did you have more trouble falling asleep than you usually do?

(Yes; No)

10./23.   How often did that happen?

(Every night; Nearly every night; Less often)

11./24.   Did you have a lot more trouble concentrating than usual? (Yes; No)

12./25.   At these times, people sometimes feel down on themselves, no good,

or worthless. Did you feel this way? (Yes; No)

13./26.   Did you think a lot about death— either your own, someone else's, or

death in general? (Yes; No)

A value of 1 was assigned to any "yes" answer to the "yes/no"
questions. For questions 8 and 21, a score of 1 was assigned if the change in
weight was at least 10 pounds (4.5 kilograms). For questions 10 and 23, a
score of 1 was given to respondents who reported having trouble falling asleep
every night or nearly every night. Those who replied "yes" to question 2, and
whose symptoms lasted all day or most of the day, and had occurred every day

or almost every day, had a maximum possible score of 8. For those who responded "yes" to question 16, and whose symptoms lasted all day or most of the day, and had occurred every day or almost every day, the maximum possible was 7. Respondents who replied "no" to questions 2 and 16 scored 0. Responses were scored, and the results were transformed into a probability estimate of a diagnosis of MDE. If the estimate was 0.9 or more, there is a 90% likelihood of a positive diagnosis of MDE. To obtain a probability of 0.9, respondents had to score 5 or more. Respondents with a score of 0.01 to 0.89 were considered to have a possible risk and those with a score of O were considered to be at no risk of having a major depressive episode in the previous 12 months. Non-response was caused primarily by refusals or by interviewers' inability to contact selected respondents or when individual questions were not answered. Non response was also coded from the use

Appendix IV

List of Generic Product Names
used for inclusion for definition of depression

Based on ATC N06A excluding Paroxetine, Venlafaxine, Citalopram
Mood stabilizers included based on ATC N05AN01, N03AF01, NO3AB02, N03AB52

AMITRIPTYLINE 10 TAB
AMITRIPTYLINE 25 TAB
AMITRIPTYLINE HCL
AMITRIPTYLINE HCL & PERPHENAZ*
AMITRIPTYLINE HCL 10ML
AMITRIPTYLINE HYDROCHLORIDE
AMITRIPTYLINE PAMOATE
AMOXAPINE
BUPROPION HCL
BUPROPION HYDROCHLORIDE
CARBAMAZEPINE
CARBAMAZEPINE 200MG TAB
CARBAMAZEPINE 5ML SUS
CARBAMAZEPINE CHEW TAB
CARBAMAZEPINE SRT 200MG TAB
CARBAMAZEPINE SRT 400MG TAB
CLOMIPRAMINE HCL
DESIPRAMINE
DESIPRAMINE HCL
DESIPRAMINE HCL.
DIPHENYLHYDANTOIN
DIPHENYLHYDANTOIN SODIUM
DIPHENYLHYDANTOIN SODIUM & PH*
DIPHENYLHYDANTOIN/PHENOBARB
DOXEPIN
DOXEPIN 50MG CAP
DOXEPIN 75MG CAP
DOXEPIN HCL
DOXEPIN HCL 100MG CAP
DOXEPIN HCL 10MG CAP
DOXEPIN HCL 150MG CAP
DOXEPIN HCL 25MG CAP
DOXEPIN HCL 50MG CAP
DOXEPIN HCL 75MG CAP
DOXEPIN HCL CRM 5%
FLUOXETINE
FLUOXETINE 10MG
FLUOXETINE 20MG
FLUOXETINE HCL
FLUOXETINE HCL 10MG CAP
FLUOXETINE HCL 20MG
FLUOXETINE HCL 20MG CAP
FLUVOXAMINE MALEATE
IMIPRAMINE HCL
IMIPRAMINE HCL 10MG TAB

IMIPRAMINE HCL 25MG TAB
IMIPRAMINE HCL 50MG TAB
IMIPRAMINE HCL 75MG TAB
L-TRYPTOPHAN
L-TRYTOPHAN
LITHIUM CARBONATE
LITHIUM CARBONATE 150MG
LITHIUM CARBONATE 300MG
LITHIUM CARBONATE 600MG
LITHIUM GLUCONICUM ((3DH-30CH*
LITHIUM ION ((LI AS LITHIUM C*
MAPROTILINE HCL
MAPROTILINE HCL 10MG TAB
MAPROTILINE HCL 25MG TAB
MAPROTILINE HCL 50MG TAB
MAPROTILINE HCL 75MG TAB
MOCLOBEMIDE
NEFAZODONE HYDROCHLORIDE
NEOMYCIN/GRAMIC/NYST/TRIAM
NORTRIPTYLINE
NORTRIPTYLINE HCL
PHENELZINE SULFATE
PHENELZINE SULFATE ((BASE EQ)*
PROTRIPTYLINE
PROTRIPTYLINE HYDROCHLORIDE
SERTRALINE
SERTRALINE ((AS HYDROCHLORIDE*
SERTRALINE HCL ((BASE EQ))
TRANYLCYPROMINE SULFATE
TRAZODONE HCL
TRAZODONE HCL 300MG TAB
TRIMIPRAMINE
TRIMIPRAMINE ((AS MALEATE))
TRIMIPRAMINE 34.86MG TAB
TRIMIPRAMINE MALEATE ((BASE E*
TRYPTOPHAN