

Assessing Gaps and Variations in Depression Care and the Impact of Physician Incentives

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of

Doctor of Philosophy

in

The Faculty of Graduate & Postdoctoral Studies
(Population & Public Health)

The University of British Columbia
(Vancouver)

August 2016

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Abstract

Depression is increasingly becoming the leading cause of disability worldwide. While effective treatments like psychological or antidepressant therapies are available, concerns remain about under treatment and disparities in care as these can adversely affect mental health outcomes. Through a series of studies, this thesis estimated the magnitude of the gap and variations in depression care and the impact physician incentives had on treatment gaps.

To perform all population-based analyses, this thesis used linked health administrative data from the Canadian province of British Columbia. An algorithm for identifying cohorts was developed to ensure that observation periods for detecting diagnosis and assessing use of mental health care were identical for all individuals. Administrative data were used to derive indicators that measure receipt of counseling/psychotherapy, receipt of antidepressants, adherence to antidepressant therapy, and physician continuity of care. Analytical approaches used in the study include calculating proportions to estimate treatment gaps, building generalized and mixed effects regression models to examine treatment variations and running interrupted time series analysis to investigate policy impacts.

Results of the analyses suggest that four out of ten individuals with depression did not receive any depression care from the formal health system. Among the treated, only one in two received minimally adequate care, mostly through antidepressants.

Minimally adequate treatment varied by sex, age, overall health status, place of residence, physician practice, and presence of specific comorbid physical conditions.

Study results also indicate that physician incentives affected depression care patterns, although the overall impact was modest. Specifically, the downward trend in counseling/psychotherapy and the upward trend in antidepressant therapy initiation were disrupted. Likewise, the percentage of individuals who received minimally adequate counseling/psychotherapy increased gradually over time while the percentage of those who received minimally adequate antidepressant therapy decreased. Some gains were also achieved in measures of physician continuity of care.

Overall, study results show that wide gaps in depression care persist despite recent efforts to improve mental health care. Expanding public coverage for psychological therapies and exploring reforms that require fundamental changes in mental health service delivery are needed to enhance treatment options and accessibility.

Preface

I hereby certify that this thesis was based on work that I, Joseph H. Puyat, conceptualized, researched, conducted and wrote.

All research activities outlined and described in this thesis were approved by the University of British Columbia's Behavioural Research Ethics Board, UBC BREB Number H11-02814.

Some sections of this thesis were completed in collaboration with members of my thesis committee: Dr. Arminee Kazanjian (AK), Dr. Elliot M. Goldner (EMG) and Dr. Hubert Wong (HW). This is reflected in the change in voice from the first person singular (Chapters 1 to 3 and 7) to the first person plural.

In all the research chapters (Chapters 4, 5 and 6), I am the lead researcher who identified the research questions; performed the literature review; designed the study; conducted all the data preparation, manipulation and analysis; interpreted the results; and, wrote and revised final versions of the manuscripts. My collaborators provided assistance in obtaining permission to access the data (AK), fine-tuning the study design (AK, HW, EMG), interpreting the results (AK, EMG, HW) and editing the subsequent manuscripts (AK, EMG, HW).

I am solely responsible for and the sole author of the other sections of this thesis (Chapters 1, 2, 3 and 7).

A version of Chapter 4 has been published:

Puyat JH, Kazanjian A, Goldner EM, Wong H. How Often Do Individuals with Major Depression Receive Minimally Adequate Treatment? A Population-Based, Data Linkage Study. *Can J Psychiatry*. 2016 Jul 1;61(7):394–404. Available at: <http://cpa.sagepub.com/content/61/7/394.full>

A version of Chapter 5 (Comorbid Physical Conditions and Depression Care) has been submitted for publication, peer-reviewed, and is currently under revision.

A version of Chapter 6 is in press:

Puyat JH, Kazanjian A, Wong H, Goldner EM. Is the Road to Mental Health Paved With Good Incentives? Estimating the Population Impact of Physician Incentives on Mental Health Care Using Linked Administrative Data. *Medical Care*.

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List of Abbreviations

ABM	Andersen Behavioural Model of Health Services
AD	Antidepressant Therapy
ADG	Aggregated Diagnostic Group
AOR	Adjusted Odds Ratio
ATC	Anatomical Therapeutic Chemical Classification System
BC	British Columbia
CHF	Congestive Heart Failure
CKD	Chronic Kidney Disease
COCI	Continuity of Care Index for All GP Visits
COCIMH	Continuity of Care Index for Mental Health-Related GP Visits
COPD	Chronic Obstructive Pulmonary Disease
CP	Counseling or Psychotherapy
CPC	Comorbid Physical Condition
CVD	Cerebrovascular Disease
FY	Fiscal Year
GP	General Practitioner
GPSC	General Practice Services Committee
ICD-9	International Classification of Diseases, Ninth Revision
ICD-10	International Classification of Diseases, Tenth Revision
IHD	Ischemic Heart Disease
ITSA	Interrupted Time Series Analysis
mADG	Minor ADG
MAAT	Minimally Adequate Antidepressant Therapy
MACP	Minimally Adequate Counseling/Psychotherapy
MDD	Major Depressive Disorder
MSP	Medical Service Plan
MHS	Mental Health Service
PDC	Proportion of Days Covered
SAS	Statistical Analysis System
SPO	Donabedian's Structure-Process-Outcome health service framework

Acknowledgments

I would like to thank the many people and agencies that helped create the conditions I needed to complete this dissertation.

First of all, I would like to express my deepest gratitude to my supervisor, Dr. Arminee Kazanjian, who has always regarded me as and made me feel like a colleague in training. She always finds the time for me to discuss my ideas and plans and did everything she can to help me implement them. Her wisdom, guidance, patience and unwavering belief that I can do this enabled me to keep on going and reaching for each and every milestone that led to the completion of this dissertation.

I am also extremely grateful for having collaborated with other members of my thesis committee, Dr. Hubert Wong and Dr. Elliot M. Goldner. Hubert helped me think through many of the issues in my study design and also encouraged me to learn and be critical of other statistical approaches. Elliot provided the initial inspiration to conduct research in this area many years ago and has been, since then, a relentless supporter of my work.

To dear friends and fellow students: Ruth Lavergne, Rachel McKay, Saskia Sivananthan, Lindsay Hedden, Stephen Pan, Chris Laugen, and Carla Hilario. I am thankful for the many opportunities to bounce off ideas with you, for sharing best practices in writing and publishing, for simply being there during challenging times, and for communicating timely information about where the next free meal, and sometimes even drinks, can be had.

To Wayne Jones of the Centre for Applied Research in Mental Health and Addictions at Simon Fraser University, thank you for being a wonderful resource on administrative data analysis and interpretation.

To current and former staff of Population Data BC: Tim Choi, Maryam Matean, Melissa Medearis, Monique Gagne, Kelly Sanderson and David Gehrmann. Thank you for helping me access all the data I needed for my analysis and for technical assistance in using the secure research environment.

I also wish to acknowledge the support provided by the following agencies and organizations: the Canadian Institutes of Health Research for the Banting and Best Doctoral Research Award; the University of British Columbia for the Four Year Fellowship Award; Population Data BC for the partial waiver of fees and for facilitating access to the linked health administrative data; and, the BC Ministry of Health and Data Stewardship Committee for granting permission to access the data. I note that the opinions expressed in this thesis do not necessarily reflect the official views of any of these agencies.

And finally, to members of my family: Joe, Levi, Jonathan, Joel, June, Matt and Rachel. Thanks for all the valuable lessons in life and for showering me with unconditional love. Happiness is, indeed, hereditary; you get them from your family!

Chapter 1

Introduction

Mental disorders cost the Canadian economy around \$48.7 billion annually in direct and indirect costs and is expected to exceed \$2.5 trillion in 30 years.¹ Of the many forms of mental disorders, among the most prevalent are major depressive disorders (MDD) – a chronic condition characterized by the experience of abnormal mood that is severe enough to interfere with everyday life for most of the day, almost every day, and lasts for a period of more than two weeks.² In addition to the huge burden of disease it causes,³ MDD also results in increased mortality risk due to suicide and higher vulnerability to physical illnesses.^{4–6} As of 2012, about 4.7% of Canadians reported experiencing MDD.⁷

Currently, around nine out of ten individuals with MDD seek help and treatment exclusively in primary care (PC).⁸ Recommended treatments for these patients include pharmacotherapy, psychological therapy or a combination of both.^{9–11} When managed, the prognosis for MDD is generally good as up to 67% of those who received treatment in primary care achieve remission, compared to only about 35% of patients who experience remission with placebo or usual.¹² This suggests a number needed to treat (NNT) of 3.1, indicating that for every 3 patients treated in primary care one can be expected to experience remission.

Despite the potential for achieving good outcomes, important issues remain in the treatment of depression, such as the existence of gaps and variations in treatment. Presently, the majority of the literature that examined gaps and variations in MDD treatment are dated, heavily dependent on self-report measures, and undertaken in countries with health care system characteristics that are different from Canada's. More importantly, there is a dearth of studies that assess whether depression care at the population-level can be influenced by policies like the introduction of physician incentives.

In the remainder of this chapter, I describe my research questions and give an overview of the sections that make up this thesis.

1.1 Research Objectives and Rationale

The work presented in this thesis was conceptualized to enrich current understanding of the gaps and variations in depression care and their amenability to policy interventions like the introduction of physician incentives. The specific objectives and the research chapters where they are discussed in detail are listed in Table 1.1, along with a description of the rationale for each objectives.

Table 1.1 Research Objectives and the Chapters That Address Them

Objective	Chapter / Page
1) Estimate gaps and variations in the receipt of the minimally adequate care for MDD	4 / 38
2) Examine if comorbid chronic physical condition influence receipt of depression care	5 / 61

Objective	Chapter / Page
3) Estimate the magnitude of the impact of physician incentives on depression care	6 / 94

Research Objective 1 – *Estimate gaps and variations in the receipt of minimally adequate care for MDD*

One in twenty individuals, each year, experience major depressive episodes (MDD).^{7,13} Many are believed to be untreated in spite of the availability of evidence-based treatments, such as psychological and antidepressant therapies.^{9,10} Even when treated, a significant proportion of individuals with MDD receive inadequate treatment. Given the huge societal and economic burden associated with depression, it is imperative that these gaps be addressed at all levels.

Essential to any jurisdiction's ability to address the gap and variability in treatment is understanding first the magnitude of the problem. Unfortunately in this regard, Canada does not appear to be at par with other developed countries. At present, I know of only two published Canadian studies that quantified the extent of the gap in treatment adequacy; one was based on data from a 2002 national survey¹⁴ and another based on a more recent provincial survey.¹⁵ There is also the 2012 Canadian Community Health Survey,¹⁶ which contains data that can be used to estimate the proportion of individuals with probable MDD who self-reported not receiving any type of treatment from the formal health care system. Common to all these published estimates is that they are all based on self-report data and thus, share common

sources of measurement error, namely social desirability¹⁷ and recall biases.¹⁸ These measurement errors, as confirmed by previous studies, are far from being negligible.¹⁹⁻²²

The analytic work performed under the first research objective was undertaken using linked administrative data, which do not have the same weaknesses associated with survey data. Findings from this work are needed to complement published estimates and strengthen current knowledge on treatment gaps. As well, the results of the analysis looking at factors associated with variations in depression care will help identify groups who are vulnerable to not receiving adequate depression care.

Research Objective 2 – *Examine if comorbid chronic physical conditions influence receipt of depression care*

Compared to the general population, the prevalence of depression in those with chronic physical condition is substantially higher, with up to 1 in 5 of those with chronic physical condition also having comorbid depression.^{23,24} Left untreated, comorbid depression can have serious adverse consequences, such as increased risk of death,^{25,26} functional disability,²⁷ and lower quality of life.²⁸ Despite the importance of treating depression in those with physical comorbidities, concerns about under treatment persist, mainly because comorbid depression is not always easy to diagnose and manage.

As a second research objective, this thesis examines the role comorbid physical conditions play in depression care. A separate and in-depth examination is required

due to the varied and complex nature of comorbid physical conditions. The results of this analytic work helps resolve inconsistencies in the published literature about the influence of physical conditions on depression care.

Research Objective 3 – *Estimate the magnitude of the impact of physician incentives on depression care*

After estimating the magnitude of the treatment gaps and examining factors that influence depression care, this thesis presents an analysis of the population-level impact of a provincial policy on depression care. Specifically, and as the third and last research objective, this thesis estimates the magnitude of physician incentives on various indicators that assess receipt of mental health services. This is an analysis that needs to be undertaken since the province of BC implemented this policy as its primary tool for effecting province-wide improvements in mental health care despite weak evidence from the published literature supporting its use in general,²⁹⁻³² and also in spite of the scarcity of evidence supporting its implementation in mental health. The work undertaken to address this last objective not only established if there was an impact but also quantified the size of the impact in terms that are directly interpretable and that policy-makers can use to fine-tune or re-evaluate the policy's implementation. The results from this work are important given calls for governments to demonstrate clearly that the services it invests in yield good outcomes, as expressed in the 2014 BC Auditor General's report:

“Government is unable to demonstrate that physician services are high-quality and cannot demonstrate that compensation for physician services is offering the best value... Overall, government

does not know if physician services are high quality and offering good value for the money spent.”³³

1.2 Thesis Overview

There are seven chapters included in this thesis. **Chapter 1** (this chapter) provides an overall introduction to the work, outlines the research objectives and provides an overview of the thesis.

Chapter 2 discusses key studies that are relevant to the research objectives. Here, I define what depression is based on criteria accepted by most clinicians. I also briefly discuss the currently recommended evidence-based treatments, the concept of minimally adequate care as reported in the literature, various estimates for the gap in depression care, and the recently implemented policy in BC to improve mental health care. Towards the end of the chapter I described the conceptual framework that guided the analytic work summarized in the research chapters.

Chapter 3 summarizes the methodological approach taken in this thesis. This is where I describe, in detail, my research design, data sources, operational definitions, the procedures I followed to construct the analytic cohorts, and the statistical analyses I performed to address my research questions. As I have intended the research chapters (Chapters 4, 5, and 6) to be understood without having to read other sections of the thesis, various elements of this chapter appears in abridged form in the three subsequent research chapters.

Chapter 4, the first research chapter in this thesis, examines gaps and variations in minimally adequate depression care. Retrospectively and using linked administrative data, I identified a cohort of individuals who initiated depression treatment and tracked their depression care 12 months after initial diagnosis. Then, I estimated the proportion of those who do not receive minimally adequate psychological therapy, minimally adequate antidepressant therapy, and minimally adequate psychological or antidepressant therapy. In addition, various factors that influence receipt of minimally adequate depression care were explored in this section.

Chapter 5 examines in detail the variations in depression care that are associated with the presence of physical comorbidity. In this research chapter, I determined if those with specific physical comorbidities receive more or less depression care when compared with those who do not have comorbid conditions.

Chapter 6, the last research chapter, estimates the magnitude of the impact physician incentives had on various aspects of depression care. In this section, I calculated monthly averages, from January 2005 to December 2012, in the use of depression care and measured the amount of change in levels of depression care that can be attributed to the introduction of physician incentives in 2008.

Chapter 7, the last chapter, concludes this thesis by providing a summary of the results, a discussion of the work's contributions, and a set of recommendations.

Chapter 2

Background

2.1 What is Depression?

There are many forms of depression. In this thesis, I focus mainly on major depressive disorder (MDD), which is defined as a mood disorder characterized by persistent abnormal mood (dysphoria or depressed mood, anhedonia or loss of interest and pleasure in daily activities, and irritability) that is experienced for most of the day, nearly every day for more than two weeks. A clinical diagnosis of MDD requires at least 5 of the following 9 symptoms to be present nearly every day:²

1. *Depressed mood or irritable most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful)*
2. *Decreased interest or pleasure in most activities, most of each day*
3. *Significant weight change (5%) or change in appetite*
4. *Change in sleep: Insomnia or hypersomnia*
5. *Change in activity: Psychomotor agitation or retardation*
6. *Fatigue or loss of energy*
7. *Guilt/worthlessness: Feelings of worthlessness or excessive or inappropriate guilt*
8. *Concentration: diminished ability to think or concentrate, or more indecisiveness*
9. *Suicidality: Thoughts of death or suicide, or has suicide plan*

2.2 How Prevalent is Depression?

Estimates of the prevalence of depression vary widely depending on the methods used for case ascertainment and the country or region the estimates were obtained from.³⁴ The best estimate, pooled from available epidemiological studies worldwide, puts the yearly prevalence of depression in the general population at 4.1% (95% CI, 2.4 to 6.2).³⁴

In the North American region, there appears to be no evidence that depression is increasing. The 2012 epidemiological survey in Canada reported that 4.7% of individuals 15 years and older have depression in the previous 12 months before the survey.⁷ Statistics Canada, the same agency that conducted the most recent survey reported a prevalence of 4.8% in 2002.³⁵ Similarly, in the US, a 2014 epidemiological survey, conducted by the Substance Abuse and Mental Health Services

Administration, of individuals 18 years and older reported a depression prevalence of 6.6%, which was the same prevalence estimate reported about 10 years ago.³⁶ It is worth noting that the higher prevalence estimate in the US, relative to Canada, may have been due to the US study including individuals with no severe impairment in its estimate. When only those with severe impairment were counted, the prevalence estimate goes down to 4.3%, or about two-thirds of the total prevalence estimate.³⁶

Depression is consistently associated with age, with prevalence being highest in the younger population and lowest in the older population. In Canada the 2012 estimate of yearly depression prevalence among those age 15 to 24 is 8.2% and 1.7% in those 65 years and older.⁷ In the US, the 18 to 25 age group has an annual depression

prevalence of 9.3% whereas the estimate for the 50 and older group is 5.2% in 2014.³⁶

Depression is also strongly associated with gender. In 2012, the prevalence of depression is 5.8% among women and 3.6% among men.⁷ The gender disparity is consistent across age groups, except for the highest age group where the prevalence for men could not be reliably differentiated from the slightly higher prevalence reported for women.⁷

Finally, the prevalence of depression is higher among those with chronic physical illnesses than in the general population, with reported estimates of up to about 20%.^{23,24} The higher prevalence has generally been explained as a function of the bidirectional relationship between depression and chronic physical conditions.^{37,38}

2.3 What are the Recommended Treatments for Depression?

Various evidence-based treatments are currently available and recommendations for their use, depending on the severity of symptoms and patient characteristics, have been detailed in clinical practice guidelines developed in several jurisdictions.^{11,39,40} The course of treatment generally follows two phases, starting with the acute phase in which the goal is to reduce or eliminate symptoms and to restore psychosocial functioning. The acute phase is then followed by the maintenance phase where treatment is geared toward regaining baseline function and preventing relapse.⁴¹

The use of antidepressants and/or psychological therapies are regarded as the first line of treatment for depression.^{9,11,42} Current guidelines do not make a distinction

among antidepressants in terms of efficacy; recommendations for initiating with or switching to specific types of antidepressants are made based on potential side effects, tolerability and treatment response.^{9,11,42} For psychological therapies, the two forms of psychotherapy that have been shown to be effective are cognitive behavior therapy and interpersonal therapy.¹⁰

In most jurisdictions, antidepressants are prescribed mostly by physicians while psychological therapies are offered usually by clinical psychologists, counseling and other mental health specialists. In Canada, only medical services provided by physicians are covered by the Canada Health Act and are therefore publicly-covered or provided free of charge. Psychological therapies offered by private mental health professionals (i.e. psychologists and counselors), on the other hand, are often paid for out of pocket. Access to prescription medications, such as antidepressants, are widely accessible due to public drug plans that cover individuals based on income, age, and medical conditions (i.e. mental illness, HIV, cancer). But, unlike physician and hospital services, Canada still has no universal or comprehensive access to prescription drugs, at least at the time of writing.⁴³

2.4 How Big is the Treatment Gap in Depression Care?

Despite the availability of effective treatments, a substantial number of individual with depression do not receive any treatment. A 2004 study that reviewed published prevalence of untreated depression reported treatment gap estimates of as low as 16%, based on a UK study, to a high of 84%, based on a study from Florence, Italy. The median and mean estimate is 56.3% and 53.5%, respectively.⁴⁴

The 2004 study included estimates from Canada, specifically from the province of Ontario, where the treatment gap was reported to be 44.5%, and from the city of Edmonton where the reported treatment gap was 43.3%.⁴⁴ More recent data from the 2012 Canadian Community Health Survey, suggest that the treatment gap is about 28% if analysis included the count of all those with probable MDD who reported not receiving help from any sources, which includes the formal health system (i.e. physicians and mental health professionals) and the individual's social network (i.e. family, friend, co-worker, and teacher). If analysis counted only those who reported not receiving depression care from the formal health system (i.e. psychiatrist, GP, psychologist, nurse, social worker, and counselor), the treatment gap increases to 37%.¹⁶

Another important treatment gap pertains to the proportion of individuals who managed to obtain depression care from the formal health care system but, for various reasons, did not get adequate treatment. Depending on the methodology and characteristics of the population used to assess treatment adequacy, estimates for this gap vary from 30% to 79% in North America,^{14,15,45-55} and 24% to 75% in Europe.⁵⁶⁻⁶²

2.5 What has Been Done in Canada to Close the Gap?

To address the treatment gaps, Canada implemented various reform initiatives, among the most notable of which is the integration of mental health care in primary care. The importance given to primary care's role is in recognition of the fact that the

majority of individuals with depression, is treated, often exclusively, in primary care settings.^{8,63}

Across the country, there is explicit acknowledgement of the importance of integrating mental health services in primary care and the need to strengthen community-based services. But because health care in Canada is a provincial responsibility, approaches to enhancing mental health in primary care differed across the provinces, both in terms of the immediacy and the nature of action taken. Some provinces, for example, created and have functioning multidisciplinary primary health care teams where mental health services can be provided. A few have even created more than one type of primary care teams depending on whether the target clientele is the general population or specific clinical subgroups. In terms of the rate of progress, some are just starting out while others have made significant inroads already.^{64,65}

As various provinces instituted structural changes to reform their primary care systems, BC took on a peculiar approach. It chose to maintain the status quo and introduced operational enhancements,⁶⁶ with financial incentives and physician training as the major components of its general strategy. According to the proponents of the initiative, the incentive programs were implemented specifically to “support and compensate” family physicians for providing guideline-based care for various conditions like diabetes, hypertension, chronic obstructive pulmonary disease, congestive heart failure and mental health.⁶⁷

The incentive program specific to mental health has been known as the Mental Health Initiative and was launched jointly by the BC Ministry of Health and the General Practice Services Committee (GPSC) on January 1, 2008 with a starting budget of \$8 million.⁶⁸ Two years later, the incentive program was supplemented with educational modules offered by the GPSC to train family physicians and their staff in the use of screening tools and diagnostic procedures as well as in the provision of evidence-based treatment to patients with mental disorders.⁶⁹ Together these two components represent the province-wide changes BC undertook to improve mental health care without fundamentally altering the existing health care delivery system. No other policies or events were implemented or have taken place that could have population-level impact on the way mental health services were delivered.

2.6 Conceptual Frameworks

To study gaps and variations in depression care and the impact of physician incentives on depression care, this study will draw upon two conceptual frameworks that have been used extensively in the study of health care use and quality: the Andersen Behavioral Model (ABM) and Donabedian's Structure-Process-Outcome (SPO) model.

According to the ABM, health care use can be investigated by examining three population characteristics that influence access to health care: 1) predisposing characteristics, 2) enabling resources, and 3) need.⁷⁰ A high quality and equitable healthcare system can be said to exist when individuals' health care use is determined more by medical need, such as the presence or severity of illness. Inequality, on the

other hand, is present when use of health services are influenced by immutable predisposing characteristics such as sex, age and ethnicity. Similarly, a health care system is inequitable if enabling characteristics such as health insurance, income levels, and place of residence influence health service use.

The analytic work undertaken in Chapters 4 and 5 were informed by the ABM. Specifically, the assessment of the use of depression care and magnitude of the gaps in treatment inadequacy were done following the three categories of determinants of health care use. Also, the statistical model used to explain relative differences in the use of depression care contain elements from the ABM, namely: 1) the diagnosis of depression as the *need* factor that determines depression care, 2) age and sex as *predisposing* factors that influence both the likelihood of developing depression and the use of depression care, and 3) income and place of residence as *enabling* characteristics that are also associated with both the diagnosis of depression and consequent use of depression care (Figure 2.1).

The analytic work in Chapter 6, which examines the impact physician incentives had on the provision of depression care, was guided by the SPO framework (Figure 2.2).⁷¹ Essentially, the SPO framework states that health care quality could be assessed along three dimensions – the structure, processes and outcome of care. The most important of these dimensions, undoubtedly, is the outcome. However, outcomes tend to be difficult to relate to medical care as there are often multiple factors, other than health care, that generate good outcomes.⁷¹ But, as long there is strong evidence that

processes of care increase the probability of good outcomes, processes of care on their own are worth examining as indicators of good quality.

Viewed within the SPO framework, the entire system that allows depression care to be delivered can be regarded as the *structure* of the health delivery system. The structural components include the availability and characteristics of family physicians and mental health specialists, the publicly funded health care system, and the policies that are in place or were introduced to influence the way health services are provided. The extent to which depression care was provided, as measured by indicators for the receipt of evidence-based treatments, is viewed as the *process* of the health care delivery system. The *outcomes* of care that could have been examined include mental health-related outcomes, such as reduced symptoms, improved functional ability, and enhanced quality of life (Figure 2.2).

The analytic work described in Chapter 6 focuses solely on the structure (physician incentives) and processes of care (depression care indicators). The case for examining only these components is strengthened by the use of indicators that assess the use or provision of depression treatments (antidepressant and psychological therapies) whose efficacy in producing good mental health outcomes has long been established. I examined the link between these two dimensions by testing the specific assumption made by the proponents of physician incentives that removing financial disincentives (which acts as structural impediments) to care provision will result in improvement in depression care.⁷² This is a claim that can be tested with considerable validity since there are no other policies or events that took place within

the time frame chosen for the analysis that could also potentially have population-level impact on depression care. As promoters of the physician incentive schemes asserted, BC deliberately avoided modifying the health service delivery structure in favor of operational enhancements to the existing system.^{69,73}

While the ideal approach within the Donabedian SPO framework is to examine and relate the three dimensions of care quality, this thesis is unable to examine outcomes since measures of mental health outcome, like scores obtained using PHQ-9, GAF or EQ5 or other standardized instruments are not routinely collected and reported at the provincial level in BC. Other researchers have proposed the use of hard outcomes like reduced suicide rates and excess mortality.⁷⁴ While such measures can be derived using linked health data, their value in assessing the impact of structural changes is difficult to assess primarily because the link between the provision of mental health services and excess mortality is still poorly understood. Various factors contribute to excess mortality (i.e. treatment effectiveness, treatment accessibility, treatment quality, social inequality, etc.) and without a model that accounts for the complex interplay among these factors, time trends in excess mortality, or the lack thereof, will remain challenging to interpret.⁷¹ Interestingly, and most likely for the same reasons, other researchers have reported that despite the scaling-up of depression treatment in developed countries in recent decades, there has been no appreciable decrease in the prevalence of depression.⁷⁵

Figure 2.1 Conceptual Framework for Understanding Use of and Disparities in Mental Health Services

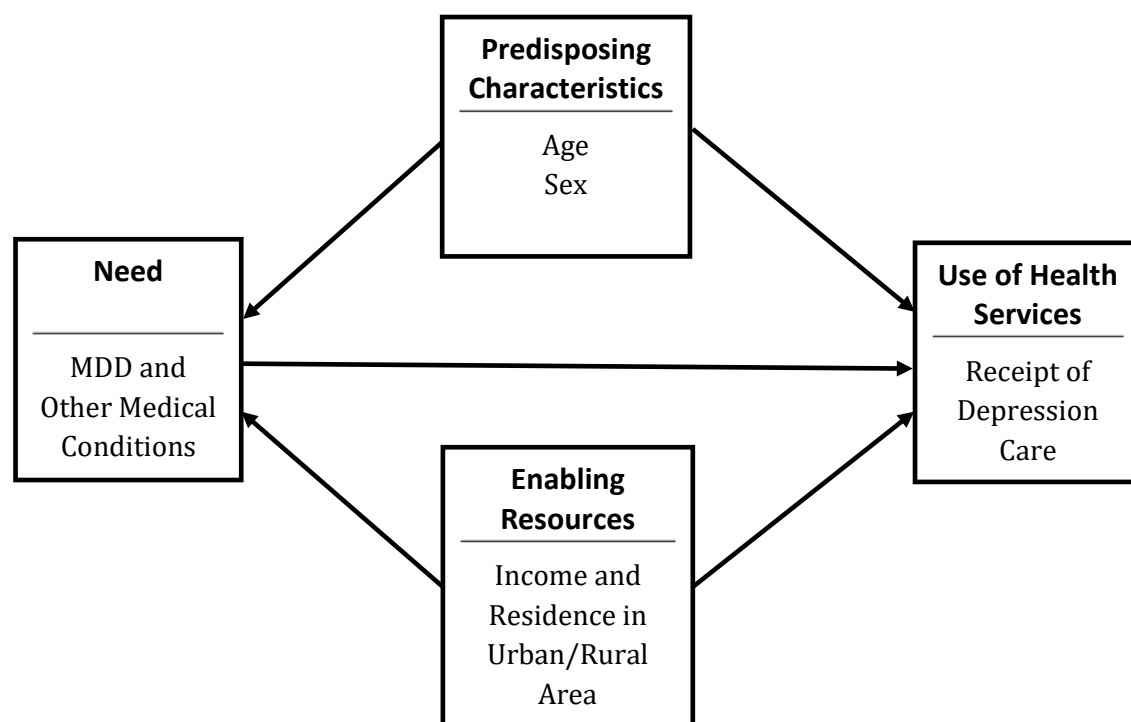
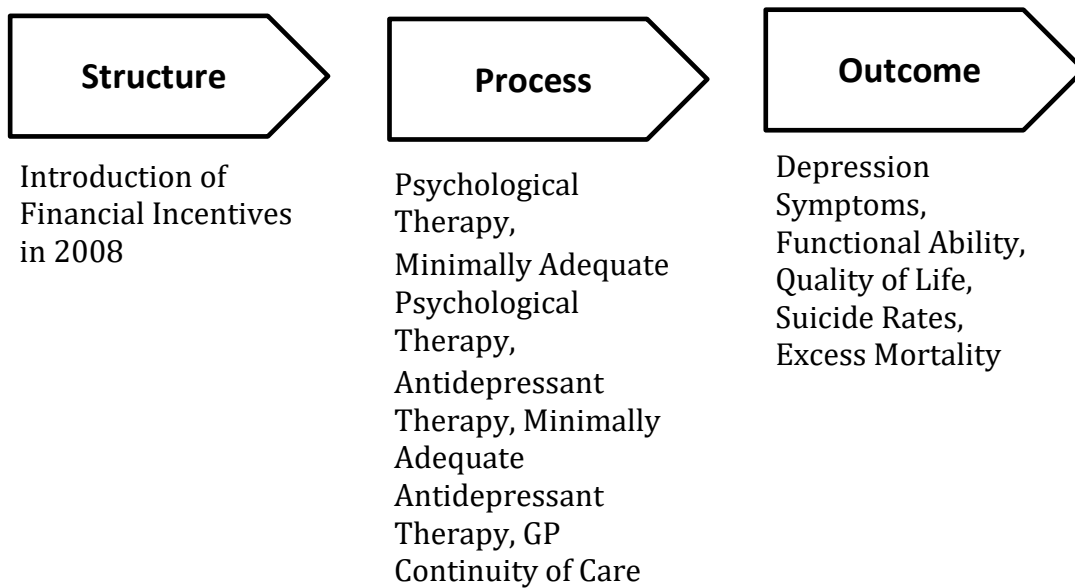


Figure 2.2 Conceptual Framework for Understanding the Impact of Physician Incentives on Depression Care



Chapter 3

Methodology

All the research objectives stated in this thesis were addressed using retrospective analysis of linked health administrative data. In this section, I describe the study participants, data sources, variables, and analyses I performed for each research objective.

3.1 Study Participants

To facilitate the identification and creation of analytic cohorts required for each research objective, I requested access to data on a large cohort that comprised 1,862,559 unique patients who received at least one outpatient or inpatient mental health-related diagnosis between January 1, 2005 and March 31, 2013. All 5 fields of the physician claims database that contain ICD9 codes and all 25 fields of the hospital database containing ICD10 codes were searched for evidence of any of the following mental health-related diagnosis:

ICD-9	296.x, 300.x, 309.x, 311.x
ICD-10	F31.x, F32.x, F33.x, F34.x, F38.x, F39.x
MSP code	50B

To allow for a look back period of up to 2 years for case ascertainment and 1 year of follow-up, I requested data that go back to January 1, 2003 and forward to December 31, 2013 for each of the unique patients in the overall cohort. The analytic cohorts used in Chapters 4, 5, and 6 were all derived from this overall cohort. Population Data

BC carried out all the data extraction and de-identification for the overall cohort, following my specifications. The data I was eventually given access to are stored in separate data files organized by year and data source. These data files are described in the next section.

3.2 Data Sources

Using Population Data BC's Secure Research Environment, I accessed and analyzed individual-level, de-identified data from the following databases:

- 1. Consolidation Files** – this is a database containing basic demographic data on age, sex, geo-codes and registration for all people registered to receive publicly-funded health care services in BC. This file is derived by PopDataBC from the Medical Services Plan Registration and Premium Billing files. I used this database to obtain socio-demographic data (age, sex, income, place of residence) and also to determine if an individual was a BC resident for most of the year using a 9-month or 275-day cut point, as has been used previous health service research studies in BC to ensure that the incomplete follow-up of those who moved in and out of BC do not bias the estimates.^{76,77} The data fields I examined include Year and Month of Birth, Sex, Neighbourhood Income Quintile/Decile (SES), the first three characters of the postal code or the Forward Sortation Address (which I used to infer place of residence), and Total Days Registered in a year.
- 2. Vital Statistics Deaths Files** – this is a database containing all deaths registered in BC. Records in this database were used to identify people who died during follow-

up and then subsequently excluded due to incomplete follow-up data. The specific data fields I examined from this database include the year and month of death.

3. *Medical Services Plan Payment (MSP) Information Files* – this is a database containing a record of all medically necessary services paid for by BC’s universal insurance program (Medical Services Plan) to fee-for-service health care professionals. I used this database for case ascertainment and to create indicators that assess visits to physicians, continuity of care, and receipt of psychological therapy. The specific data fields I examined were: Service Date, Paid for Item (or Fee Item), Service Code, ICD9 Diagnostic Code, Paid Service Units, Paid Amount, Explanatory Code, Date Paid, Practitioner Number, Claim Specialty Code, Service Where Code, and Location of the Service.

4. *Discharge Abstracts Database* – this is a file that contains data on all acute care hospitalizations including day surgery in BC. I used the following fields from this database to ascertain MDD cases: Admission Date, Discharge Date, Admit Category, and ICD10-CA Code.

5. *Mental Health Services (MHS) File* – this is a file that contains a record of all patients/clients that receive mental health services in the community as reported by each health authority via the Minimum Reporting Requirement tables of the Mental Health Data Warehouse. The data fields I examined include: Care Episode Number, Location Code, First Contact Date, DSM Axis Code, Create Date, Care Episode Number, Service Event Number, Service Event Code, and Service Event Date. Records in this database were used only in Chapter 6 to ascertain cases and

track receipt of counseling or psychotherapy. I did not include this database in Chapter 5 because data from the year 2012 were not available at the time I submitted the request to access data. I also did not include this database in Chapter 6 because health service events reflected in this database were very small in number and are not directly impacted by the policy measure (i.e. introduction of financial incentives to encourage the provision of mental health services by fee-for-service physicians) I investigated.

6. ***PharmaNet*** – this is a database containing a record of all outpatient prescriptions filled at BC community and hospital outpatient pharmacies. I used this database to construct indicators that assess receipt of (as reported in Chapters 4 to 6) and adherence or compliance with (Chapter 5) antidepressant therapy. The data fields I examined include: DINPIN, Chemical/Generic Name, AHFS Code, Date of Service, Quantity Dispensed, and Days Supply.

3.3 Variables

3.3.1 Dependent Variables

This section lists the dependent variables I used to address my research objectives. These dependent variables pertain to either health service use or technical processes of care, depending on the framework used to address a specific research objective. Also indicated in the descriptions that follow are the research chapters where these dependent variables are used.

1. *Antidepressant Therapy*

This is an indicator (examined in Chapters 4, 5 and 6) for whether a prescription for any antidepressant medication was filled during a 12-month period starting from the index date of depression diagnosis. Following previous health service use studies on prescription drugs,^{76,77} I used the World Health Organization's Anatomical Therapeutic Chemical (ATC) classification code (N06Axxx) to identify antidepressants from the PharmaNet data. PharmaNet currently uses the drug codes from the American Hospital Formulary Service classification system. To use the ATC coding system, I first linked the unique drug identification number (DINPIN) from PharmaNet to the DINPIN found in Health Canada's Drug Product Database,⁷⁸ which contains both the DINPIN and ATC coding for all medications that have been made available in Canada.

2. *Minimally Adequate Antidepressant Therapy (MAAT)*

This is an indicator (examined in Chapters 4 and 6) for whether antidepressant prescriptions were filled with 84 or more supply days within a 12-month period starting from the index date of depression diagnosis. The ≥ 84 cutpoint was based on previous studies,^{50,79} and corresponds to the 12-week acute treatment phase⁴¹ during which individuals that initiated antidepressant therapy are expected to stay on medication. To create this indicator, I summed up the number of supply days during the 12-month follow-up period for each individual. This is a procedure deemed sufficient for examining medication use in shorter time frames.⁸⁰

3. *Proportion of Days Covered (PDC)*

The proportion of days covered is a measure of medication adherence (used in Chapter 5) that quantifies the proportion of time within a fixed interval that individuals have an available supply of medication.^{81,82} Higher values for this measure suggest better adherence. Two versions of this continuous measure (PDC180 and PDC365) were calculated by summing up the supply days for each individual and dividing the total by 180 and 365 days. To avoid double counting supply days in cases where individuals are prescribed a combination of antidepressant medications on the same day, I counted only one of the prescriptions that had identical supply days, or the prescription with the greatest number of supply days in cases where the recorded supply days vary. I credited overlapping supply days in the calculation of PDC by creating arrays for each individual as described in a previously published procedure.⁸³ The procedure results in a slightly higher PDC value as the procedure assumes the overlap is due to individuals refilling their prescriptions in advance of consuming their last supply. Although cut points of 50%, 75%, or 80% have been used to convert this measure into a dichotomous indicator of adherence (adherent versus non-adherent), I used the raw PDC values in my analyses and interpreted scores equal to or higher than 80% as indicative of good adherence..⁸⁰

4. *Counseling or Psychotherapy (CP)*

This is an indicator (examined in Chapters 4, 5, and 6) that assesses whether individuals received at least one session of counseling or psychotherapy

during the 12-month period following the index date of depression diagnosis. I derived this indicator from the MSP file using the following fee item codes: 12120, 12220, 13220, 15220, 15320, 16120, 16220, 17120, 17220, 18120, 18220, 00120, 00121, 00122, 00276, 00277, 00513, 00514, 00515, 00630, 00631, 00632, 00633, 00635, 00636, 00638, 00650, 00651, 00652, 00663, 00664, 00665, 00666, 00667, 00668, 00669, 00670, 00673, 00674, 00675, 00676, 00677, 00678, 00679, 00680, 00681, 00634, 00639, 00671, 00672, 13018, 13021, 13022, 13038, 60607, 60608, 60610, 60613, 60625, 60630, 60631, 60632, 13120, 50514, 00605, 00607, 00608, 00609, 00610, 00625, 00699, 14044, 14045, 14046, 14047, 14048. In Chapter 4 where the MHS file was included in case ascertainment, the following MHS codes were also used to determine receipt of counseling or psychotherapy: 02, 03, 04, and 27.

5. *Minimally Adequate Counseling or Psychotherapy (MACP)*

This is an indicator (examined in Chapters 4 and 6) for whether individuals received counseling or psychotherapy (CP), as previously defined, of 4 or more sessions within a 12-month period after the index date of depression diagnosis. The ≥ 4 cutpoint was adapted from similar studies that analyzed administrative databases^{50,79} and reflects a realistic threshold in the context of BC's publicly-funded mental health care system, which easily allows for up to four counseling claims per patient per year.⁸⁴

6. *Minimally Adequate Treatment*

This is an indicator (examined in Chapters 4 and 6) for whether individuals

received either MACP or MAAT within the 12-month follow-up period after the index date of depression diagnosis.

7. *Number of Physician Visits*

This count variable (used in Chapters 4 and 5) was created by summing up all visits made to a physician, for any reason, within 12 months of the index date of depression. To identify visits, I looked at the date of service provision and the associated fee item. If a non-negative and non-reversed dollar value is present, that encounter is counted as a valid visit. To avoid double counting, multiple billings made by the same physician on the same day were counted as one visit only.

8. *Number of Mental Health-Related Visits*

This count variable (used in Chapters 4 and 5) was similar to the variable that counts the number of physician visits, except that the encounter also has to be accompanied by a mental health diagnosis.

9. *Number of Counseling or Psychotherapy Visits*

This count variable (used in Chapters 4 and 5) was similar to the variable that counts the number of physician visits, except that the encounter needs to be associated with fee item codes for counseling or psychotherapy (as listed in indicator number 4).

10. *GP Continuity of Care (COC)*

GP continuity of care is a continuous variable (used in Chapters 5 and 6) that

measures the degree to which GP services and visits were provided by or made to the same physician.⁸⁵ The values for this variable range from 0 to 1, with the highest possible value of 1 indicating that all GP visits were made to the same physician. I used a previously published formula⁸⁵ to calculate values for two versions of this measure; one for all GP visits and another for GP visits that have an accompanying mental health diagnosis. Only individuals with at least 3 GP visits were included in the calculation of this measure.

$$GP \text{ continuity of care} = 100 \times \frac{1 - \left(\frac{\text{number of GPs}}{\text{number of GP visits} + .1} \right)}{1 - \left(\frac{1}{\text{number of GP visits} + .1} \right)}$$

11. *GP Continuity of Care for Mental Health (COCMH)*

This is similar to COC except that only visits with a mental health diagnosis as the most responsible diagnosis were counted.

3.3.2 Explanatory Variables

The explanatory variables I examined in Chapters 4 and 5 include sex and age (as predisposing characteristics), physical comorbidity (as need), and neighbourhood-level income and residence in urban areas (as enabling factors). All these variables were obtained from the Consolidation Files.

For Chapter 6, the main explanatory variable I used is the date physician incentives for mental health started, which was January 1, 2008.⁸⁴ There have been no other major initiatives implemented across the province during this period, except for the introduction of physician training modules on diagnosing and treating mental

disorders (also known as the Mental Health Learning Module) that started in the summer of 2009. I did not include the introduction of physician training as another explanatory variable due to uncertainties in the start date for that intervention and the low enrolment and completion date. Published documents report the total enrolment to be 30% of the full-service GPs in BC by the end of August 2010,⁸⁶ and 42% by the end of 2012. Of the number of physicians that have enrolled, as of 2012, 67% actually completed the training program.⁸⁷

3.4 Study Cohorts

To address my research objectives, I derived 3 analytic cohorts from the overall cohort as described in Section 3.1. Cohorts of individuals who initiated MDD treatment (new cases) were used in Chapters 4 and 6, whereas cohorts of individuals who are continuing MDD treatment (prevalent cases) was examined in Chapter 5. The procedures followed in constructing the cohorts for Chapters 4 and 6 are similar, except for the 12-month period used to identify MDD cases in Chapter 4 versus the 30-day (also 28-day and 31-day, depending on the month) period for Chapter 6. All study cohorts were constructed using SAS/ SQL software V 9.4.

3.4.1 Study Cohort for Chapter 4

In Chapter 4, I identified new MDD cases included in the cohort by searching for individuals who received one or more recorded inpatient (ICD10 F32.x, F33.x or F39.x) or outpatient (ICD9 296*, 296.2x, 296.3x, and 311.x) depression diagnosis in

* Only those coded with exactly three digits were counted.

FY 2010/11. To be deemed “new”, the individual must not have any evidence of having been treated for a mental disorder in the previous 12 months using a look back period that start from FY 2009/10. For example, individuals who received a diagnosis of 311.x in September 2010 will be considered new cases if they did not have any mental disorder diagnoses (i.e. depression, anxiety, or schizophrenic disorders) that were treated in the community, physician offices or hospitals between September 2009 and September 2010 (Figure 4.1). I tried to exclude all those with bipolar disorder diagnoses (ICD-9 296.4x to 296.7x), but it is possible that BPD cases remained due to the tendency of some physicians to code at the 3-digit level only. The proportion of individuals with BPD that could not be removed from this cohort is small and most of them are probably receiving treatment for depressive symptoms, which will be managed similarly (with antidepressant and psychological therapies) as MDD symptoms. I excluded those who died during follow-up or were not residing in BC most of the time as indicated by registration in the government health insurance of less than 275 days in a year to avoid biases that may arise from including people with incomplete follow-up. I also excluded those who were <19 years of age as the indicators of minimally adequate treatment for depression (particularly antidepressant medication) I am examining may not be appropriate for the younger age groups. Finally, I excluded a small proportion of people who have missing data on sex, place of residence and income (Figure 4.2).

3.4.2 Study Cohorts for Chapter 5

The study cohorts for Chapter 5 comprise individuals with existing depression diagnosis. I constructed two cohorts using calendar years, as opposed to fiscal years,

to optimize the use of the earliest and most recent data I can access. I chose to study two cohorts, 2005 and 2012 that are reasonably far apart to allow for the study of potential changes in patterns of care over time.

The first step in creating this cohorts involves identifying individuals who have at least one inpatient or outpatient depression diagnosis during the case ascertainment period (e.g. January 1 – December 31, 2005). I used the earliest diagnosis on record within this period to identify the index date, which I then use to determine the start and end dates for the 12-month look back and follow-up periods. To be included in the study cohorts, individuals must have either one inpatient or two outpatient depression diagnosis within the look back period that includes the index date. The physical comorbidities of the individuals included in the cohort were assessed in a similar manner, such that the presence of one inpatient or two outpatient diagnoses for the chronic conditions listed on Table 5.2 during the look back period signifies that the patients has the specific comorbidity in question. Those who were under 19 years of age, died during follow-up or had registration of less than 275 days in any of the observation years were excluded for the same reason given for the Chapter 4 cohort.

3.4.3 Study Cohorts for Chapter 6

Chapter 6 requires monthly cohorts of newly diagnosed individuals starting from January 2005 to December 2012, for a total monthly data points of 96, which is considered adequate for interrupted time series analyses.⁸⁸ I chose the dates based on data I have access to. The January 2005 start allows for a 12 month look back of up

to January 2004 and the December 2012 end date allows for follow-up periods of up to December 2013.

To create the monthly cohorts, I extracted records of individuals with at least one inpatient or outpatient depression diagnosis between the first and last day of each month. In cases where individuals received multiple diagnosis in a given month, the record with the earliest date was used as the index date of diagnosis. Then, I removed everyone with any mental health-related diagnosis during a 12-month look back period that includes the index date of diagnosis. As with the study cohorts for Chapter 4 and 5, I excluded those who were less than 19 years of age, died during follow-up, had less than 275 days of health insurance registration in the year before and after the index date of diagnosis, and had missing data on sex and age.

3.4.4 Construction of the Indicators and Measures Using Administrative Data

All the indicators in this thesis were derived from the Medical Services Plan (MSP), Mental Health Services (Chapter 4 only), and PharmaNet files. These files were checked first for potential data entry errors and duplicates. In particular, the MSP files need to be checked for duplicates or reversed billings every time they are used to derive the indicators and measures. To detect and resolve duplicates or reversed claims in the MSP files, I followed procedures used and described by researchers from the Centre for Applied Research in Mental Health and Addictions.⁸⁹ I used SAS/SQL V 9.4 to derive all the indicators.

To calculate values for the indicators, I used the total count of individuals in the cohort as denominators and the total count of individuals who met the criteria

defined by the indicator as numerator. For example, the indicator for receipt of counseling or psychotherapy (Chapter 5) was calculated by entering the total count of individuals who had at least one counseling or psychotherapy session during the follow-up period in the numerator and everyone in the cohort as the denominator.

$$\text{Receipt counseling or psychotherapy} = \frac{\text{count of individuals from the denominator who received } \geq 1 \text{ session of counseling or psychotherapy within 12 months of initial diagnosis}}{\text{total count of individuals who initiated depression treatment between January 1 and December 31, 2012}} \times 100$$

The same indicator used in Chapter 6, where monthly indicators are required, was derived similarly except that the denominator has a 30-day, instead of a 12-month, case ascertainment period:

$$\text{Receipt of counseling or psychotherapy, Jan 2008} = \frac{\text{count of individuals from the denominator who received } \geq 1 \text{ session of counseling or psychotherapy within 12 months of initial diagnosis}}{\text{total count of individuals who initiated depression treatment from January 1 to 31, 2008}} \times 100$$

The continuous measures (i.e. GP continuity of care indices and adherent measures) examined in Chapters 5 were calculated slightly differently from the binary indicators. Specifically, the continuity of care indices used denominators that are lower than the total number of individuals in the cohorts since only those who had 3 or more GP visits were included in the calculations. I made this adjustment as continuity of care indices based on fewer than 3 visits are challenging to interpret.⁹⁰ For the adherence measures (i.e. proportion of days covered), which was summarized as mean values for the entire cohort, the denominators I used in calculating averages

are the total number of individuals who filled at least one antidepressant during follow-up.

3.4.5 Statistical Analysis

Prior to performing the statistical analyses described below, I calculated descriptive statistics to describe the characteristics of the study cohorts, summarize overall trends in the use of depression care, and show the absolute magnitude of variations in depression care by socio-demographic characteristics.

In Chapter 4, I used mixed effects logistic regression to determine if receipt of depression care is associated with selected explanatory variables and physician-level variations. This regression model was informed by ABM (see Section 2.6), which suggests that in a fully functioning health care system, receipt of depression care should be based largely on medical need (i.e., presence of depression), with very little or no variation by predisposing or enabling characteristics. Statistically, this formulation implies that when examined in a multivariable regression model, receipt of treatment in individuals with depression should not be significantly associated with independent variables such as age, sex, place of residence, income, and physician practice variations.

To test this idea, I ran mixed effects logistic regressions that have patient demographic and clinical characteristics as fixed factors and physician study identifiers as random effects. The adjusted odds ratios (AOR) generated by these models were interpreted as measures of associations between the indicators and the fixed-effect factors. Physician-level variations, on the other hand, were quantified

using the intra cluster correlation (ICC) coefficients and the median odds ratios (MOR),⁹¹ which refers to the median of the distribution of all possible ORs that is formed when a physician with higher odds is compared with another who has lower odds of providing care. An MOR with a value equal or closer to 1 can be interpreted to mean that all physicians are somewhat equally likely to provide a particular type of service; an MOR that is substantially greater than 1 implies that some physicians are more likely than other physicians to provide a specific type of care. I used the *xtmixed* with 30 integration points and *xtmrho* routines running under Stata V 13.1 to generate the model results.

In Chapter 5, ABM (see Section 2.6) was used, similarly, to examine disparities in depression care between those with and without physical comorbidities. Here, ABM was used to hypothesize that receipt of depression care and other health services will be relatively greater in individuals with depression and comorbid physical conditions since need is greater in those with both these conditions than in those with just one. In addition, the greater use of services should persist, even after controlling for predisposing factors (i.e., age and sex) and enabling characteristics (i.e., income and place of residence).

I ran a series of generalized linear models to test for differences in the use of health services. Specifically, I used logistic regression for binary variables (e.g. receipt of counseling or psychotherapy), negative binomial regression for variables with count data (e.g. number of GP visits and counseling or psychotherapy sessions), and log normal regression for variables with continuous data (e.g. GP continuity of care, and

PDC). I ran these models for each comorbid condition using those with depression only as the reference category. The regression coefficients I reported were all adjusted for sex, age, income and place of residence. I used Stata V 13.1 to generate the model results.

In Chapter 6, I used the SPO model (see Section 2.6) to examine whether a change in the structure of the health care system (i.e., introduction of physician incentives) results in changes to processes of care (i.e., provision of depression care and provision of care by the same physician). To evaluate this association statistically, I performed segmented or interrupted time series analysis on each of the monthly indicators of care processes. This is an analytic approach often used in assessing the population impact of policies or large scale interventions on health and health care.^{88,92}

The regression equation I used in the interrupted time series analysis consists of the following basic parameters: depression care indicators $_t = \beta_0 + \beta_1 \times \text{time}_t + \beta_2 \times \text{physician incentive}_t + \beta_3 \times \text{incentive}_t \times \text{time} + \varepsilon_t$.^{88,92} β_0 represents the intercept and β_1 the pre-policy average rate of change per month. The average shift in the level immediately after the introduction of physician incentives is estimated by β_2 . The post-policy change in the monthly trend, if any, is estimated by β_3 .

I also deseasonalized the monthly values before running the segmented regression to minimize the impact of seasonal variations on the model results. There are two recommended methods for adjusting for seasonal variations both of which produce virtually identical results.⁹³ The first method involves directly including dummy

terms in the regression equation to account for the changes in the levels that happen from January to December. The second method involves regressing the outcome variable first on the months of the year using dummy variables and then adjusting the raw monthly values using the regression coefficients. Once the average seasonal effects have been removed, the monthly values are then subjected to the regular segmented regression analysis. I present only the results from the second method because I wanted to plot the deseasonalized data along with the regression lines. To ensure that the deseasonalized data appear consistent with the regression lines from the final model, I added the mean of the raw data to the deseasonalized data. Without this additional step, the resulting graphs would have regression lines that appear off-centered.

After generating the model results for each variable, I post-estimated the overall impact (trend plus shift in the level) of physician incentives on depression care at the end of years 1, 3, and 5 using the formula: $\beta_2 + \beta_{3(1*12)}$, $\beta_2 + \beta_{3(3*12)}$, and $\beta_2 + \beta_{3(5*12)}$. All model and post-estimation results were produced using Stata V 13.1 with the help of the *itsa* module.⁹⁴

Chapter 4

Gaps and Variations in Depression Care[†]

4.1 Introduction

One in twenty individuals, each year, experience major depressive episodes (MDD).^{7,13} Many remain untreated even though evidence-based treatments, such as psychological and antidepressant therapies⁹⁻¹¹ exist. Contrary to popular belief, most of those with depression actually receive treatment exclusively from general practitioners (GPs).⁸

Estimates of the percentage of people with untreated depression vary widely, ranging from 16% to 84% (median, 56%).⁴⁴ The treatment gap is high even in largely developed regions like Europe, 45%, and the Americas, 57%.⁴⁴ In Canada, analysis of recent data indicate that 28% (95% CI, 24% to 32%) of the population with probable MDD self-reported not receiving any help for their condition.¹⁶ The gap increases to 37% (95% CI, 33% to 41%) if we count only those with probable MDD who self-reported not receiving mental health care from hospitals or other health care professionals like psychiatrists, GPs, psychologists, nurses, social workers and counselors.¹⁶

[†]A version of Chapter 4 has been published and is reproduced here with permission: Puyat JH, Kazanjian A, Goldner EM, Wong H. How Often Do Individuals with Major Depression Receive Minimally Adequate Treatment? A Population-Based, Data Linkage Study. *The Can J Psychiatry*. 2016 Jul 1;61(7):394-404; Available from: <http://cpa.sagepub.com/content/61/7/394.full>

Some of the treatment gap is due to personal circumstances, such as not knowing how to get help or not having confidence in the health care system; and to health system factors, such as services being unavailable or inaccessible.⁹⁵ There are individuals, however, who overcome these challenges and manage to put their feet within the door of the formal health care system, only to contend with another issue – poor or under treatment by any published standard.

Studies in North America^{14,15,45–55} suggest that 30% to 79% (median, 52%) of individuals with MDD or mood disorders who undergo treatment receive treatment that does not meet the minimum threshold for adequacy. In Europe, recent studies^{56–62} estimate the proportion of those who receive poor treatment to be between 24% and 75% (median, 60%).

The variation in these estimates is likely due to differences in definitions, population characteristics, sample size, and methods. Despite the variations, however, the overall evidence still highlight that a large number of people receive inadequate treatment for depression. Addressing this gap is important, given the huge societal impact of mental illness⁹⁶ in general, and MDD in particular. Most importantly, closing the gap will improve patient outcomes.^{97,98}

An essential step toward addressing the gap is understanding its magnitude. Canada, in this respect, does not appear to be at par with other developed countries. At the time of writing, we are aware of only two published studies that quantified the extent of the gap; one based on data from a 2002 national survey¹⁴ and another based on a more recent provincial survey.¹⁵ Both used self-reported data, which are susceptible

to social desirability¹⁷ and recall biases.¹⁸ Studies comparing survey and administrative data show that self-reported data substantially under count people with mental health conditions²⁰ while at the same time over counting the frequency of health care use,¹⁹ particularly among individuals experiencing severe symptoms.^{21,22}

In this population-based data linkage study, we aim to contribute to current understanding of the gaps and disparities in depression care in publicly-funded health systems. Specifically, we address the following questions:

- 1) How often do individuals receive minimally adequate care for MDD?
- 2) Does receipt of minimally adequate care for depression differ by variables such as age, sex, income, geographic location and practising physicians?

4.2 Methods

4.2.1 Data Sources

We examined individual-level health administrative data from virtually everyone in the province of British Columbia (BC). Anonymized data were extracted from multiple databases linked by unique study identifiers (Table 4.1).

The BC Ministry of Health, Data Stewardship Committee, and Vital Statistics Agency granted data access permissions. The UBC Behavioral Research Ethics Board provided ethics approval.

4.2.2 Study Cohort

We examined data from three fiscal years (FY) to ensure that each individual in our cohort has 12 months of health service history and 12 months of follow-up. We ascertained cases in FY2010/11 and used FY2009/10 and FY2011/12 as look back and follow-up periods. This configuration enabled us to determine whether those first diagnosed in 31/05/2010, for example, had a 12-month history (31/05/2009 to 30/05/2010) of any of the diagnoses listed in our exclusion criteria, and also if they received treatment within 12 months (31/05/2010 to 30/05/2011) following initial diagnosis (Figure 4.1).

To identify study cohort members, we first extracted records of individuals with MDD (ICD-9 296, 296.2x, 296.3x and 311.x; and ICD-10 F32.x, F33.x and F39.x) from physician claims, hospital separations and community mental health service data files in FY2010/11. We considered only the most responsible diagnosis. When individuals showed up in more than one database, we retrieved the earliest record and marked that as the index date. We removed those with diagnoses of schizophrenia or bipolar disorders (ICD-9 295.x and 296.4x to 296.7x, ICD-10 F25.x and F29 to F31.x) between FY2009/10 and 2011/12.

As we were interested only in individuals who initiated treatment during FY2010/11, we excluded those who had a 12-month history of any mood disorder diagnoses (ICD-9 296.x and 311.x and code 50B, ICD-10 F3x). Additionally, we ensured that the cohort consisted only of those eligible to receive publicly funded health services by removing anyone with yearly registration in the provincial health services plan of less

than 275 days between 2009 and 2011. Last, we excluded those who were under 19 years of age; died during the 12-month follow-up; or had missing data on sex; place of residence and income (Figure 4.2).

The use of algorithms based on ICD9/10 diagnoses for MDD case detection is common in health administrative data analyses.⁹⁹ In our study, we used diagnostic codes similar to those used by a Canadian surveillance system,¹⁰⁰ which shows good validity (sensitivity, 81.1%; specificity, 94.8%; PPV, 79.6%; NPV, 95.2%) based on validation work conducted in several Canadian provinces.¹⁰¹ Analysis of BC data from the validation study¹⁰¹ yielded comparable validity indices.¹⁰²

4.2.3 Outcome Measures

We constructed indicators to measure minimally adequate counseling/psychotherapy (MACP); minimally adequate antidepressant therapy (MAAT); and minimally adequate treatment.

MACP assesses receipt of ≥ 4 counseling or psychotherapy in individual or group settings. The cutpoint was adapted from similar studies that analyzed administrative databases^{50,79} and reflects a realistic threshold in BC where the publicly-funded health system easily allows up to four counseling claims per patient, annually.⁸⁴ Only paid claims specifically designated as counseling or psychotherapy, regardless of duration, were counted in creating MACP.

MAAT measures whether antidepressant prescriptions were filled with ≥ 84 supply days. We used the World Health Organization's Anatomical Therapeutic Chemical

classification code (N06Axxx) to identify antidepressant fills. The cutpoint was adapted from previous studies,^{50,79} and corresponds to the 12-week acute treatment phase⁴¹ during which individuals initiating antidepressant therapy are expected to be on medication. Because the 84-day period is covered in many cases by single fills (such as Rx for 90 days), MAAT was created by counting only the supply days, which is considered sufficient for investigating medication use in shorter time frames.⁸⁰

The last indicator measures receipt of either MACP or MAAT.

These indicators were previously examined within the acute treatment period.^{50,79} In our study, we used a 12-month period to capture services that take longer to access in BC (such as publicly-covered psychotherapy/counseling).

4.2.4 Explanatory Variables

Our explanatory variables include age, sex, income, and place of residence. As more recent household-level income data are not available, we used Statistics Canada's neighbourhood income quintiles. We coded patient's place of residence as rural if the second character of their postal code is zero, and urban for everyone else.

We created aggregated diagnostic groups (ADGs) following the Johns Hopkins Adjusted Clinical Groups Case-Mix system.¹⁰³ We used counts of major ADGs (mADGs) as a measure of health status, with higher counts signifying greater morbidity and clinical complexity.¹⁰³

Because BC does not have a formal rostering of patients with physicians, we adapted a method of linking individual patients to a major source of care (msoc).¹⁰⁴ First,

patients were assigned to physicians who charged the annual mental health planning (MHP) fee code. When MHP was claimed more than once in a year, we assigned the patient to the physician with the earliest MHP claim. Then, we designated as msocs those physicians who were visited exclusively by patients during follow-up. Failing these two approaches, we assigned patients to physicians who provided at least two-thirds of the follow-up care. The remaining patients who could not be assigned were given the same five-digit msoc number.

4.2.5 Statistical Analysis

We used descriptive statistics to summarize the cohort's characteristics. We also provided counts and proportions for the three indicators (MACP, MAAT, minimally adequate treatment), broken down by demographic and clinical characteristics. To determine if the indicators were associated with the explanatory variables and physician-level variations, we ran mixed-effects logistic regression, with patient demographic and clinical characteristics entered as fixed factors and physician study identifiers as random effects. We used the adjusted odds ratios (AOR) from the models as measures of the magnitude of association between the indicators and explanatory variables. Physician-level variations, on the other hand, were quantified using intraclass correlation coefficients (ICC). Higher ICCs were interpreted as indicative of greater physician variations. We also calculated median odds ratios (MORs) to complement the ICCs, which has a limited interpretation in a mixed-effects logistic regression.¹⁰⁵ In the context of our study, MOR refers to the median of the distribution of all ORs formed when a physician with higher odds is compared with another who has lower odds of providing care. When the odds of providing care vary

substantially across physicians, the OR distribution will be wider and its median farther from the value of 1. An MOR=1 could, thus, mean that all physicians are equally likely to provide a particular type of service; whereas an MOR>1 implies that some physicians are more likely than other physicians to provide a specific type of care. This intuitive interpretation of the MOR along with its being in the same scale as the other model ORs facilitate comparison of the various factors that influence receipt of minimally adequate care. Further details on the MOR can be found elsewhere.⁹¹

We used SAS/SQL software V 9.4 to link and manage multiple databases. We used *xtmixed* (with 30 integration points) and *xtmrho* routines running under Stata Version 13.1 to generate the model results.

4.3 Results

The number of individuals who received treatment for mood disorders in FY2010/11 was 275,575, representing 6% of the total population in BC, based on a 2011 population estimate of 4,576,000.¹⁰⁶ The majority of these individuals received mental health care only from general practitioners (77%). The rest visited psychiatrists exclusively (8%); general practitioners or specialists (including psychiatrists) (14.5%); and other specialists (excluding psychiatrists) (0.5%).

The final cohort included 108,101 individuals, representing 3% of the BC population who were over 19 years of age in 2011. These individuals who initiated some form of treatment for depression in 2011 were predominantly women, between the ages of

36 and 55 (41%), and urban residents. Higher concentrations were found in the lower income groups, particularly in the lowest quintile.

Close to half of the cohort members had no mADGs while a smaller proportion had 3 or more mADGs. Less than 1% (n=1003) were hospitalized with a mental health reason as the most responsible diagnosis. About 57.7% received ≥ 1 counseling/psychotherapy; 58.4% filled ≥ 1 antidepressant prescription; and up to 82.5% received either treatment.

The median number of mental health-related physician visits was 2 and were mostly visits to GPs; the majority (P75) had no psychiatry visits. The median number of counseling/psychotherapy visits was 1, provided mostly by GPs; the majority (P75) had no counseling/psychotherapy visits to psychiatrists (Table 4.2).

4.3.1 Minimally Adequate Counseling or Psychotherapy (MACP)

A small percentage (13%) of the cohort received MACP. Differences by sex, age, residence and health status were present and persisted even after adjustment for other factors in a multivariable regression model. Men had slightly higher odds than women of receiving MACP. Individuals between the ages of 19 and 35 had greater odds of receiving MACP compared with older adults (46-55 years) whose odds are considerably greater than those over 75 years of age. Rural residents had lower odds of MACP than those living in urban areas. Patients with higher mADG counts had greater odds of receiving MACP.

The provision of MACP appeared to vary substantially by physicians. Model results suggest that about 33% of the variation that cannot be explained by any of the fixed factors were due to practice variations. The MOR also indicates that some physicians had about three times the odds of other physicians (MOR=3.36) in providing MACP. Furthermore, MOR suggests that the odds of receiving MACP was contingent more on which physicians were visited than on patient characteristics like age, sex, etc.

4.3.2 Minimally Adequate Antidepressant Therapy (MAAT)

A little less than half of the cohort (48%) received MAAT. Differences by socio-demographic and health factors were present (Table 3), which also persisted even after adjusting for other factors in a multivariable regression model. Men seemed less likely than women to receive MAAT. Individuals between the ages of 19 and 35 had substantially lower odds than older adults (46 years and over). Rural residents had higher odds of receiving MAAT than those living in urban areas and patients with greater mADGs had greater odds of receiving MAAT. The residual variation that could be attributed to variations in physician practice was remarkably lower (9%) than that observed for MACP.

4.3.3 Minimally Adequate Treatment

A little more than half (53%) of the cohort received minimally adequate treatment. Higher proportions were observed in women, older individuals, higher income quintiles, and residents of rural areas (Table 4.3). These differences remained even after adjusting for other factors in a multivariable model. The odds for receiving minimally adequate treatment were lower in men than women. Individuals between

the ages of 19 and 35 had lower odds than older adults. The odds for patients in the lowest income quintile were lower than the odds for patients in the third quintile, whose odds, in turn, were lower than patients in the highest income quintile. The residual variation in the receipt of minimally adequate treatment that could be attributed to physician practice variations was similar to that of MAAT.

4.3.4 Discussion

We conducted a population-based, data linkage study to determine how often individuals diagnosed with MDD receive minimally adequate care and to measure disparities associated with various factors. We found that about half of the individuals diagnosed with depression receive minimally adequate care, mostly in the form of antidepressant therapy. Furthermore, whether patients receive these services depends, to varying degrees, on their sex, age, income level, health status, hospitalization for mental health reasons, place of residence, and the specific physicians they visit to seek care.

Our finding that 53% receive minimally adequate depression care appears low compared to a US study that reported a proportion of up 70% in a Medicaid-enrolled population.⁵⁰ The proportion of individuals who receive MACP (13%) in our study is also surprisingly low compared with 62% who receive similar care found in the US study.⁵⁰ However, our study found higher proportion of individuals who receive MAAT (48% versus 29.5% in the US study).

These contrasting numbers are explained partly by some methodological differences between our and the US study.⁵⁰ For example, we used a 12-month period for

ascertaining cases and for follow-up, versus a 12-week look back and 144-day follow-up periods used in the US study. We used population-based data in BC where depression treatment is provided mostly in primary care, whereas the US study examined Medicaid-enrollees receiving treatment in mental health specialty care settings where minimally adequate treatment tend to be high.⁴⁸ Our cohort also has fewer individuals who were hospitalized for mental health reasons (0.93% versus 15.7% in the US study). It is unlikely, nevertheless, that the marked differences in the levels of use are entirely due to methodological differences.

Indeed, similar levels of minimally adequate depression care have been reported in at least one Canadian province. A Quebec study,¹⁵ for instance, found that up to 13% of its survey respondents meeting criteria for MDD receive MACP. Additionally, the study reported that 46% of its respondents receive MAAT, and that 52% receive either type of treatment. We note, however, that the Quebec study define MACP as receipt of ≥ 12 consultations for mental health reasons in the previous year plus ≥ 1 recommended psychotherapy; and, MAAT as receipt of ≥ 1 prescription for antidepressants plus ≥ 3 medical visits.

It is also worth noting that the minimally adequate depression care received by the majority in our cohort is mainly through antidepressant therapy. Several reasons could account for this. First, most individuals with depression receive treatment in primary care where antidepressant therapy is more available and appears to be the treatment of choice.¹⁰⁷ Second, services provided by physicians constitute the majority, if not all, of the publicly-funded counseling/psychotherapy services and

accessing these is challenging because of significant wait-times.¹⁰⁸ Third, some fee-for-service physicians are predisposed to regard the dispensation of antidepressants as an opportunity to reduce time spent on patient counseling¹⁰⁹ and consequently increase the number of billable visits. BC instituted policies in 2008 to curb this propensity through financial incentives.¹¹⁰ However, we are not aware of any studies, to date, that demonstrate its impact on the provision of counseling/psychotherapy.

Another notable finding is the lower odds of receiving minimally adequate treatment overall among younger individuals. This disparity, in addition to the large gap in minimally adequate care, underscores the need to enhance access to counseling/psychotherapy or other forms of treatment for this age group. Given existing concerns about the lack of efficacy of and the adverse events linked to antidepressant therapy in the younger population,¹¹¹ it is difficult to discuss the expanded role antidepressants could have in addressing the considerable gap and disparity in treatment adequacy.

We also would like to highlight results that indicate the presence of substantial practice variations in the provision of MACP. Much of these variations could be explained by differences between mental health specialists and family physicians in the inclination and ability to deliver these services. It could also be due to differences in familiarity with treatment algorithms for depression and amount of practice time devoted to mental health.¹¹² Notwithstanding all these potential sources of variation, our results highlight the need for a higher level of consistency in providing these services since most patients with depression receive treatment from physicians and

that certain types of brief psychological therapies are known to be effective in primary care settings.¹¹³⁻¹¹⁵

Finally, our 6% estimate of the treated prevalence of mood disorders is slightly higher than the national estimate of 5.4% (95%CI, 4.9 to 5.8).⁷ This is partly because our estimate is based on the entire population, unlike the national survey which drew samples from individuals who are at least 15 years of age. The slight discrepancy could also be due to physician coding error in the claims database or to residual social desirability bias¹⁷ in the survey.²⁰

Our study adds to the body of knowledge on minimally adequate care for depression, especially in Canada where evidence is scarce. Our data sources do not share the same weaknesses as self-reported data and as such our results complement findings from existing literature currently dominated by survey studies. Like other studies, nevertheless, some limitations need to be kept in mind when considering our results.

First, case identification was done through ICD-9/10 codes, which although accurate is still associated with misclassification errors.¹⁰² Second, we were unable to examine the appropriateness of counseling/psychotherapy provided by physicians as our data do not allow us to classify the type of counseling/psychotherapy provided. Third, we were unable to track counseling/psychotherapy services that are not publicly covered and not provided by physicians. These services, which are usually provided by professional counselors and psychologists, are not captured in the databases we examined. As a result we may have underestimated the extent to which the population receives counseling/psychotherapy (particularly among high income

groups who could pay out-of-pocket costs for these services) and probably understated the degree of income-related disparity. The underestimation is likely to be small as analysis of recent Canadian data indicate that 3.4% (95%CI, 1.8 to 4.9) of those with probable MDD saw psychologists exclusively.¹⁶ Fourth, our pharmacotherapy results were based on filled prescriptions, which could overestimate actual use and underestimate prescribing practices. Fifth, because many of the individuals in our cohort could not be assigned to a specific major source of care, our models may have underestimated the magnitude of practice variations. Sixth, our results may not generalize to other jurisdictions due to the peculiarities of the BC health system. Last, our analyses are based only on individuals who receive a diagnosis from the formal health care system. If everyone with MDD could be accounted for, the magnitude of the gap in minimally adequate treatment for depression would be much higher than what our results show.

4.4 Conclusion

Only about half of those with depression receive either minimally adequate counseling/psychotherapy or minimally adequate antidepressant therapy. Disparities also persist, affecting mostly men and younger individuals. A multifactorial approach is therefore needed to improve access to and reduce variations in the receipt of minimally adequate depression care.

Table 4.1 Data Sources and Data Fields Used in the Study

Data Source	Data Fields
Consolidation File	Patient Study ID, Birth Month, Birth Year, Sex, 3-Digit Postal Code (or Forward Sortation Address), Neighbourhood Income Quintile, Number of Days Registered in the Provincial Health Services Plan
Physician Claims Data	Patient Study ID, Service Date, Practitioner Study ID Number, Specialty Code, Service Code, Fee Item Codes, Service Units, Amount Paid, Service Units, ICD9 Codes
Hospital Separations	Patient Study ID, Separation Date and ICD10 Codes
Prescription Database	Patient Study ID, Drug Identification Number, Date Dispensed, Quantity Dispensed, and Days Supply
Mental Health Services File	Patient Study ID, Activation Date, Type of Health Service, ICD9 Codes
Vital Statistics Deaths	Patient Study ID, Year and Month of Death

Table 4.2 Ambulatory Visits (25th Percentile, Median, and 75th Percentile) to Physicians by Individuals Diagnosed With Depression During a 12-Month Follow-Up

	All Physician Visits			Mental Health-Related Visits									Counseling/Psychotherapy Visits								
				All			GPs			Psychiatrists			All			GPs			Psychiatrists		
	P25	M	P75	P25	M	P75	P25	M	P75	P25	M	P75	P25	M	P75	P25	M	P75	P25	M	P75
BC	8	14	23	1	2	4	1	2	3	0	0	0	0	1	2	0	1	1	0	0	0
Sex																					
Men	6	12	22	1	2	4	1	2	4	0	0	0	0	1	2	0	0	1	0	0	0
Women	8	14	24	1	2	4	1	2	3	0	0	0	0	1	2	0	1	1	0	0	0
Age groups																					
19 to 25	6	10	17	1	2	5	1	2	4	0	0	0	0	1	2	0	1	1	0	0	0
26 to 35	6	11	19	1	2	4	1	2	4	0	0	0	0	1	2	0	1	1	0	0	0
36 to 45	6	11	19	1	2	4	1	2	4	0	0	0	0	1	2	0	1	1	0	0	0
46 to 55	7	13	21	1	2	4	1	2	4	0	0	0	0	1	2	0	1	1	0	0	0
56 to 65	9	15	25	1	2	4	1	2	3	0	0	0	0	1	2	0	0	1	0	0	0
66 to 75	13	21	32	1	2	3	1	2	3	0	0	0	0	1	2	0	0	1	0	0	0
Over 75	16	16	39	1	1	3	1	1	3	0	0	0	0	0	2	0	0	1	0	0	0

	All Physician Visits			Mental Health-Related Visits									Counseling/Psychotherapy Visits								
				All			GPs			Psychiatrists			All			GPs			Psychiatrists		
	P25	M	P75	P25	M	P75	P25	M	P75	P25	M	P75	P25	M	P75	P25	M	P75	P25	M	P75
Income quintile																					
1 (lowest)	8	15	25	1	2	4	1	2	4	0	0	0	0	1	2	0	0	1	0	0	0
2	8	14	24	1	2	4	1	2	3	0	0	0	0	1	2	0	0	1	0	0	0
3	8	13	23	1	2	4	1	2	4	0	0	0	0	1	2	0	1	1	0	0	0
4	7	13	22	1	2	4	1	2	3	0	0	0	0	1	2	0	1	1	0	0	0
5 (highest)	7	13	22	1	2	4	1	2	3	0	0	0	0	1	2	0	1	1	0	0	0
Major ADGs																					
0	6	10	16	1	2	4	1	2	3	0	0	0	0	1	2	0	1	1	0	0	0
1	9	15	24	1	2	4	1	2	4	0	0	0	0	1	2	0	1	1	0	0	0
2	14	23	35	1	2	5	1	2	4	0	0	0	0	1	2	0	1	2	0	0	0
3 or more	21	33	50	1	2	5	1	2	4	0	0	1	0	1	3	0	0	1	0	0	1
Place of residence																					
Rural	8	13	23	1	2	4	1	2	3	0	0	0	0	1	2	0	1	1	0	0	0
Urban	8	14	23	1	2	4	1	2	4	0	0	0	0	1	2	0	0	1	0	0	0

Table 4.3 Treatment Adequacy for Depression: Prevalence (%) and Adjusted Odds Ratio (AOR)

	n	Minimally Adequate Counseling/Psychotherapy		Minimally Adequate Antidepressant Therapy		Minimally Adequate Treatment	
		Count (%)	AOR (95% CI)	Count (%)	AOR (95% CI)	Count (%)	AOR (95% CI)
Total	108101	14047 (13.0)	-	52297 (48.4)	-	57450 (53.1)	-
Sex							
Men	37949	5305 (14.0)	1.04 (1.00,1.09)	17032 (44.9)	0.78 (0.76,0.80)	19123 (50.4)	0.81 (0.79,0.83)
Women	70152	8742 (12.5)	1.00	35265 (50.3)	1.00	38327 (54.6)	1.00
Age groups							
19 to 25	9879	1476 (15.0)	1.24 (1.16,1.33)	3362 (34.0)	0.48 (0.46,0.51)	3971 (40.2)	0.53 (0.50,0.56)
26 to 35	16963	2395 (14.1)	1.17 (1.10,1.25)	6865 (40.5)	0.65 (0.62,0.67)	7803 (46.0)	0.68 (0.65,0.71)
36 to 45	20493	2793 (13.6)	1.09 (1.03,1.16)	9483 (46.3)	0.82 (0.79,0.85)	10511 (51.3)	0.84 (0.80,0.87)
46 to 55	24011	3199 (13.3)	1.00	12338 (51.4)	1.00	13453 (56.0)	1.00
56 to 65	18433	2145 (11.6)	0.78 (0.74,0.83)	10321 (56.0)	1.20 (1.16,1.25)	11050 (60.0)	1.16 (1.12,1.21)
66 to 75	9177	954 (10.4)	0.60 (0.56,0.65)	5106 (55.6)	1.18 (1.12,1.24)	5442 (59.1)	1.10 (1.04,1.16)
Over 75	9145	1085 (11.9)	0.57 (0.53,0.63)	4822 (52.7)	1.01 (0.96,1.07)	5220 (57.1)	0.94 (0.89,0.99)
Income quintile							
1 (lowest)	22728	3001 (13.2)	1.00 (0.94,1.06)	10578 (46.5)	0.94 (0.91,0.98)	11702 (51.5)	0.95 (0.92,0.99)
2	22106	2849 (12.9)	0.99 (0.93,1.05)	10651 (48.2)	1.00 (0.96,1.04)	11659 (52.7)	1.00 (0.96,1.04)
3	21211	2711 (12.8)	1.00	10259 (48.4)	1.00	11219 (52.9)	1.00
4	21223	2713 (12.8)	0.99 (0.93,1.05)	10493 (49.4)	1.03 (1.00,1.08)	11501 (54.2)	1.04 (1.00,1.09)
5 (highest)	20833	2773 (13.3)	1.03 (0.97,1.10)	10316 (49.5)	1.03 (0.99,1.07)	11369 (54.6)	1.05 (1.01,1.09)

	n	Minimally Adequate Counseling/Psychotherapy		Minimally Adequate Antidepressant Therapy		Minimally Adequate Treatment	
		Count (%)	AOR (95% CI)	Count (%)	AOR (95% CI)	Count (%)	AOR (95% CI)
Total	108101	14047 (13.0)	-	52297 (48.4)	-	57450 (53.1)	-
Major ADGs							
0	52909	4942 (9.3)	1.00	24568 (46.4)	1.00	26444 (50.0)	1.00
1	32844	4587 (14.0)	1.77 (1.69,1.86)	16097 (49.0)	1.09 (1.06,1.12)	17764 (54.1)	1.18 (1.14,1.21)
2	14164	2584 (18.2)	2.77 (2.62,2.93)	7211 (50.9)	1.14 (1.09,1.18)	8128 (57.4)	1.33 (1.27,1.38)
3 or more	8184	1934 (23.6)	4.47 (4.18,4.78)	4421 (54.0)	1.26 (1.19,1.32)	5114 (62.5)	1.63 (1.55,1.72)
Place of residence							
Rural	12274	1427 (11.6)	0.84 (0.79,0.90)	6327 (51.6)	1.08 (1.03,1.12)	6839 (55.7)	1.05 (1.01,1.10)
Urban	95827	12620 (13.2)	1.00	45970 (48.0)	1.00	50611 (52.8)	1.00
Physician-Level Variation							
SD	-	-	1.28 (1.21,1.35)	-	0.58 (0.54,0.61)	-	0.58 (0.54,0.61)
ICC	-	-	0.33 (0.31,0.36)	-	0.09 (0.08,0.10)	-	0.09 (0.08,0.10)
Median OR	-	-	3.38	-	1.73	-	1.73

Figure 4.1 Timeline for Cohort Selection and Follow-Up

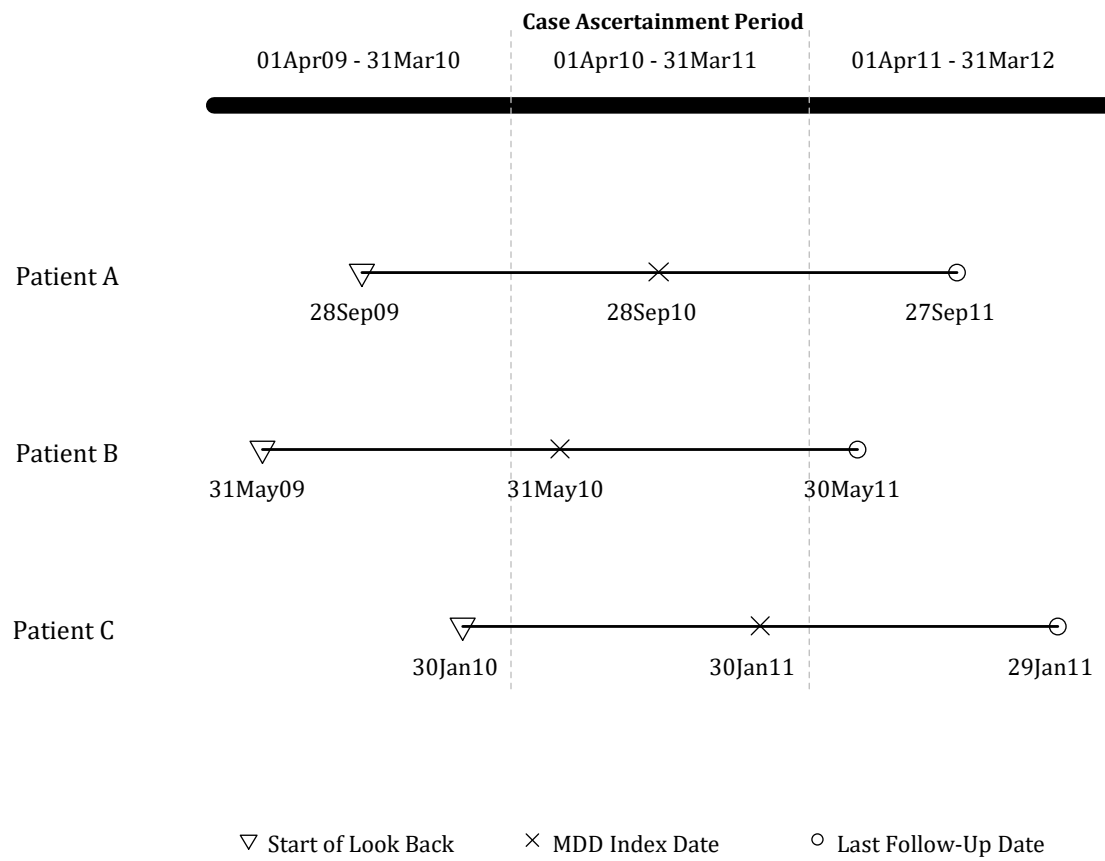
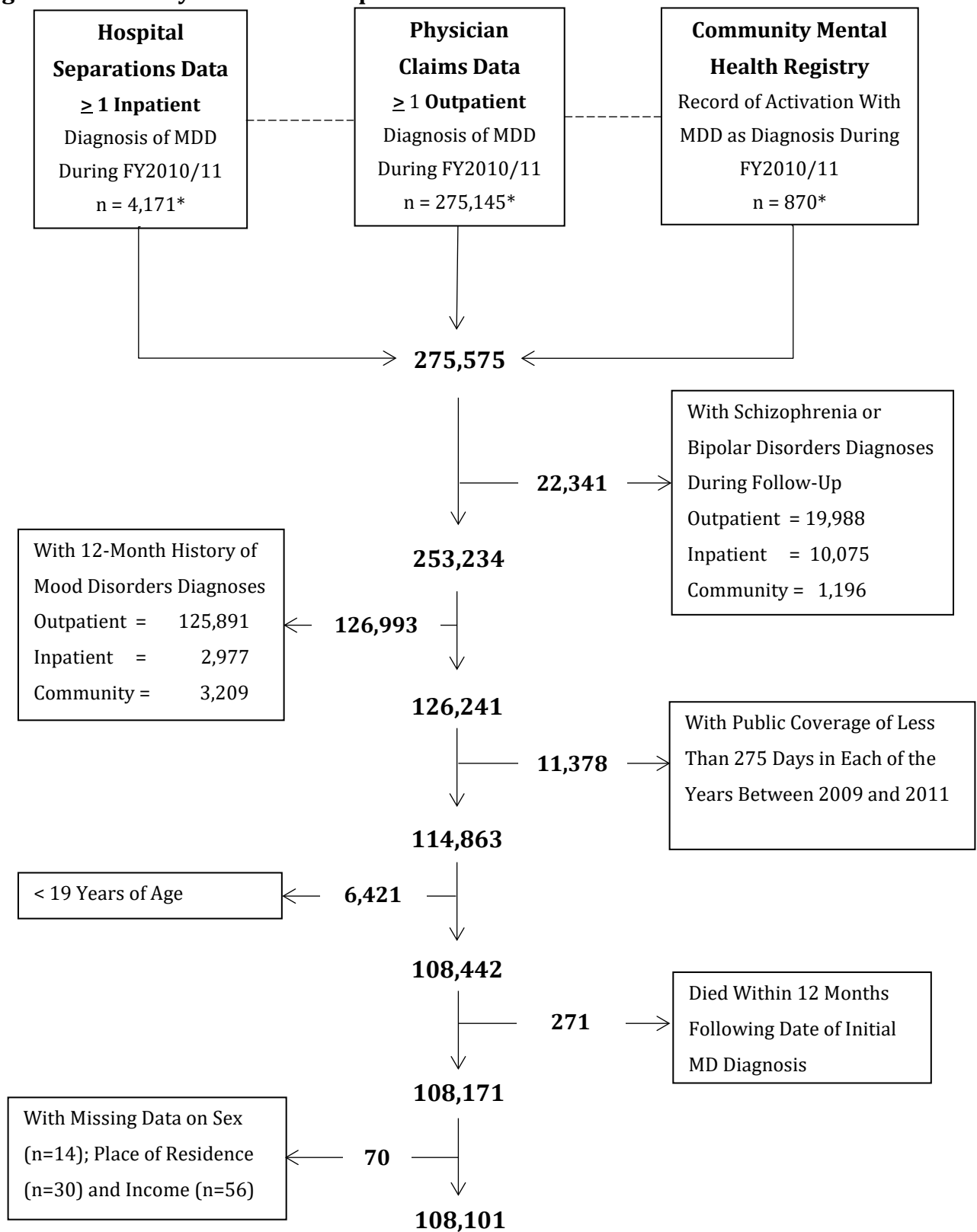
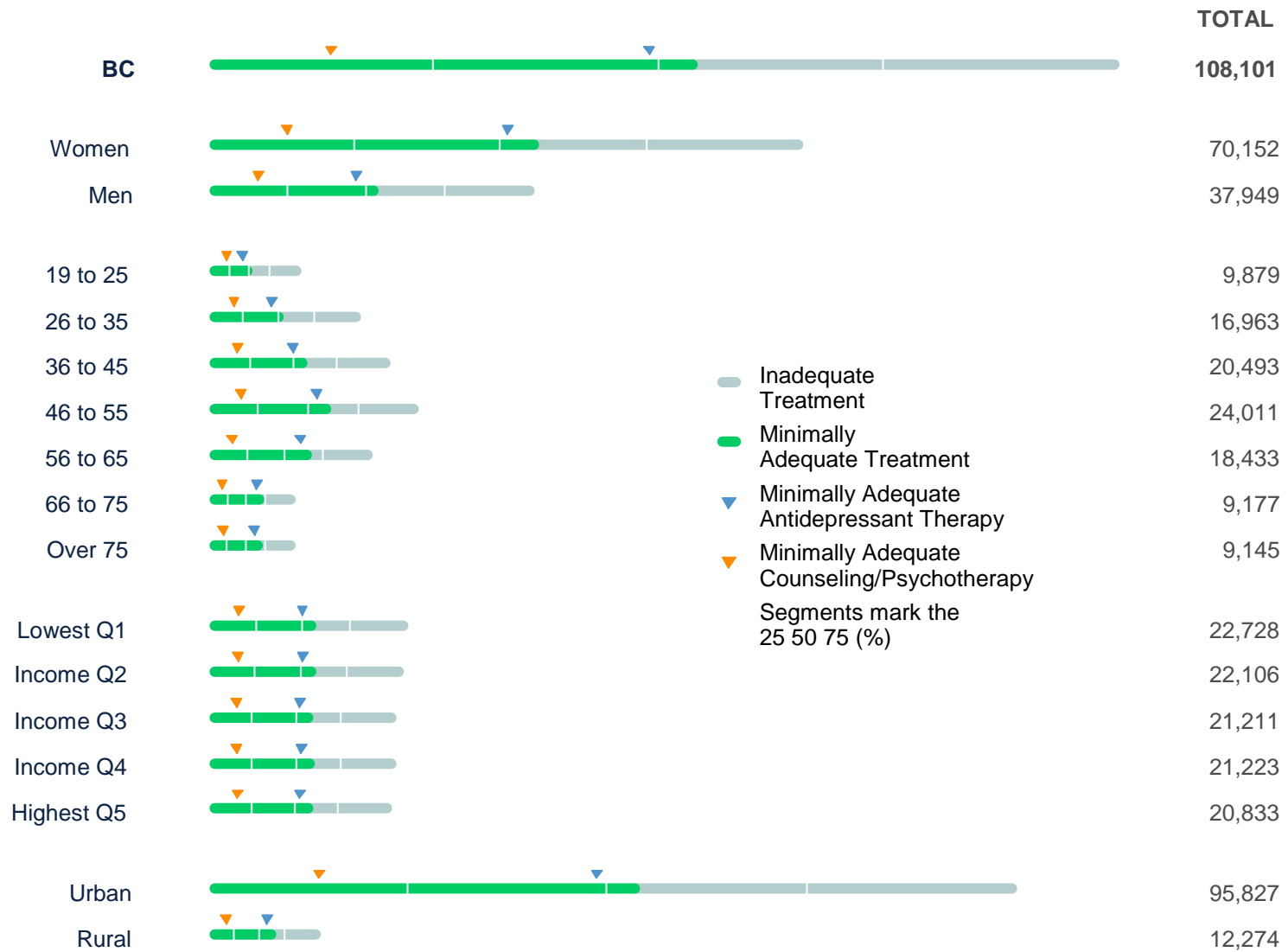


Figure 4.2 Study Cohort for Chapter 4



*Count of individuals who have a recorded diagnosis of depression (multiple listings are possible) in physician claims, hospital data and community mental health treatment registries during FY 2010/11.

Figure 4.3 Gaps in Minimally Adequate Depression Care in BC



Chapter 5

Comorbid Physical Conditions and Depression Care[‡]

5.1 Introduction

About 1 in 20 individuals in the general population have major depression.^{7,36} In those with chronic physical conditions like diabetes and heart disease, the prevalence is substantially higher with up to 1 in 5 individuals diagnosed as having comorbid depression.^{23,24} The higher co-occurrence has generally been attributed to the reciprocal relation between depression and chronic physical conditions.^{37,38} Chronic physical conditions, along with the stress, pain, discomfort and activity limitations that go with it, make people prone to having depression symptoms. Conversely, depression brings about physiological and behavioral changes that increases one's susceptibility to developing chronic physical conditions.^{116,117} A more recent view also proposes that some form of depression and chronic physical conditions share common aetiological pathways, like childhood abuse or trauma.¹¹⁸

When it co-occurs with a chronic physical condition, depression can have serious negative health consequences. Comorbid depression has been reported to be associated with increased risk of cardiac events after myocardial infarction as well as increased risk of mortality among those with heart disease.^{25,26} It increases functional

[‡]A version of this chapter has been submitted, peer-reviewed and is currently under revision.

disability^{119,27,120} and contributes to lower quality of life.²⁸ Indirectly, through its effect on behavior, comorbid depression lowers adherence to treatment regimens¹²¹⁻¹²³ and physical rehabilitation for the comorbid physical condition.¹²⁴ At the health system level, it results in higher health care costs.^{27,125,126}

In the general population, symptoms of depression are managed using psychological and pharmaceutical therapies or a combination of both.^{9,10} Similar treatment modalities are available for those with chronic physical conditions, but because the presence of comorbid conditions can potentially moderate the effectiveness of these treatments, recommendations vary based on the specific chronic physical condition and the strength of available evidence.^{40,116}

In spite of the importance of managing depression symptoms and the availability of effective treatments, concerns persist about untreated or under treated depression in individuals with comorbid physical conditions. In a recently conducted study,¹²⁷ for example, 13 of the 46 studies that were systematically reviewed reported lower levels of treatment or follow-up care among those with depression and comorbid physical condition when compared with those who have depression only. The under treatment is likely due to various factors, one of which is related to the difficulty associated with differentiating depression symptoms from those brought about by physical illnesses.¹²⁸ Another issue is the common view that depression is a normal response to the stresses that chronic physical conditions bring, and that it should go away on its own, over time, or once the medical comorbidity has been addressed.¹¹⁷ Compounding these issues are the apprehensions shared by many about potential

adverse risks associated with antidepressant therapy when administered in conjunction with medications for comorbid physical conditions.^{128,129} Together, these views and challenges predispose clinicians and patients to either consciously or unconsciously agree on treating first the chronic physical conditions, particularly in primary health care settings where clinical encounters tend to be brief and where multiple health concerns from patients with comorbid conditions often compete for GPs attention.^{130,131}

The presence of comorbid physical conditions, however, does not consistently result in receipt of lower levels of depression care.¹²⁷ Studies that have used comorbidity measures or number of comorbidities to examine the link between depression care and physical comorbidities suggest that those with one or more comorbid conditions actually receive higher levels of care.^{14,132} Other researchers that have examined specific comorbid conditions, on the other hand, have reported that levels of depression care vary by specific type of comorbidities.¹³³

The current inconsistency in the reported patterns of depression care underscores the importance of conducting studies that will complement available knowledge on the impact of the mere presence or the number of physical comorbidities on depression care levels. Because depression care can differ by type of comorbid condition, which makes certain patient groups more or less likely to be undertreated, and that studies that examine depression care patterns by specific types of medical comorbidities are particularly scarce, we decided to conduct this study. The specific

aim of this study is to compare depression care in individuals with and without specific comorbid physical conditions.

5.2 Methods

5.2.1 Data Sources

We examined de-identified and individual-level health administrative data from virtually everyone in BC, except for a small percentage (4%) of individuals whose health care is covered under federal jurisdiction. The individuals who were not represented in our data include registered status Indians (or aboriginals), veterans, federal penitentiary inmates, and members of the Royal Canadian Mounted Police.

The data fields used to derive the variables required for analyses were extracted from multiple health administrative databases, such as the government-sponsored health insurance registry, physician claims database, hospital database, outpatient prescription database and provincial death registry. These database files were linked through a common study identifier generated by Population Data BC, in lieu of the actual individual health and medical practitioner numbers. The names of the specific databases and their description are provided in Table 5.1.

Permission to access data was provided by the BC Ministry of Health Services and the BC College of Pharmacists. The Behavioral Research Ethics Board of the University of British Columbia granted ethics approval for the study.

5.2.2 Cohort

Following identical procedures, we constructed two study cohorts (one for the year 2012 and another for 2005) to see if there have been substantial changes in depression care patterns over time. The results presented and discussed in this chapter, however, are based only on the 2012 cohort, although tabled results for the 2005 cohort are also presented at the end of this chapter.

Everyone in the study cohorts had exactly 12 months of look back and follow-up periods to reduce or eliminate potential biases that arise when fixed dates for everyone are used in ascertaining chronic disease status or measuring health service use (Figure 5.1). The first step in constructing the cohorts involved identifying people who received depression diagnoses (Table 5.2) between January 1 and December 31 of a given cohort year. The earliest diagnosis received within the period was then noted and used as the index date for determining the 12-month look back and follow-up periods (Figure 5.1). Everyone who received at least one inpatient or two outpatient depression diagnosis within the look back period, which includes the index date, was considered to have met the criteria for inclusion in the cohorts. The physical comorbidities of the cohorts were similarly assessed, such that the presence of one inpatient or two outpatient diagnoses for various chronic conditions (Table 5.2) within the look back period was considered an indication that the patient has the corresponding comorbidity.

Those who had less than 275 days of registration in the publicly funded health care system in each of the three years covering the look back, case ascertainment and

follow-up periods were dropped from analysis. This was done to ensure that those who moved in and out of the province and therefore had incomplete health service records were excluded from analysis. Similarly, those who died at any point during the observation period were dropped from analysis. Finally, those under 19 years of age were also excluded as the study's focus is on adult mental health services only.

5.2.3 Outcome Variables

The following seven variables were constructed to examine the use of the following health services during a 12-month follow-up period, starting from the index date:

- 1) Counseling or Psychotherapy (CP) –a binary variable indicating whether patients received counseling or psychotherapy.
 - 2) Antidepressant Therapy (AD) – a binary variable indicating whether patients were treated with antidepressant therapy.
 - 3) Receipt of CP or AD – a binary variable indicating whether patients received either CP or AD.
 - 4) GP Visits – a continuous variable that sums up all the visits made by patients to GPs , regardless of whether the visits were to the same GP or not. Two versions of this variable were created, one for all GP visits and another for GP visits that are associated with a mental health diagnosis.
 - 5) GP Continuity of Care Index - a continuous variable that indicates the degree to which GP services and visits were provided by or made to the same physician.⁸⁵
- The values for this variable range from 0 to 1, with 1 indicating that all GP visits were made to the same physician. Two versions of this variable were created, one

for all GP visits and another for mental health related visits only. This variable was calculated for patients who have 3 or more visits only.

- 6) CP Counts– a continuous variable that sums up all the counseling or psychotherapy sessions received by the cohort. Only claims associated with a mental health-related diagnosis were counted.
- 7) Proportion of Days Covered (PDC) for Antidepressant Therapy – a continuous variable that quantifies the number of days in a given period that patients were on antidepressant therapy. The variable was calculated by creating time arrays that reflect the dates encompassed by each fill and summing up only those days that were covered by antidepressant fills. Two versions of this variable were created, one that measures PDC within a 180-day period and another within a 365-day period. Values for this variable range from 0 to 100, with higher values (i.e. 80) indicating good adherence.^{134,135}

5.2.4 Explanatory Variables

The main explanatory variable used in this analysis is the presence or absence of the following chronic conditions that have been the target of recent quality improvement efforts in BC: diabetes, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), chronic kidney disease (CKD), asthma, cerebrovascular disease (CVD), ischemic heart disease (IHD). Algorithms for detecting these conditions using health administrative data have been tested in a previously completed study that found no material improvements in quality of care from 2005 to 2011.¹³⁶

5.2.5 Analysis

The demographic characteristics of the study cohorts were summarized using counts and percentages. Health service use patterns were also descriptively summarized using means and standard deviations. We used generalized linear models to determine if those with physical comorbidities are more or less likely to receive various types of health services relative to those without physical comorbidities. Specifically, we used logistic regression for binary outcomes (i.e. receipt of CP, AD, and CP or AD), negative binomial regression for count data (i.e. GP visits and CP sessions), and log normal regression for continuous data (i.e. COCI and PDC). The regression models were run individually for each comorbid physical condition with the no comorbid condition as the reference category (e.g. patients with diabetes vs patients without diabetes). A separate model with a binary and overall indicator of comorbid physical condition was also run to determine if having at least one comorbid condition is associated with lower or higher use of health services. All models were adjusted for sex, age, income and place of residence and were reported with 95% confidence intervals. As the focus of the study is on the association between physical comorbidities and use of health care, regression coefficients for all the adjustment variables are not presented in any of the tabled results.

We used SAS/SQL software V 9.4 to link and manage multiple databases and Stata Version 13.1 to generate the model results.

5.3 Results

We have identified a total of 105,476 individuals with existing depression and who were in contact with the formal health system in 2012. Women, middle-aged individuals, and individuals who live in low income or urban areas have a disproportionate share of the prevalence of depression (Table 5.3).

5.3.1 Receipt of Psychological, Antidepressant and Combination Therapy

Around 91% of the cohort received either CP or AD, with AD being the modal treatment. Less than half (44%) of the cohort received both CP and AD. The proportion treated with AD is higher in women (78%) than men (73%) whereas the proportion that received CP is slightly higher among men (60%) than women (59%). Similarly, the proportion treated with AD is higher among rural (78%) compared with urban (76%) residents, whereas the proportion treated with CP is higher among urban (60%) compared with rural (56%) residents.

Overall, the proportion of those who received CP is higher in those with one or more comorbid conditions than in those with no comorbid condition, whereas the proportion of those who received AD is the same regardless of the presence of comorbid physical conditions. This general pattern of use does not apply, however, to those with CVD or CHF, who appear to have the lowest proportions of individuals who received either CP or AD (Table 5.3).

Results from the fully adjusted multivariable logistic regression models show similar trends. In general, those with comorbid conditions have higher odds of receiving CP,

except for those with CVD where the odds of receiving CP is not substantially different in those with and without comorbid physical conditions (Figure 5.2). In contrast, the general pattern for AD suggest that those with comorbid conditions have levels of AD use that are either similar or lower compared to those without comorbid conditions (Figure 5.3). With regards to receiving any depression care, individuals with comorbid CHF or CVD, compared with those that do not have these conditions, seemed to have lower odds of receiving either CP or AD (Figure 5.4).

5.3.2 GP visits and GP continuity of care

On average, members of the study cohorts visited their GPs about 12 times a year for any reason, and about 4 times a year specifically for mental health reasons. The COC index was higher (0.80) for mental health visits than for any type of visits (0.73). In terms of socio-demographic characteristics, women and older individuals have slightly higher GP visits, overall, but lower GP visits for mental health. Individuals over 75 years of age had the lowest GP mental health visits but the highest COCI for mental health (Table 5.4).

When compared with those without comorbid conditions, individuals that have one or more comorbid conditions have generally higher number of visits overall, but lower GP visits with mental health as the primary reason for consultation. This is true for most of the comorbid disorders as well, except for COPD and asthma where the number of mental health-related GP visits are slightly higher than those without physical comorbidities. Continuity of care, both for all types and for mental health

visits, is higher in those with compared with those without physical comorbidities (Table 5.4).

Results from the fully adjusted multivariable regression analyses suggest that GP visits vary by physical comorbidities. Generally, GP visits for any reason were higher in those with one or more physical comorbidities regardless of the type of physical comorbidity (Figure 5.5). Mental health-related GP visits, on the other hand, were higher in those with COPD and asthma and lower in those with diabetes (Figure 5.6). Overall, having one or more of the comorbid conditions examined was not consistently associated with higher GP visits for mental health reasons.

Continuity of care, overall and for mental health, remained marginally higher in those with physical comorbidity even after adjusting for differences in socio-demographic variables in a multivariable regression analysis (Figure 5.7 and Figure 5.8).

5.3.3 Counseling or Psychotherapy Sessions in a Year

On average, cohort members received about three CP sessions in a year except for those who reside in rural areas or those who were over 75 years of age (Table 5.5). The mean numbers of CP sessions are generally higher in those with comorbid conditions, except for those with CHF or COPD.

Adjusted results from the multivariable regression models also show the same general pattern of higher number of CP sessions for individuals with physical comorbidities (Figure 5.9).

5.3.4 Adherence to Antidepressant Therapy

The mean PDC for the cohort is 0.81 for the 180-day period and 0.76 for the 365-day period. Younger individuals had lower PDC than older individuals (Table 5.5).

Individuals with comorbid physical conditions had slightly higher PDC than individuals without comorbid physical conditions. Results from the multivariable regression analyses, however, indicate that the relative differences in PDC were either small in magnitude or not statistically significant (Figure 5.10 and Figure 5.11).

5.3.5 Results of Analysis from the 2005 Cohort

A total of 85,671 individuals with depression comprises the 2005 cohort, which is relatively smaller than the 2012 cohort. The difference in raw counts between the two cohorts appears to be primarily due to population growth as prevalence estimates of 2.7% and 2.9% were obtained using 2005 and 2012 population figures from BC.

The proportion of those who have at least one comorbid physical condition was 10% in 2005 and 13% in 2012. The increase appears to be due to a higher number of individuals diagnosed with diabetes, COPD and kidney disease in 2012 (Table 5.7 and Table 5.3).

While AD is the modal treatment for the 2005 and 2012 cohorts, the proportion of individuals treated with AD decreased slightly from 78% in 2005 to 76% in 2012, accompanied by a corresponding increase, from 56% in 2005 to 60% in 2012, in the proportion of individuals that received CP (Table 5.7).

Depression care patterns between those with and without comorbid physical conditions in the 2005 cohort are generally similar to the care patterns observed in 2012 (Table 5.8, Table 5.9 and Table 5.10).

5.4 Discussion

This chapter examined differences in health service use among patients diagnosed with major depression and comorbid physical condition compared with those without the comorbid physical condition. Results of the analyses indicate that individuals who have one or more comorbid physical conditions, in general, compared with those with depression alone received better mental health care in almost all indicators we examined (i.e. any psychological therapy, number of psychological therapy sessions, any depression treatment, and GP continuity of care) except for indicators that assess antidepressant therapy initiation and GP visits for mental health reasons. Results of analyses by individual comorbid physical conditions suggest that use of depression care is relatively lower in some patients with comorbid conditions. Overall, the observed patterns of use appear to be relatively stable, although there are areas where improvements appeared to have been made over time.

We are not aware of any similar studies that looked at GP continuity of care, GP visits for mental health reasons, or the basic provision of any psychological therapies to individuals with depression and comorbid conditions, hence, we are unable to compare results with previous findings. In terms of the number of psychological therapies or receipt of any treatment, we found that our results are similar to other

studies that reported a positive association between having a comorbid physical condition and higher number of psychological therapy sessions^{14,132} or greater likelihood of receiving any type of depression care.^{132,137,138}

Our finding about the lower odds of being on antidepressant therapy in those with comorbid physical conditions contradicts other studies that reported an association in the opposite direction.^{139,140} The inconsistency in the results could partly be explained by the fact that our cohort comprised prevalent cases of depression only. It could be that individuals with comorbid physical conditions who are receiving longer-term depression care are less likely to be on antidepressant therapy as discussed in a recently conducted systematic review.¹²⁷ Another study that examined antidepressant use in cohorts of mutually exclusive incident and prevalent cases of depression¹⁴¹ found opposing patterns of medication use that are consistent with findings reported in this chapter.

Our results also highlight the utility of studying specific physical comorbidities when looking at differences in depression care. Restricting the analysis to overall counts, or the mere presence of a comorbid condition would never have revealed, for example, that those with CVD have lower odds of receiving either psychological or antidepressant therapy. Similarly, we would have never found out that those with comorbid diabetes have relatively lower mean GP visits for mental health reasons.

The findings regarding lower levels of use raise some questions about mental health services that individuals with depression and specific physical condition are accessing and receiving. In individuals with CVD and depression, for instance, their

use of mental health care, other than the two modal treatments for depression, need to be examined. As well, the impact of relatively lower rates of mental health service use on health outcomes such as increased mortality or reduced quality of life need to be investigated. Finding answers to these questions are important given the potential disparity in outcomes resulting from unequal treatment and given that other researchers have reported similar findings.^{133,141}

It should be noted that lower levels of use does not necessarily mean poor quality of care. Case in point is the finding of lower odds of antidepressant use observed in those with at one or more comorbid condition, in general, and in individuals with CKD or cerebrovascular disease, in particular. Due to potential adverse drug interactions, clinical practice guidelines currently emphasize caution in the use of antidepressants to treat individuals with depression and comorbid physical conditions.^{40,116} In certain conditions like cerebrovascular disorders, the benefits associated with the use of antidepressant therapy and whether they outweigh the attendant risks remains arguable.^{129,142} As such, the lower odds of antidepressant initiation in those with comorbid physical condition do not necessarily mean poor care, and instead could be a reflection of clinicians' mindfulness of the cautionary notes stated in current practice guidelines. Future analyses should help determine the magnitude of adverse events that were prevented, if any, by the relatively lower odds of antidepressant initiation in this segment of the patient population.

Finally, we note the relatively good level of compliance or adherence among those who were initiated on antidepressant therapy as indicated by the mean proportion of

days covered of close to 0.80 or higher. The absence of disparity between those with and without comorbid physical condition is equally notable given that physical comorbidity could potentially affect compliance and adherence for various reasons like increased medication costs.¹⁴³ The higher adherence levels and the lack of disparity could partly be accounted for by public coverage in BC. Previous studies have shown that adherence to antidepressant therapy tend to be high in individuals whose access to medications are facilitated by government insurance.^{144,145}

Some limitations in this study need to be acknowledge when considering our results. First, only services rendered by either a GP or a medical specialist were and could be counted since services provided by those without medical degrees are not publicly covered in Canada and consequently not captured in our databases. Second, our measure of antidepressant use and adherence were based on refills, which could underestimate prescribing practices and overestimate actual use. Third, we were unable to assess the quality of psychological therapies due to absence of relevant details in the claims data. Last, our analysis included only those who have been diagnosed with depression as the primary diagnosis, effectively excluding those with either sub threshold or undiagnosed depression. Because it is likely that the counts of undiagnosed depression is higher in those with comorbid physical condition than in the general population, it is possible that we may have underestimated the extent of disparity in specific conditions with lower rates of use and at the same time overestimated the degree of greater use in other conditions.

5.5 Conclusion

Individuals with prevalent depression and at least one comorbid medical conditions receive better mental health care in terms of receipt of any psychological therapy, the number of psychological therapy sessions received in a year, receipt of any depression treatment and GP continuity of care. Initiation of antidepressant therapy appears to be less likely on these same individuals, but among those initiated, adherence was generally just as good as, and for some conditions slightly better, than those who do not have comorbid physical conditions. In designing interventions or policies, it is necessary to examine individual comorbidities since global measures of comorbidity, either as a binary or a count variable, will fail to reveal specific areas where clinically important disparities persist.

Table 5.1 Data Sources and Data Fields Used in Chapter 5

Database and Source	Data Fields
<i>Consolidation File, 2004 – 2013</i> British Columbia Ministry of Health [creator] (2014): Consolidation File (MSP Registration & Premium Billing). V2. Population Data BC [publisher]. Data Extract. MOH (2014). http://www.popdata.bc.ca/data	Patient Study ID, Birth Month, Birth Year, Sex, 3-Digit Postal Code (or Forward Sortation Address), Neighbourhood Income Quintile, Number of Days Registered in the Provincial Health Services Plan
<i>Physician Claims Database, 2004 – 2013</i> British Columbia Ministry of Health (2015): Medical Services Plan (MSP) Payment Information File. V2. Population Data BC [publisher]. Data Extract. MOH (2014). http://www.popdata.bc.ca/data	Patient Study ID, Service Date, Practitioner Study ID, Specialty Code, Service Code, Fee Item Code, Service Units, Amount Paid, ICD9 Codes
<i>Hospital Separations, 2004 – 2013</i> Canadian Institutes for Health Information [creator] (2015): Discharge Abstract Database (Hospital Separations). V2. Population Data BC [publisher]. Data Extract. MOH (2014). http://www.popdata.bc.ca/data	Patient Study ID, Separation Date and ICD10 Codes
<i>Prescription Database, 2004-2013</i> BC Ministry of Health [creator] (2014): PharmaNet. V2. BC Ministry of Health [publisher]. Data Extract. Data Stewardship Committee (2014). http://www.popdata.bc.ca/data	Patient Study ID, Drug Identification Number, Date Dispensed, Quantity Dispensed, and Days Supply
<i>Deaths Registry, 2004 – 2013</i> BC Vital Statistics Agency [creator] (2014): Vital Statistics Deaths. V2. Population Data BC. Data Extract BC Vital Statistics Agency (2014). http://www.popdata.bc.ca/data	Patient Study ID, Year and Month of Death

Table 5.2 ICD9 and ICD10 Diagnoses Used in Ascertaining Disease Status

Condition	ICD9 Codes From Physician Claims Data	ICD10 Codes From Hospital Discharge
Depression	296, 296.2x, 296.3x, 311.x	F32.x, F33.x, F39.x
Diabetes mellitus	250.x	E10.x-E14.x
Congestive heart failure (CHF)	428.x	I50.x
Chronic obstructive pulmonary disease (COPD)	491.x, 492.x, 494.x, 496.x	J41.x-J44.x, J47.x
Chronic kidney disease (CKD)	582.x, 583.x, 584.x, 585.x, 586.x, 587.x, 589.x	N01.x-N07.x, N18.x, N19.x, N26.x, N27.x
Asthma	493.x	J45.x, J46.x
Cerebrovascular Disease (CVD)	362.3x, 430.x, 431.x, 433.x, 434.x, 435.x, 436.x	G45.0x, G45.1x, G45.2x, G45.3x, G45.8x, G45.9x, H34.1x, I60.x, I61.x, I63.x, I64.x
Ischemic heart disease (IHD)	410.x, 413.x, 414.x	I20.x, I21.x, I25.x

Table 5.3 Demographic and Health Service Characteristics, 2012 Cohort

	Total Count (Col %)	Mental Health Care Received			
		Counseling or Psychotherapy (CP) Count (Row %)	Antidepressant Therapy (AD) Count (Row %)	CP or AD Count (Row %)	CP and AD Count (Row %)
Total	105476 (100.0)	62879 (59.6)	80475 (76.3)	96246 (91.2)	47108 (44.7)
Sex					
Women	70165 (66.5)	41683 (59.4)	54834 (78.2)	64477 (91.9)	32040 (45.7)
Men	35305 (33.5)	21193 (60.0)	25638 (72.6)	31764 (90.0)	15067 (42.7)
Missing	6 (0.0)	3 (50.0)	3 (50.0)	5 (83.3)	1 (16.7)
Age					
19 to 25	6249 (5.9)	3969 (63.5)	4375 (70.0)	5619 (89.9)	2725 (43.6)
26 to 35	15564 (14.8)	9491 (61.0)	11240 (72.2)	13995 (89.9)	6736 (43.3)
36 to 45	21242 (20.1)	12619 (59.4)	16063 (75.6)	19354 (91.1)	9328 (43.9)
46 to 55	26684 (25.3)	16046 (60.1)	20762 (77.8)	24474 (91.7)	12334 (46.2)
56 to 65	21191 (20.1)	12710 (60.0)	16741 (79.0)	19636 (92.7)	9815 (46.3)
66 to 75	8629 (8.2)	4981 (57.7)	6811 (78.9)	7956 (92.2)	3836 (44.5)
over 75	5917 (5.6)	3063 (51.8)	4483 (75.8)	5212 (88.1)	2334 (39.5)
Income					
Lowest Quintile	23608 (22.4)	14344 (60.8)	17484 (74.1)	21327 (90.3)	10501 (44.5)
Second Quintile	21336 (20.2)	12801 (60.0)	16290 (76.3)	19482 (91.3)	9609 (45.0)
Third Quintile	20411 (19.4)	12016 (58.9)	15719 (77.0)	18629 (91.3)	9106 (44.6)
Fourth Quintile	19468 (18.5)	11418 (58.7)	15111 (77.6)	17879 (91.8)	8650 (44.4)
Highest Quintile	17961 (17.0)	10723 (59.7)	13945 (77.6)	16537 (92.1)	8131 (45.3)
Missing	2692 (2.6)	1577 (58.6)	1926 (71.5)	2392 (88.9)	1111 (41.3)
Residence					
Rural	9998 (9.5)	5558 (55.6)	7803 (78.0)	9134 (91.4)	4227 (42.3)
Urban	85359 (80.9)	51525 (60.4)	64875 (76.0)	77889 (91.2)	38511 (45.1)
Missing	10119 (9.6)	5796 (57.3)	7797 (77.1)	9223 (91.1)	4370 (43.2)
Comorbid Physical Condition					
Diabetes	7180 (6.8)	4981 (69.4)	5477 (76.3)	6644 (92.5)	3814 (53.1)
CHF	837 (0.8)	523 (62.5)	636 (76.0)	752 (89.8)	407 (48.6)
COPD	2091 (2.0)	1347 (64.4)	1620 (77.5)	1938 (92.7)	1029 (49.2)
Kidney	921 (0.9)	619 (67.2)	696 (75.6)	864 (93.8)	451 (49.0)
Asthma	1982 (1.9)	1298 (65.5)	1518 (76.6)	1835 (92.6)	981 (49.5)
CVD	815 (0.8)	473 (58.0)	618 (75.8)	725 (89.0)	366 (44.9)
IHD	1993 (1.9)	1316 (66.0)	1528 (76.7)	1826 (91.6)	1018 (51.1)
No Comorbidity	92147 (87.4)	53998 (58.6)	70303 (76.3)	83965 (91.1)	40336 (43.8)
≥ 1 condition	13329 (12.6)	8881 (66.6)	10172 (76.3)	12281 (92.1)	6772 (50.8)

Table 5.4 GP Visits and GP Continuity of Care, 2012 Cohort

	GP Visits		Continuity of Care Index	
	All mean (SD)	Mental Health mean (SD)	All mean (SD)	Mental Health mean (SD)
Total	11.62 (11.46)	4.17 (7.44)	0.73 (0.24)	0.80 (0.28)
Sex				
Women	11.71 (10.56)	3.88 (6.14)	0.73 (0.23)	0.80 (0.27)
Men	11.43 (12.94)	4.76 (9.29)	0.74 (0.25)	0.79 (0.29)
Missing	76.00 (140.60)	61.33 (146.82)	0.81 (0.16)	0.87 (0.16)
Age				
19 to 25	10.16 (11.13)	4.45 (7.94)	0.59 (0.27)	0.70 (0.32)
26 to 35	11.75 (13.65)	5.27 (10.33)	0.64 (0.27)	0.72 (0.31)
36 to 45	11.15 (12.16)	4.77 (8.73)	0.70 (0.25)	0.77 (0.29)
46 to 55	11.17 (11.02)	4.19 (7.12)	0.75 (0.23)	0.81 (0.27)
56 to 65	11.16 (9.81)	3.48 (5.23)	0.79 (0.20)	0.84 (0.24)
66 to 75	12.89 (9.78)	3.00 (3.67)	0.82 (0.18)	0.86 (0.23)
over 75	16.29 (11.39)	3.01 (3.28)	0.85 (0.15)	0.90 (0.20)
Income				
Lowest Quintile	13.18 (13.63)	4.98 (9.64)	0.74 (0.24)	0.79 (0.28)
Second Quintile	12.05 (11.66)	4.21 (7.35)	0.73 (0.24)	0.79 (0.28)
Third Quintile	11.26 (10.76)	3.99 (6.68)	0.74 (0.24)	0.80 (0.28)
Fourth Quintile	10.63 (9.94)	3.71 (5.97)	0.74 (0.24)	0.80 (0.28)
Highest Quintile	10.60 (10.03)	3.75 (6.21)	0.73 (0.24)	0.80 (0.28)
Missing	11.20 (11.81)	4.36 (8.10)	0.70 (0.26)	0.75 (0.30)
Residence				
Rural	11.71 (11.00)	3.97 (6.64)	0.73 (0.24)	0.79 (0.28)
Urban	11.65 (11.65)	4.25 (7.72)	0.74 (0.24)	0.80 (0.28)
Missing	11.25 (10.23)	3.74 (5.58)	0.73 (0.23)	0.78 (0.27)
Comorbid Physical Condition				
Diabetes	15.76 (12.62)	3.44 (7.05)	0.82 (0.18)	0.85 (0.24)
CHF	21.97 (15.65)	3.23 (5.23)	0.85 (0.14)	0.87 (0.23)
COPD	19.34 (17.64)	4.58 (11.26)	0.81 (0.18)	0.85 (0.23)
Kidney	18.32 (14.67)	3.54 (6.39)	0.82 (0.18)	0.86 (0.24)
Asthma	18.81 (18.88)	5.29 (11.87)	0.75 (0.22)	0.80 (0.28)
CVD	18.00 (16.05)	3.58 (5.69)	0.82 (0.18)	0.88 (0.23)
IHD	17.46 (15.82)	3.69 (9.85)	0.81 (0.18)	0.85 (0.24)
No Comorbidity	10.92 (10.94)	4.23 (7.47)	0.72 (0.24)	0.79 (0.28)
≥ 1 Comorbid Condition	16.47 (13.63)	3.78 (7.21)	0.80 (0.19)	0.84 (0.24)

Table 5.5 Counseling, Psychotherapy and Antidepressant Therapy, 2012 Cohort

	Count of CP Sessions/Year	Proportion of Days Covered	
		180 Days	365 Days
	Mean (SD)	Mean (SD)	Mean (SD)
Total	3.22 (5.99)	0.81 (0.25)	0.76 (0.29)
Sex			
Women	3.18 (6.02)	0.81 (0.24)	0.77 (0.28)
Men	3.29 (5.93)	0.80 (0.26)	0.74 (0.30)
Missing	4.83 (7.00)	0.99 (0.02)	0.99 (0.02)
Age			
19 to 25	3.39 (6.45)	0.71 (0.28)	0.62 (0.32)
26 to 35	3.07 (5.64)	0.76 (0.27)	0.69 (0.31)
36 to 45	3.22 (6.16)	0.79 (0.25)	0.73 (0.29)
46 to 55	3.42 (6.34)	0.82 (0.24)	0.77 (0.28)
56 to 65	3.39 (6.00)	0.84 (0.23)	0.80 (0.26)
66 to 75	2.98 (5.37)	0.85 (0.23)	0.82 (0.26)
Over 75	2.28 (4.68)	0.85 (0.23)	0.82 (0.26)
Income			
Lowest Quintile	3.31 (6.03)	0.80 (0.25)	0.75 (0.29)
Second Quintile	3.17 (5.74)	0.80 (0.25)	0.75 (0.29)
Third Quintile	3.12 (5.68)	0.81 (0.25)	0.76 (0.28)
Fourth Quintile	3.17 (6.14)	0.81 (0.24)	0.76 (0.28)
Highest Quintile	3.35 (6.42)	0.81 (0.25)	0.76 (0.28)
Missing	3.01 (5.78)	0.79 (0.25)	0.73 (0.29)
Residence			
Rural	2.46 (4.31)	0.81 (0.24)	0.77 (0.28)
Urban	3.40 (6.28)	0.81 (0.25)	0.75 (0.29)
Missing	2.47 (4.63)	0.81 (0.25)	0.76 (0.28)
Comorbid Physical Condition			
Diabetes	4.26 (6.88)	0.84 (0.23)	0.81 (0.26)
CHF	2.85 (4.53)	0.85 (0.22)	0.82 (0.26)
COPD	2.99 (4.96)	0.84 (0.24)	0.81 (0.27)
CKD	3.88 (5.99)	0.86 (0.23)	0.82 (0.26)
Asthma	3.82 (6.47)	0.80 (0.26)	0.76 (0.29)
CVD	3.18 (5.79)	0.85 (0.23)	0.82 (0.26)
IHD	3.78 (6.18)	0.82 (0.24)	0.79 (0.28)
No Comorbidity	3.13 (5.93)	0.80 (0.25)	0.75 (0.29)
≥ 1 Comorbid Condition	3.83 (6.32)	0.84 (0.24)	0.80 (0.27)

Table 5.6 Relative Differences in Depression-Related Care Between Those With and Without Comorbid Physical Conditions, 2012 Cohort

	Diabetes	CHF	COPD	Kidney	Asthma	CVD	IHD
Depression Care (Odds Ratio and 95% CI)							
CP	1.67	1.32	1.33	1.52	1.29	1.04	1.43
	1.58, 1.76	1.14, 1.52	1.22, 1.46	1.32, 1.75	1.17, 1.42	0.91, 1.20	1.30, 1.58
AD	0.95	0.96	1.00	0.92	1.00	0.94	0.99
	0.89, 1.00	0.81, 1.13	0.90, 1.12	0.79, 1.07	0.90, 1.11	0.80, 1.11	0.89, 1.10
CP or AD	1.2	0.95	1.24	1.53	1.19	0.83	1.08
	1.09, 1.31	0.76, 1.20	1.05, 1.46	1.17, 2.01	1.00, 1.41	0.66, 1.04	0.92, 1.27
GP Visits in a Year (Rate Ratio and 95% CI)							
All	1.34	1.65	1.56	1.44	1.62	1.38	1.41
	1.30, 1.37	1.53, 1.77	1.49, 1.63	1.35, 1.54	1.55, 1.70	1.29, 1.49	1.35, 1.48
Mental Health CP Sessions in a Year	0.89	0.95	1.21	0.96	1.22	1.02	0.96
	0.86, 0.91	0.88, 1.03	1.15, 1.27	0.89, 1.04	1.16, 1.28	0.94, 1.10	0.91, 1.01
	1.37	0.98	0.99	1.27	1.20	1.08	1.22
	1.33, 1.41	0.91, 1.07	0.94, 1.04	1.18, 1.36	1.14, 1.26	1.00, 1.17	1.16, 1.28
Continuity of Care (Ratio of Means and 95% CI)							
All	1.05	1.05	1.03	1.03	1.02	1.02	1.03
	1.05, 1.06	1.03, 1.07	1.01, 1.04	1.01, 1.05	1.01, 1.04	1.00, 1.04	1.01, 1.04
MH only	1.03	1.02	1.01	1.02	1.00	1.04	1.02
	1.02, 1.04	0.98, 1.05	0.99, 1.03	0.99, 1.06	0.98, 1.02	1.00, 1.07	1.00, 1.04
Antidepressant Therapy, Proportion of Days Covered (Ratio of Means and 95% CI)							
180 days	1.02	1.02	1.00	1.03	0.99	1.02	0.99
	1.01, 1.03	0.99, 1.04	0.99, 1.02	1.01, 1.05	0.98, 1.01	0.99, 1.04	0.97, 1.00
365 days	1.03	1.02	1.02	1.03	1.00	1.03	1.00
	1.02, 1.04	1.00, 1.05	1.00, 1.03	1.00, 1.06	0.98, 1.02	1.00, 1.05	0.98, 1.01

Table 5.7 Demographic and Health Service Characteristics, 2005 Cohort

	Total Count (Col %)	Mental Health Care Received			
		Counseling or Psychotherapy (CP) Count (Row %)	Antidepressant Therapy (AD) Count (Row %)	CP or AD Count (Row %)	CP and AD Count (Row %)
Total	85671 (100.0)	48328 (56.4)	66437 (77.5)	78259 (91.3)	36506 (42.6)
Sex					
Women	58916 (68.8)	33037 (56.1)	46622 (79.1)	54092 (91.8)	25567 (43.4)
Men	26741 (31.2)	15285 (57.2)	19807 (74.1)	24156 (90.3)	10936 (40.9)
Missing	14 (0.0)	6 (42.9)	8 (57.1)	11 (78.6)	3 (21.4)
Age					
19 to 25	5530 (6.5)	3216 (58.2)	4093 (74.0)	5002 (90.5)	2307 (41.7)
26 to 35	13418 (15.7)	7531 (56.1)	10038 (74.8)	12108 (90.2)	5461 (40.7)
36 to 45	21287 (24.8)	11883 (55.8)	16485 (77.4)	19384 (91.1)	8984 (42.2)
46 to 55	22338 (26.1)	12884 (57.7)	17763 (79.5)	20616 (92.3)	10031 (44.9)
56 to 65	13266 (15.5)	7641 (57.6)	10500 (79.1)	12269 (92.5)	5872 (44.3)
66 to 75	5191 (6.1)	2850 (54.9)	4104 (79.1)	4776 (92.0)	2178 (42.0)
Over 75	4641 (5.4)	2323 (50.1)	3454 (74.4)	4104 (88.4)	1673 (36.1)
Income					
Lowest Quintile	18992 (22.2)	11053 (58.2)	14317 (75.4)	17191 (90.5)	8179 (43.1)
Second Quintile	16676 (19.5)	9338 (56.0)	12956 (77.7)	15235 (91.4)	7059 (42.3)
Third Quintile	16023 (18.7)	8857 (55.3)	12570 (78.4)	14651 (91.4)	6776 (42.3)
Fourth Quintile	15505 (18.1)	8596 (55.4)	12261 (79.1)	14281 (92.1)	6576 (42.4)
Highest Quintile	13962 (16.3)	7992 (57.2)	10994 (78.7)	12893 (92.3)	6093 (43.6)
Missing	4513 (5.3)	2492 (55.2)	3339 (74.0)	4008 (88.8)	1823 (40.4)
Residence					
Rural	8394 (9.8)	4568 (54.4)	6733 (80.2)	7705 (91.8)	3596 (42.8)
Urban	68453 (79.9)	39301 (57.4)	52874 (77.2)	62641 (91.5)	29534 (43.1)
Missing	8824 (10.3)	4459 (50.5)	6830 (77.4)	7913 (89.7)	3376 (38.3)
Comorbid Physical Condition					
Diabetes	3821 (4.5)	2571 (67.3)	2922 (76.5)	3560 (93.2)	1933 (50.6)
CHF	488 (0.6)	264 (54.1)	359 (73.6)	429 (87.9)	194 (39.8)
COPD	708 (0.8)	424 (59.9)	578 (81.6)	652 (92.1)	350 (49.4)
Kidney	366 (0.4)	256 (69.9)	256 (69.9)	340 (92.9)	172 (47.0)
Asthma	1903 (2.2)	1137 (59.7)	1463 (76.9)	1742 (91.5)	858 (45.1)
CVD	547 (0.6)	312 (57.0)	400 (73.1)	481 (87.9)	231 (42.2)
IHD	1663 (1.9)	1006 (60.5)	1286 (77.3)	1521 (91.5)	771 (46.4)
No Comorbidity	77470 (90.4)	43158 (55.7)	60157 (77.7)	70703 (91.3)	36612 (42.1)
≥ 1 Condition	8201 (9.6)	5170 (63.0)	6280 (76.6)	7556 (92.1)	3894 (47.5)

Table 5.8 GP Visits and GP Continuity of Care, 2005 Cohort

	GP Visits		Continuity of Care	
	All Mean (SD)	Mental Health Mean (SD)	All Mean (SD)	Mental Health Mean (SD)
Total	11.54 (12.06)	4.10 (8.26)	0.76 (0.23)	0.80 (0.27)
Sex				
Women	11.86 (11.20)	3.96 (7.08)	0.75 (0.22)	0.80 (0.26)
Men	10.85 (13.74)	4.42 (10.40)	0.76 (0.24)	0.80 (0.28)
Missing	9.14 (6.06)	1.57 (1.34)	0.75 (0.24)	0.76 (0.27)
Age				
19 to 25	10.48 (11.48)	4.12 (8.44)	0.62 (0.26)	0.71 (0.31)
26 to 35	11.05 (13.05)	4.54 (9.67)	0.67 (0.25)	0.74 (0.30)
36 to 45	11.01 (12.84)	4.50 (9.39)	0.73 (0.23)	0.79 (0.27)
46 to 55	11.29 (12.31)	4.27 (8.82)	0.78 (0.21)	0.82 (0.25)
56 to 65	11.54 (10.05)	3.46 (5.60)	0.81 (0.19)	0.85 (0.24)
66 to 75	13.53 (10.22)	3.17 (4.12)	0.84 (0.16)	0.86 (0.22)
Over 75	15.70 (10.93)	3.07 (3.52)	0.87 (0.14)	0.89 (0.19)
Income				
Lowest Quintile	13.01 (14.24)	4.84 (10.63)	0.75 (0.23)	0.79 (0.27)
Second Quintile	11.79 (12.62)	4.21 (8.81)	0.75 (0.23)	0.80 (0.27)
Third Quintile	11.11 (10.98)	3.89 (7.11)	0.76 (0.23)	0.80 (0.27)
Fourth Quintile	10.58 (10.24)	3.72 (6.41)	0.75 (0.23)	0.80 (0.27)
Highest Quintile	10.22 (9.95)	3.63 (6.45)	0.75 (0.23)	0.80 (0.27)
Missing	13.39 (14.26)	4.11 (9.00)	0.78 (0.22)	0.81 (0.26)
Residence				
Rural	11.60 (10.87)	3.90 (6.19)	0.74 (0.22)	0.79 (0.27)
Urban	11.61 (12.38)	4.15 (8.69)	0.76 (0.23)	0.80 (0.27)
Missing	10.99 (10.51)	3.93 (6.32)	0.76 (0.22)	0.79 (0.26)
Comorbid Physical Condition				
Diabetes	16.22 (13.26)	3.40 (7.40)	0.83 (0.17)	0.84 (0.25)
CHF	21.56 (16.92)	3.37 (5.85)	0.87 (0.14)	0.89 (0.20)
COPD	18.81 (15.02)	4.14 (8.61)	0.84 (0.16)	0.86 (0.22)
Kidney	16.79 (17.76)	3.99 (9.55)	0.84 (0.16)	0.87 (0.24)
Asthma	18.65 (17.29)	5.11 (11.06)	0.76 (0.21)	0.79 (0.27)
CVD	18.89 (13.48)	3.63 (5.15)	0.86 (0.15)	0.87 (0.22)
IHD	16.83 (13.05)	3.08 (3.81)	0.84 (0.16)	0.84 (0.24)
No Comorbidity	10.98 (11.67)	4.13 (8.31)	0.75 (0.23)	0.80 (0.27)
≥ 1 Comorbid Condition	16.84 (14.24)	3.79 (7.77)	0.82 (0.18)	0.83 (0.25)

Table 5.9 Counseling, Psychotherapy and Antidepressant Therapy, 2005 Cohort

	Count of CP Sessions/Year	Proportion of Days Covered	
		180 Days	365 Days
	Mean (SD)	Mean (SD)	Mean (SD)
Total	3.22 (6.70)	0.79 (0.25)	0.74 (0.29)
Sex			
Women	3.15 (6.76)	0.79 (0.25)	0.74 (0.29)
Men	3.36 (6.57)	0.78 (0.26)	0.72 (0.30)
Missing	2.50 (4.22)	0.81 (0.31)	0.78 (0.32)
Age			
19 to 25	3.14 (6.66)	0.71 (0.29)	0.63 (0.32)
26 to 35	2.93 (6.13)	0.75 (0.27)	0.67 (0.31)
36 to 45	3.17 (6.74)	0.78 (0.26)	0.72 (0.29)
46 to 55	3.54 (7.24)	0.81 (0.24)	0.76 (0.28)
56 to 65	3.48 (6.90)	0.82 (0.24)	0.78 (0.27)
66 to 75	3.01 (6.20)	0.83 (0.24)	0.79 (0.27)
Over 75	2.27 (5.02)	0.83 (0.24)	0.79 (0.28)
Income			
Lowest Quintile	3.34 (6.68)	0.79 (0.26)	0.73 (0.30)
Second Quintile	3.09 (6.27)	0.78 (0.26)	0.73 (0.30)
Third Quintile	3.15 (6.66)	0.79 (0.25)	0.74 (0.29)
Fourth Quintile	3.21 (6.97)	0.80 (0.25)	0.74 (0.29)
Highest Quintile	3.33 (7.05)	0.80 (0.25)	0.74 (0.28)
Missing	3.04 (6.38)	0.79 (0.26)	0.73 (0.31)
Residence			
Rural	2.43 (5.31)	0.80 (0.25)	0.74 (0.29)
Urban	3.48 (7.08)	0.79 (0.26)	0.74 (0.29)
Missing	1.93 (4.18)	0.79 (0.25)	0.74 (0.29)
Comorbid Physical Condition			
Diabetes	4.43 (8.05)	0.82 (0.25)	0.79 (0.28)
CHF	3.31 (7.16)	0.85 (0.22)	0.82 (0.27)
COPD	3.68 (6.88)	0.84 (0.24)	0.80 (0.27)
Kidney	5.10 (8.25)	0.82 (0.25)	0.78 (0.29)
Asthma	3.48 (6.66)	0.79 (0.26)	0.74 (0.30)
CVD	3.77 (7.80)	0.81 (0.26)	0.79 (0.28)
IHD	3.62 (6.68)	0.83 (0.24)	0.78 (0.29)
No Comorbidity	3.14 (6.61)	0.79 (0.26)	0.73 (0.29)
≥ 1 Comorbid Condition	3.97 (7.47)	0.81 (0.25)	0.77 (0.29)

Table 5.10 Relative Differences in Mental Health Care Between Those With and Without Comorbid Physical Conditions, 2005 Cohort

	Diabetes	CHF	COPD	Kidney	Asthma	CVD	IHD
Depression Care (Odds Ratio and 95% CI)							
CP	1.64	1.02	1.22	1.89	1.14	1.11	1.24
	1.53, 1.76	0.85, 1.22	1.05, 1.42	1.51, 2.36	1.04, 1.25	0.94, 1.32	1.12, 1.37
AD	0.93	0.88	1.32	0.69	0.95	0.81	1.01
	0.86, 1.01	0.72, 1.09	1.09, 1.61	0.55, 0.86	0.85, 1.05	0.67, 0.99	0.89, 1.13
CP or AD	1.31	0.81	1.17	1.32	1.01	0.74	1.05
	1.15, 1.49	0.61, 1.07	0.89, 1.55	0.88, 1.97	0.86, 1.19	0.57, 0.96	0.88, 1.25
GP Visits in a Year (Rate Ratio and 95% CI)							
All	1.36	1.59	1.48	1.36	1.62	1.47	1.36
	1.31, 1.41	1.45, 1.75	1.37, 1.60	1.22, 1.51	1.54, 1.69	1.35, 1.60	1.29, 1.43
Mental Health	0.86	0.97	1.13	1.03	1.24	1.03	0.84
	0.83, 0.90	0.88, 1.08	1.04, 1.23	0.92, 1.16	1.18, 1.30	0.94, 1.14	0.79, 0.89
CP sessions	1.37	1.13	1.19	1.62	1.07	1.28	1.15
	1.32, 1.42	1.02, 1.25	1.09, 1.29	1.44, 1.81	1.02, 1.13	1.17, 1.41	1.08, 1.21
Continuity of Care (Ratio of Means and 95% CI)							
All Visits	1.05	1.04	1.03	1.05	1.01	1.05	1.03
	1.04, 1.06	1.02, 1.07	1.01, 1.05	1.02, 1.08	0.99, 1.02	1.02, 1.07	1.02, 1.04
MH Only	1.01	1.03	1.03	1.05	0.98	1.03	1.00
	0.99, 1.02	0.99, 1.08	0.99, 1.06	1.00, 1.10	0.96, 1.00	0.99, 1.07	0.98, 1.02
Antidepressant Therapy, Proportion of Days Covered (Ratio of Means and 95% CI)							
180 Days	1.01	1.04	1.03	1.01	1.00	0.99	1.02
	1.00, 1.02	1.01, 1.07	1.00, 1.05	0.97, 1.05	0.98, 1.01	0.96, 1.02	1.00, 1.03
365 Days	1.03	1.06	1.04	1.03	1.00	1.02	1.01
	1.02, 1.05	1.02, 1.10	1.01, 1.07	0.98, 1.07	0.98, 1.02	0.98, 1.06	0.99, 1.03

Figure 5.1 Study Cohort for Chapter 5

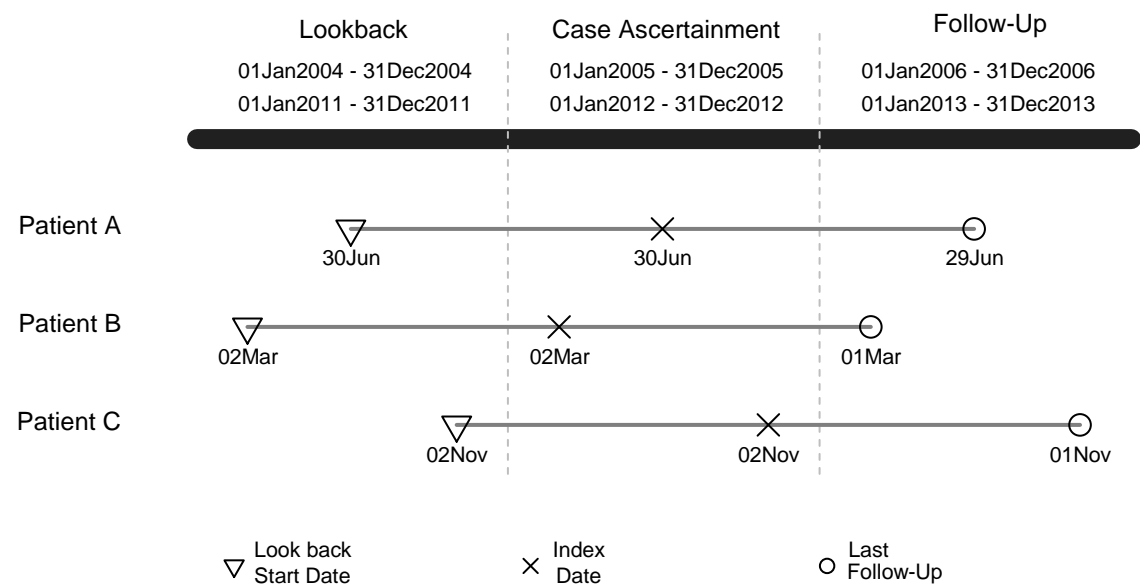


Figure 5.2 Relative Differences in the Odds of Receiving Psychological Therapy in Those With and Without Comorbid Physical Conditions

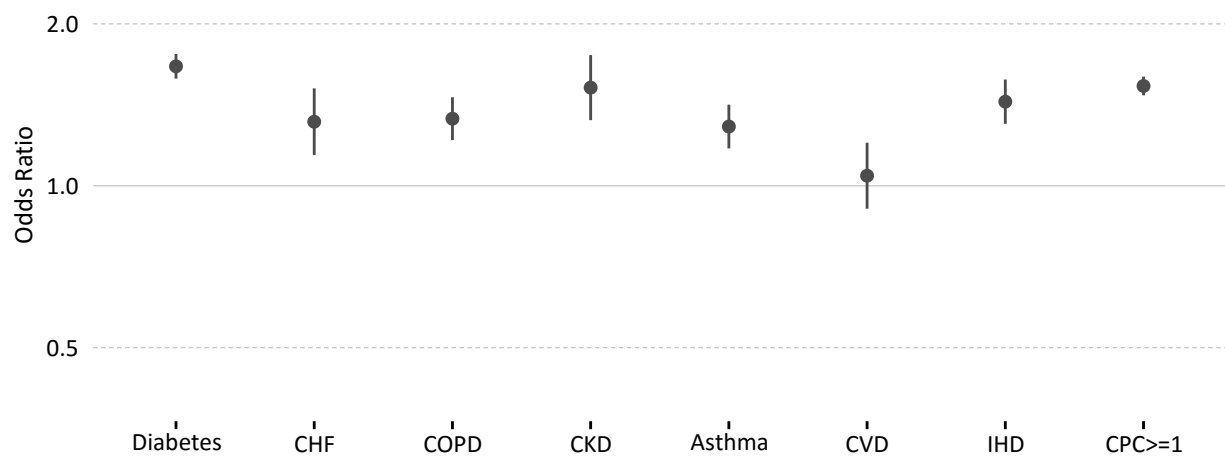


Figure 5.3 Relative Differences in the Odds of Antidepressant Therapy in Those With and Without Comorbid Physical Conditions

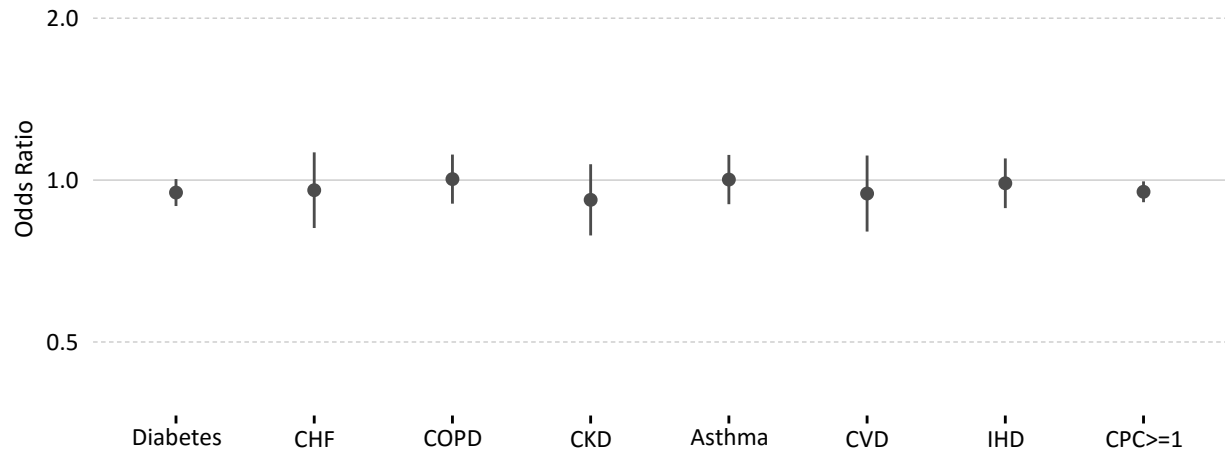


Figure 5.4 Relative Differences in the Odds of Receiving Either Psychological or Antidepressant Therapy in Those With and Without Comorbid Physical Conditions

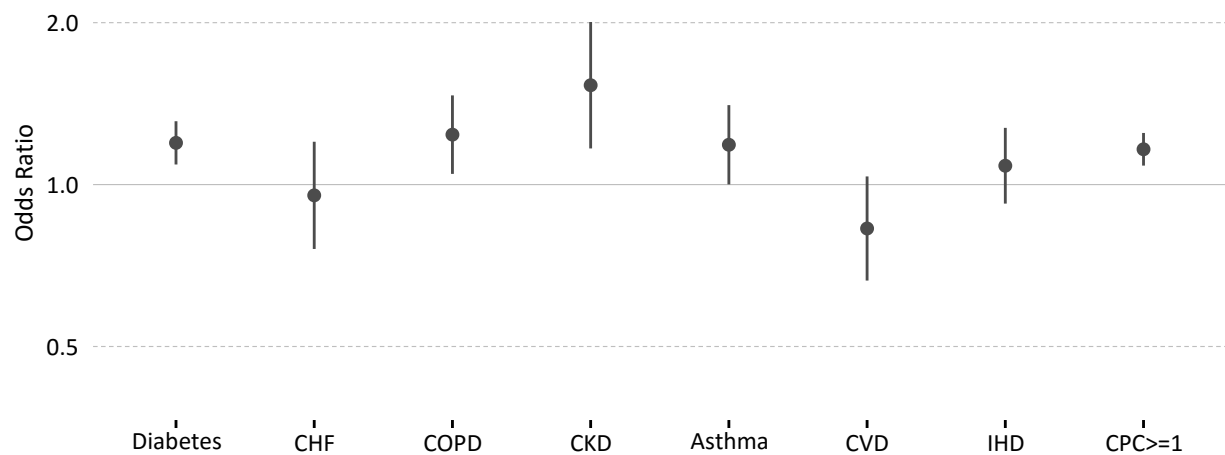


Figure 5.5 Relative Differences in the Count of GP Visits in Those With and Without Comorbid Physical Conditions

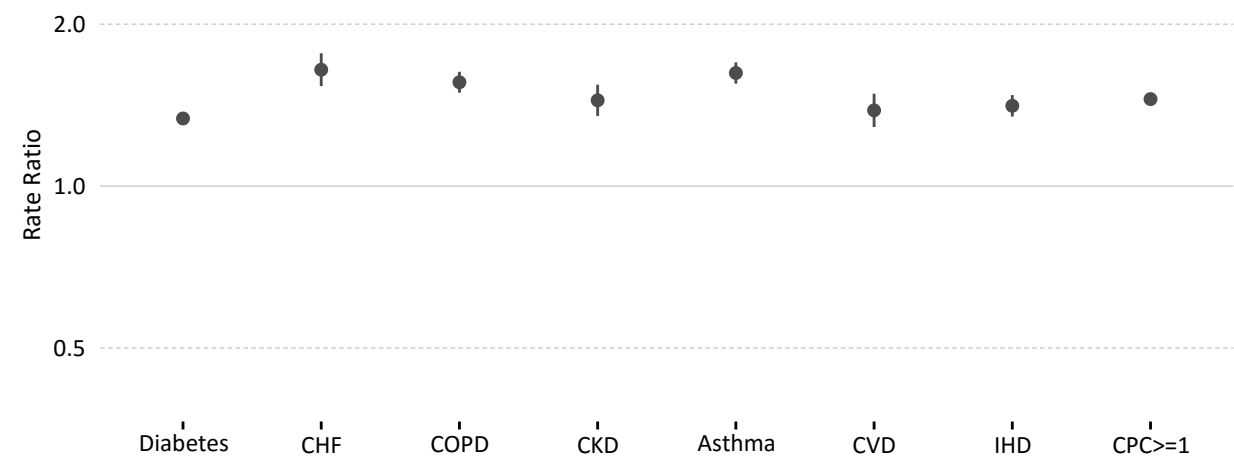


Figure 5.6 Relative Differences in the Count of GP Visits for Mental Health Reasons in Those With and Without Comorbid Physical Conditions

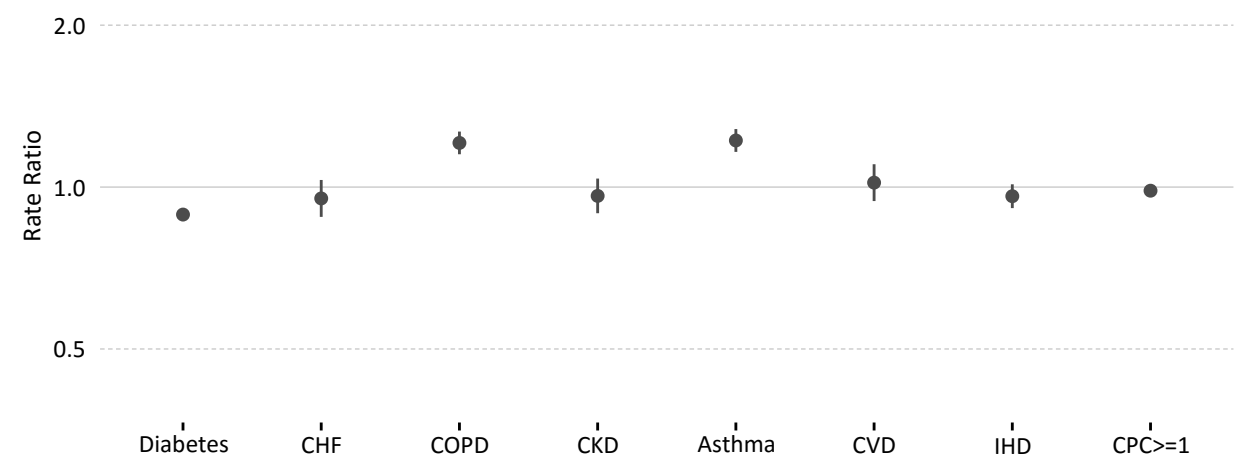


Figure 5.7 Relative Differences in Continuity of Care for All GP Visits in Those With and Without Comorbid Physical Conditions

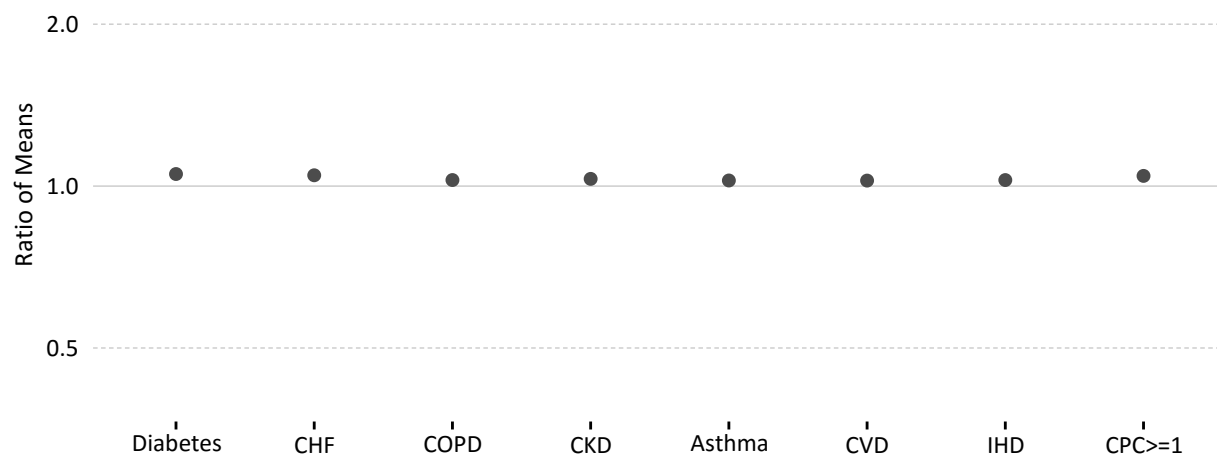


Figure 5.8 Relative Differences in Continuity of Care for GP Mental Health Visits in Those With and Without Comorbid Physical Conditions

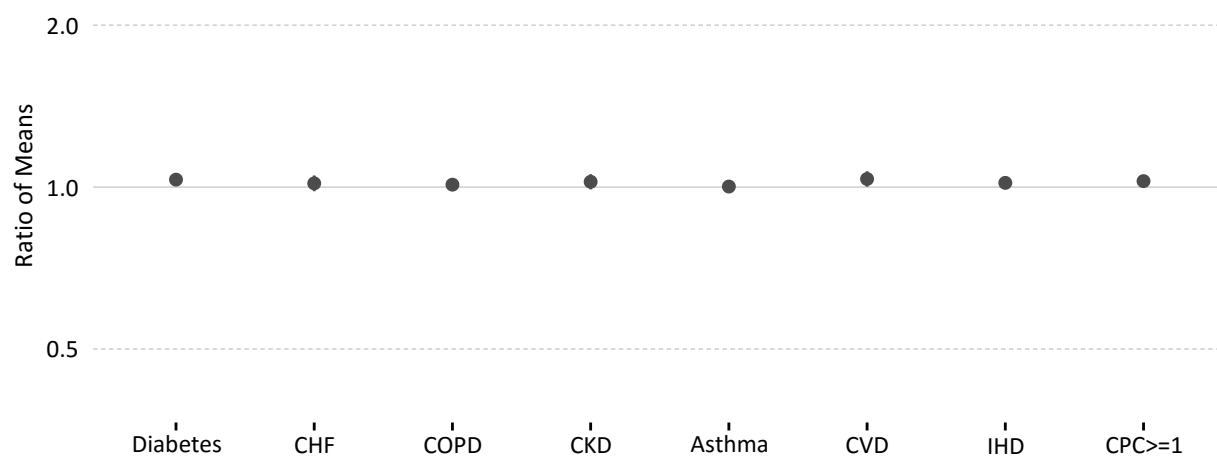


Figure 5.9 Relative Differences in the Count of Sessions of Psychological Therapies Received in a Year in Those With and Without Comorbid Physical Conditions

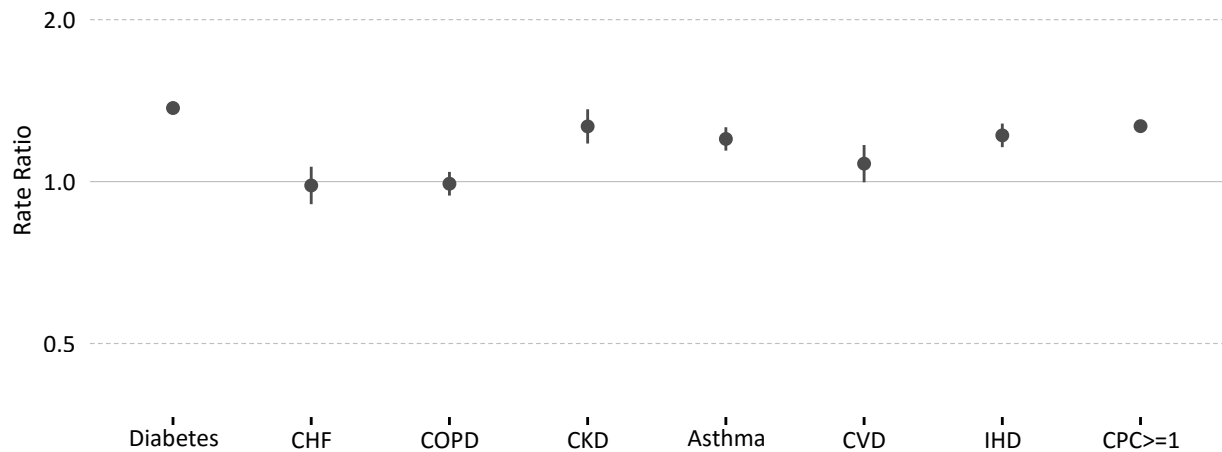


Figure 5.10 Relative Differences in the 180-Day Proportion of Days Covered (PDC) for Antidepressant Therapy in Patients With and Without Comorbid Physical Conditions

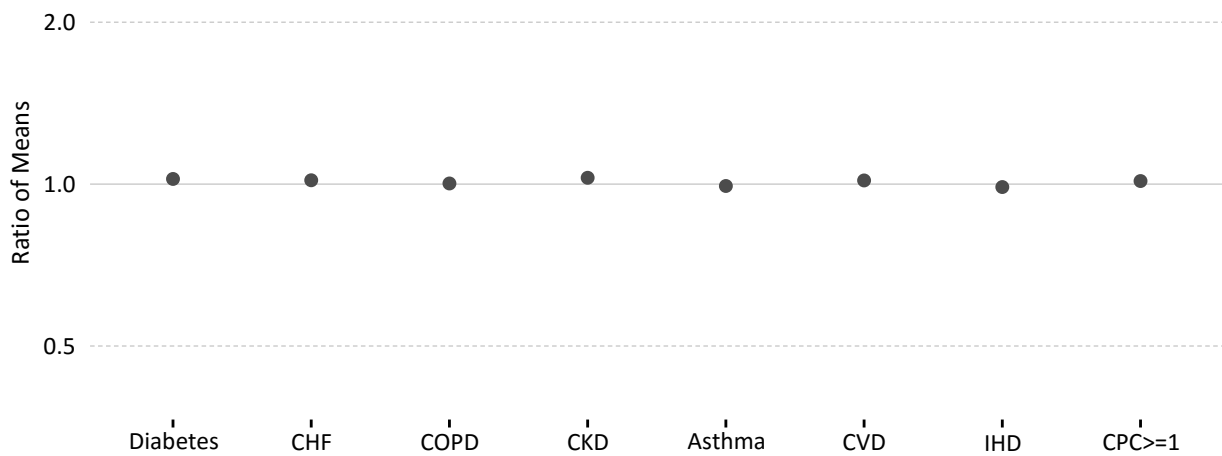
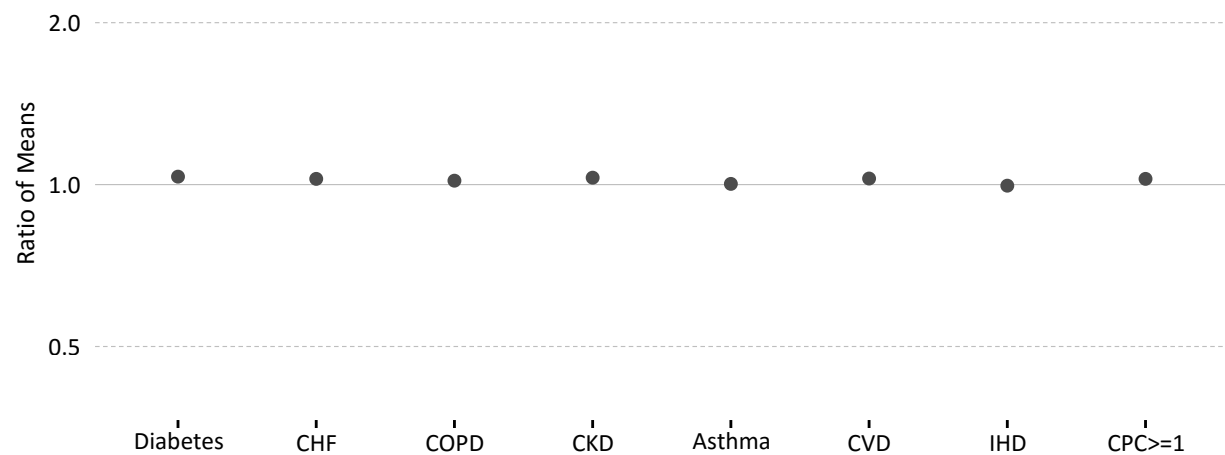


Figure 5.11 Relative Differences in the 365-Day Proportion of Days Covered (PDC) for Antidepressant Therapy in Patients With and Without Comorbid Physical Conditions



Chapter 6

Physician Incentives and Depression Care[§]

6.1 Introduction

Every year, one out of every twenty individuals experience major depression (MD).⁷ Despite the availability of evidence-based treatments, many with MD do not receive treatment and a considerable number of those who receive treatment do not get minimally adequate care.¹³² This gap in treatment is an issue that many countries face and which some have tried to address using a variety of policy levers, including the introduction of explicit physician incentives.^{146–149}

Physician incentives are usually introduced to remove financial disincentives to providing more and better quality mental health care. This is particularly important in primary care where most individuals with MD seek treatment.¹³² To date, the available literature suggests financial incentives could play a role in closing existing gaps in treatment.^{148,149} Studies focused on mental health, however, is sparse, so much of the potential impact has to be inferred from the broader body of studies that examined the link between physician incentives and health care delivery.

Unfortunately, many systematic reviews, including a systematic review of systematic reviews,¹⁵⁰ conclude that explicit physician incentives do not consistently lead to

[§] A version of Chapter 6 is in press: Puyat, JH, Kazanjian, A, Goldner, EM. Is the Road to Mental Health Paved with Good Incentives? Estimating the Population Impact of Physician Incentives on Mental Health Care Using Linked Administrative Data. *Medical Care*.

better health care and if they do, the impact is generally modest and sometimes short-lived.^{29–32} This is not surprising given the wide variation in the contexts of the primary studies. Theoretical advances in social psychology and behavioural economics in the past few decades have articulated how the inconsistency of the effects of physician incentives on health care provision relates to the complex interplay of social context, agents and cognitive processes.^{151,152}

In Canada, the use of physician incentives as a tool for improving mental health care was recently tested in the Canadian province of British Columbia (BC). The move was part of the region's deliberate choice to avoid changing the way primary health care services are delivered⁷³ – something other provinces like Quebec and Ontario have tried for several years.^{64,65}

Driving BC's atypical approach to primary mental health care reform is the view that the observed gaps in treatment is caused by an operational problem – the overall decline of family practice that started in the mid-1990s and peaked in the mid-2000.⁷³ Back then, general practitioners (GPs) were reported to be dissatisfied with their remuneration, the increasing complexity of their workload, and their relationship with the provincial government.⁷³ This disenchantment compelled GPs to work shorter hours and limit their role as full-service family physicians. For patients, that meant greater challenges in finding a regular GP and difficulty in securing appointments among those who have one.⁷³

In order to reverse the continuing decline in family practice, a package of physician incentives was introduced, including one specifically intended to strengthen the

provision of mental health care. The BC initiative contains other smaller components (i.e. physician training), but enhancing the existing publicly-funded fee-for-service (FFS) system through additional financial incentives is its cornerstone.¹⁵³ Since the introduction of these incentives, no other province-wide changes in the health system or policies have occurred.

Because it is important to know if the use of explicit incentives improves mental healthcare and represents good use of limited public resources, we decided to conduct this study. Specifically, our objectives are to estimate the population-level impact of physician incentives on mental health care using indicators that measure receipt of counseling/psychotherapy (CP); antidepressant therapy (AT); minimally adequate counseling/psychotherapy (MACP); and minimally adequate antidepressant therapy (MAAT). Additionally, we examined physician incentives' impacts on overall continuity of care (COCI) and of mental health care (COCMH).

6.2 Method

6.2.1 Data Sources

We examined de-identified and individual-level health administrative data from virtually everyone in BC, except for a small percentage (4%) of individuals whose health care is covered under federal jurisdiction. The individuals who were not represented in our data include registered status Indians (or aboriginals), veterans, federal penitentiary inmates, and members of the Royal Canadian Mounted Police.

The data fields used to derive the variables required for analyses were extracted from multiple health administrative databases, such as the government-sponsored health insurance registry, physician claims database, hospital database, outpatient prescription database and provincial death registry. These database files were linked through a common study identifiers generated by Population Data BC, in lieu of the actual individual health and medical practitioner numbers. The names of the specific databases and their description are provided in Table 6.1.

Permission to access data was provided by the BC Ministry of Health Services and the BC College of Pharmacists. The Behavioral Research Ethics Board of the University of British Columbia granted ethics approval for the study.

6.2.2 Study Cohorts

We identified cohorts of individuals who received new MD diagnoses (ICD-9 diagnoses of 296, 296.2x, 296.3x or 311.x; ICD-10 diagnoses of F32.x, F33.x or F39.x) in each of the months between January 2005 and December 2012. An MD diagnosis was considered new if it was not associated with any mood disorder diagnoses in the prior 12 months. The presence of diagnoses was ascertained by examining only the primary diagnoses associated with a physician visit or hospitalization.

Several steps were followed to derive the monthly cohorts (Figure 6.1). First, records of individuals with at least one major depressive disorder diagnosis between the first and last day of a given month were extracted from the database of physician visits and hospital records. In cases where individuals received the relevant diagnoses multiple times, or were seen in the same month by a physician and hospitalized with

depression as a primary diagnosis, the record with the earliest date was retrieved and marked as the index date of diagnosis. Second, we removed everyone with a recorded diagnosis of schizophrenia or bipolar disorders (ICD-9 295.x and 296.4x to 296.7x, ICD-10 F25.x and F29.x to F31) during a 12-month period before the index date of diagnosis. Third, we excluded those with a 12-month history of receiving mood disorder diagnoses (ICD-9 296.x and 311.x and BCMoH code 50B; ICD-10 F3x). Fourth, we dropped those who were not registered in the provincial health services plan for at least 275 days in the year before and after the index date of diagnosis. This was done to ensure that the cohort includes only those who were eligible to receive publicly funded health services. Finally, we excluded those who were under 19 years of age at the time of initial diagnosis and those who died within 12-months after the index date (Table 6.2). Individuals younger than 19 years were excluded because their care is managed differently from adults (i.e. antidepressants may not be prescribed to adolescents due to increased risk of suicide). Those who died, as determined through the deaths registry (Table 6.1), were excluded due to incomplete follow-up.

Each monthly cohort comprises unique individuals with new MD diagnoses. However, it is possible for individuals to be included in more than one cohort. For example, individuals who initiated treatment in February 2005 and remitted after a year or more of treatment would be included in later cohorts if they initiated treatment again at a later date and met the inclusion criteria.

6.3 Variables

6.3.1 Outcome

We examined receipt of the following health services in order to investigate changes in the provision of mental health services for people diagnosed with depression over a period of 8 years: 1) at least one counseling or psychotherapy session; 2) at least one filled prescription for an antidepressant; 3) minimally adequate counseling or psychotherapy, defined as 4 or more counseling/psychotherapy sessions; and, 4) minimally adequate antidepressant therapy, defined as 84 or more days of antidepressant therapy. The criteria for these services were considered met or exceeded if an individual received the services within 12 months following the initial diagnosis of depression. We note that the 12-month follow-up time used in constructing the indicators is generous relative to other health care contexts. This is, however, appropriate for mental health especially in publicly-funded health systems. Using a shorter time frame would exclude services with substantial wait-times and consequently preclude reliable measurement of intervention effects.

We also created variables measuring physician continuity of care, one for all visits and another for mental health visits only. These measures indicate the degree to which ambulatory care is provided by the same GP within a 12-month period. The calculation was based on previously published formula:⁸⁵

$$\text{continuity of care} = 100 \times \frac{1 - \left(\frac{\text{number of GPs}}{\text{number of GP visits} + .1} \right)}{1 - \left(\frac{1}{\text{number of GP visits} + .1} \right)}$$

6.3.2 Explanatory Variables

We regarded the introduction of physician incentives by the BC government as the intervention that explains population-level changes in the receipt of mental health services. The primary purpose of the intervention was to remove financial barriers that adversely affect the management of patients with mental health issues.⁸⁴ These incentives were embedded in a revised FFS schedule that enabled GPs who prepare a comprehensive treatment plan to be remunerated for taking on the role of being the patients' main source of care. The revised schedule also increased the number of counseling/psychotherapy sessions GPs can bill, from 4 to 8 sessions per year, and introduced additional fee codes for coordinating patient care with other health care providers and for email or telephone follow-ups.¹⁵⁴ The revised FFS took effect on January 1, 2008 with an initial budget of \$8 million,⁶⁸ followed a year later by training modules designed to enhance physician skills in diagnosing and managing patients with mental health issues were offered. The uptake of the training modules, however, has been slow in spite of a \$2,900 payment for attendance.⁸⁶ Records show that by November 2012, only 42% of full-service GPs in BC have enrolled in the training program and that only 67% of the enrollees went on to complete the training program.⁸⁷

6.4 Analysis

We constructed monthly indicators for each of the six measures. These indicators represent percentages, which were calculated by dividing the total count of individuals who met criteria for an indicator in a given month by the total number of

individuals with new diagnoses of depression in the same month, multiplied by 100.

For example, the percentage of individuals who received minimally adequate antidepressant therapy in January 2008 was calculated using, as denominator, the total count of individuals with new diagnoses of depression between the first and last day of January 2008, and using, as numerator, the total count of individuals from the denominator who were on antidepressant therapy for at least 84 days within a 12-month follow-up period.

$$\begin{aligned} \text{\% minimally adequate} \\ \text{antidepressant therapy} \\ \text{in January 2008} = \frac{\text{count of individuals from the denominator} \\ \text{who filled antidepressants for } \geq 84 \text{ days} \\ \text{within 12 months of initial diagnosis}}{\text{total count of individuals} \\ \text{diagnosed with depression} \\ \text{between January 1 and 31, 2008}} \times 100 \end{aligned}$$

We present results for the period January 2005 to December 2012 only even though we have complete data from January 2004 to December 2013. The extra two years of data were used to ensure that everyone in the cohort had one year of look back data to meet inclusion/exclusion criteria (e.g., individuals diagnosed in 01/01/2005) and also one year of follow-up data (e.g., individuals diagnosed in 12/31/2012).

Before performing the main analyses, we adjusted for seasonal variation using regression models that contain dummy codes for months as regressors:

$$\begin{aligned} \hat{Y}_t = \beta_0 + \beta_1 Feb_t + \beta_2 Mar_t + \beta_3 April_t + \beta_4 May_t + \beta_5 Jun_t + \\ \beta_6 Jul_t + \beta_7 Aug_t + \beta_8 Sep_t + \beta_9 Oct_t + \beta_{10} Nov_t + \beta_{11} Dec_t + e_t \end{aligned}$$

From these models, we generated residuals (e_t) that capture the remaining variability in the data that is not due to seasonal variation. Then we added the mean

of the original data to the residuals to generate deseasonalized data that are centered on the distribution of the original data. A plot and analysis of the original data are available online (Figure 6.11 and Table 6.6).

After deseasonalizing the monthly time series data, we used ordinary least squares regression to estimate the shift in observed levels and trend before and after the intervention. Autocorrelation was addressed using Newey-West standard errors¹⁵⁵ with a maximum lag value of 6. The regression equation that we used has the following general form:

$$\hat{Y}_t = \beta_0 + \beta_1 month_t + \beta_2 intervention_t + \beta_3 month_after_intervention_t + e_t ,$$

where \hat{Y}_t is the level of the indicator at a given month; β_0 , the intercept; β_1 , the monthly rate of increase (or trend); β_2 , the post-intervention shift in the level observed in January 2008; β_3 , the post-intervention change in trend; and e_t , the residual. Of particular interest is the magnitude of β_2 , which estimates the change in level immediately after the intervention, and β_3 , which estimates the change in trend in the post-intervention period.

To estimate the post-intervention impact at year 3 (and also at years 1 and 5), we subtracted the counterfactual (what the level would have been if the intervention did not occur) from the observed levels using this formula:

$$\begin{aligned} \widehat{impact}_{(5*12)} &= [\beta_0 + \beta_1(3*12)+5(*12) + \beta_2 + \beta_3(5*12)] - [\beta_0 + \beta_1(3*12)+5(*12)] \\ &= \beta_2 + \beta_3(5*12) \end{aligned}$$

We plotted each indicator with the calculated regression lines superimposed to facilitate examination of the change in trend and levels pre- and post-intervention.

Sensitivity analyses

We performed three additional analyses to examine how sensitive our conclusions are to different study assumptions. The first analysis examined data that contain everyone diagnosed with MD except for those under 19 years of age. We performed this analysis to examine how including people with incomplete follow-up (those who died and those who were not insured for at least 275 days in a year) affects our estimates. The second analysis looks at the influence of including earlier time periods (01/2007 to 01/2008) on the effect estimates. We note that receipt of partial benefit from the intervention is possible at an earlier time (\geq 01/2007) because of the 12-month follow-up used in creating the indicators (i.e. people diagnosed in 01/2007 could have received incentivized care in 01/2008 or people diagnosed in 12/2007 could have received incentivized care between 01/2008 and 11/2008). The third analysis estimates intervention effects without adjusting for seasonal variation. We used SAS/SQL software V 9.4 to extract, link and manage the multi-year data from multiple databases. Statistical analyses were performed in Stata V.13 with the help of the *itsa* module.⁹⁴

6.5 Results

Between Jan 2005 and December 2012, the monthly number of people diagnosed with MD ranged from 7,498 (April 2006) to 10,576 (March 2010). When the monthly

counts are summed each year and the yearly total divided by the population supplied by the BC government,¹⁰⁶ the incidence rate of people initiating depression treatment every year remained at three percent (Figure 6.2).

6.5.1 Counseling and Psychotherapy (CP)

About 57.3% of the cohort received one or more CP at the beginning of 2005. The percentage decreased each month until the end of 2007 (Table 6.3). Post-intervention, there was an immediate upward shift in the level. The pre-intervention downward trend was also cancelled out by the post-intervention change in trend that is slightly higher in magnitude than the pre-intervention trend (Figure 6.3). Five years post-intervention, the percentage of individuals who receive CP was estimated to be higher by 3.3 percentage points (Table 6.3) compared to what it would have been without the intervention, or the counterfactual level.

The percentage of individuals who received 4 or more CP at the start of 2005 was about 11.9% and showed a slight upward trend up to 2007, though the trend was not statistically significant (Table 6.3). There was no statistically significant shift in the level in 2008 but the levels gradually accelerated over time due to a positive and significant change in trend (Figure 6.4). At the end of five years after the incentives were introduced, the percentage of individuals who received 4 or more CP was higher by 1.8 percentage points compared to the counterfactual level.

6.5.2 Antidepressant Therapy (AT)

At the start of the observation period, the percentage of the cohort who received AT was about 56.7% (Table 6.3), which rose to about 59% by the end of 2007. Post-

intervention, there was an immediate drop in the level, accompanied by a significant decrease in trend. The magnitude of the change in trend was not sufficient to negate or overturn the increasing trend before the intervention, hence the relatively less steep slope in the post-intervention period (Figure 6.5). At the end of the 5-year period, the estimated post-intervention impact was a decrease of 4.5 percentage points in the percentage of patients who receive AT, relative to the counterfactual level (Table 6.3).

Similarly, before the intervention there was an increasing trend in the percentage of individuals that received MAAT, which was estimated to be about 46.1% in January 2005 (Table 6.3). Right after the intervention, there was a measurable decrease in the level and a negative change in trend that reduced slightly the monthly rate of increase (Figure 6.6). After 5 years, there was an estimated decrease of 2.2 percentage points in the percentage of patients who receive MAAT, relative to the counterfactual levels (Table 6.3).

6.5.3 Continuity of Care (COC)

The impact of the intervention on both measures of continuity of care (all visits and mental health visits only) indicate similar patterns of declining pre-intervention levels that were disrupted by the intervention, noticeably shifting the levels higher and arresting, but not overturning, the pre-intervention trend (Figure 6.7 and Figure 6.8). The estimated post-intervention effect was positive and the impact post-five years was greater in the COC for all visits than the COC for mental health visits only (Table 6.3).

6.5.4 Sensitivity Analyses

Results from the three additional analyses reinforced the key finding that physician incentives had a modest impact on depression care. The direction of the change estimated by the extra analyses is consistent with all the results from the main analysis although the magnitude of the estimates vary slightly. Specifically, there were some indications of effect dilution in the analysis that include everyone with incomplete follow-up (Table 6.4 and Figure 2.1Figure 6.9) and the analysis that moved the start of intervention to an earlier date (Table 6.5 and Figure 6.10). Conversely, intervention effects were generally higher in the analysis that did not control for seasonal variation (Table 6.6 and Figure 6.11).

6.6 Discussion

The study's objective is to determine and estimate the impact of physician incentives on six indicators related to mental health care. The results suggest that the intervention disrupted the upward trend in antidepressant therapy and the downward trend in counseling or psychotherapy. Further declines in continuity of care have also been curbed, although there was no appreciable indication that it increased over five years post-intervention. All of the estimated effects were modest at best and falls within the range reported in the literature.

The observed change in the percentage of individuals who received at least one session of counseling/psychotherapy (an increase of four percentage points) and in the percentage of individuals who received antidepressant therapy (a decrease of six percentage points) appear consistent with the hypothesized effect of incentives on

the volume of incentivized care. The direction and magnitude of the impact also suggest a shift in treatment modality that is in line with the objectives of the intervention. Generally, GPs are predisposed to prescribe antidepressant therapy,^{87,156,157} possibly even to patients with less severe symptoms who are less likely to benefit from the treatment.^{10,158} This is because prescribing medications minimizes the amount of time required to manage patients, hence, limiting the financial consequences to physicians' practice.¹⁰⁹ It could be that this tendency was discouraged when explicit financial compensation was given to physicians who provide services that take more time to administer and who assume the role of being the patient's major source of care.

On the other hand, removing the disincentives to providing counseling/psychotherapy did not have a similar effect, in terms of magnitude, on the percentage of patients that received MACP. There was no immediate impact, and the impact over time was surprisingly low, given the pre-intervention levels. These suggest the presence of other barriers to receiving MACP that may be less influenced by physician incentives¹⁵⁹ and that could be more amenable to other interventions.¹⁶⁰

A finding that we did not expect was the post-intervention declines in the level and trend of MAAT. We note, however, that the observed decrease in trend was not sufficient to counteract the baseline trend, allowing MAAT to increase albeit at a slower rate. In the literature, the use of physician incentives has been documented to discourage the provision of non-incentivized services.^{161,150} It is likely that this unintended consequence of financial incentives is behind the observed post-

intervention decrease in MAAT trend and levels. This could be because the intervention did not include incentives that target explicitly the promotion of adherence in patients who could benefit from antidepressant therapy. There are new fee codes in the incentive package that could have been used to encourage medication adherence¹⁵⁴ but payments for these are substantially lower (for example, \$15 telephone or email management fee) compared to the newly introduced codes for counseling/psychotherapy.

Finally, we highlight the flat post-intervention trends in the continuity of care regardless of the type of ambulatory visits. As this was preceded by a declining trend, which was consistent with reports of deteriorating GP-patient relationship⁷³ during the pre-intervention years, our results suggest that gains were achieved over time despite the noticeable lack of upward movement post-intervention. Continuity of care would probably have been worse if no explicit incentives were introduced.

Our results provide population-based evidence of the modest impact of physician incentives on mental health care using large administrative data files obtained from a geographic region that experienced virtually no other relevant events or changes in policy. Our study also does not have the same weaknesses as other studies that use small sample sizes or self-reported data. Some limitations, however, need to be considered. First, administrative data captures only those who received treatment from hospitals and physicians. Our analyses probably underestimate the number of individuals who require treatment for MD. Second, we were unable to examine the appropriateness of counseling/psychotherapy provided by physicians as our data do

not allow us to classify the type of counseling/psychotherapy provided. Third, the results regarding the use of antidepressant therapy were based on filled prescriptions records, which may underestimate prescribing rates and overestimate actual use. Fourth, we were not able to rule out completely the influence of unmeasured confounders or events that occurred at the national level on our estimates. Addressing this limitation requires a replication in one or more Canadian provinces where physician incentives were not introduced. Last, we could not account for MD severity using the available data and our cohorts explicitly excluded those with comorbid schizophrenic and bipolar disorders. Because of this, some may argue that our results should be considered as conservative estimates of the post-intervention impacts since the incentives were primarily intended for patients with severe mental disorders.¹⁵⁴ While plausible, it could also be that our estimates represent the best the intervention can achieve given that severe mental disorders are difficult to deal with in primary care and that GPs have an incentive to avoid patients that would be challenging to manage.¹⁵⁰

Table 6.1 Data Sources and Data Fields Used in the Study

Data Source	Data Fields
<i>Consolidation File, 2004 – 2013</i> British Columbia Ministry of Health [creator] (2014): Consolidation File (MSP Registration & Premium Billing). V2. Population Data BC [publisher]. Data Extract. MOH (2014). http://www.popdata.bc.ca/data	Patient Study ID, Birth Month, Birth Year, Sex, 3-Digit Postal Code (or Forward Sortation Address), Neighbourhood Income Quintile, Number of Days Registered in the Provincial Health Services Plan
<i>Physician Claims Database, 2004 – 2013</i> British Columbia Ministry of Health (2015): Medical Services Plan (MSP) Payment Information File. V2. Population Data BC [publisher]. Data Extract. MOH (2014). http://www.popdata.bc.ca/data	Patient Study Id, Service Date, Practitioner Study ID, Specialty Code, Service Code, Fee Item Code, Service Units, Amount Paid, Service Units, ICD9 Diagnostic Codes
<i>Hospital Separations, 2004 – 2013</i> Canadian Institutes for Health Information [creator] (2015): Discharge Abstract Database (Hospital Separations). V2. Population Data BC [publisher]. Data Extract. MOH (2014). http://www.popdata.bc.ca/data	Patient Study ID, Separation Date and ICD10 Codes
<i>Prescription Database, 2004-2013</i> BC Ministry of Health [creator] (2014): PharmaNet. V2. BC Ministry of Health [publisher]. Data Extract. Data Stewardship Committee (2014). http://www.popdata.bc.ca/data	Patient Study ID, Drug Identification Number, Date Dispensed, Quantity Dispensed, and Days Supply
<i>Deaths Registry, 2004 – 2013</i> BC Vital Statistics Agency [creator] (2014): Vital Statistics Deaths. V2. Population Data BC. Data Extract BC Vital Statistics Agency (2014). http://www.popdata.bc.ca/data	Patient Study ID, Year and Month of Death

Table 6.2 Counts and Proportions of Individuals That Initiated Depression Treatment but Were Excluded From Analysis in Chapter 6

Year	Initiated MD Treatment ¹	Less Than 19 Years of Age ²		Died ³		Less Than 275 Days of Registration ⁴	
	Count	Count	%	Count	%	Count	%
2005	118303	7735	6.5	2277	1.9	13390	11.3
2006	122015	7607	6.2	2238	1.8	14114	11.6
2007	125215	7494	6.0	2464	2.0	14136	11.3
2008	128217	7501	5.9	2551	2.0	14184	11.1
2009	128399	7127	5.6	2544	2.0	13199	10.3
2010	131845	7532	5.7	2635	2.0	12467	9.5
2011	130517	7861	6.0	2569	2.0	12253	9.4
2012	127972	8510	6.6	2752	2.2	11765	9.2

Note:

¹Total counts of individuals with a recorded primary diagnosis of major depression.

²Excluded because indicators for appropriate mental health care may not apply to this subgroup (i.e. antidepressant use among adolescents carry greater risk of suicide).

³Excluded because people who died have incomplete follow-up.

⁴Excluded because individuals who moved in/out of the province, as indicated by the number of registration days in the public health insurance, have incomplete follow-up. Exclusion categories are not mutually exclusive.

Table 6.3 Model Estimates of the Impact of Physician Incentives on Six Indicators Mental Health-Related

	Counseling or Psychotherapy		Antidepressant Therapy		Continuity of Care	
	One or More	Minimally Adequate	One or More	Minimally Adequate	All GP Visits	Mental Health GP Visits Only
Model Estimates						
β_0	57.36 (57.02, 57.70)	11.90 (11.70, 12.10)	56.65 (56.32, 56.97)	46.04 (45.65, 46.43)	75.61 (75.08, 76.13)	82.07 (81.75, 82.39)
β_1	-0.03 (-0.04, -0.01)	0.01 (0.00, 0.02)	0.07 (0.05, 0.09)	0.06 (0.04, 0.08)	-0.11 (-0.14, -0.07)	-0.06 (-0.08, -0.04)
β_2	1.05 (0.57, 1.53)	0.26 (-0.19, 0.72)	-1.08 (-1.78, -0.39)	-1.14 (-1.84, -0.44)	1.28 (0.38, 2.18)	0.60 (0.06, 1.15)
β_3	0.04 (0.02, 0.05)	0.03 (0.01, 0.04)	-0.06 (-0.08, -0.03)	-0.02 (-0.04, 0.00)	0.10 (0.07, 0.14)	0.06 (0.04, 0.08)
Pre-Intervention						
Level in Jan 2005	57.33 (57.00, 57.66)	11.91 (11.71, 12.10)	56.72 (56.41, 57.03)	46.10 (45.73, 46.47)	75.50 (75.00, 76.00)	82.01 (81.71, 82.31)
Monthly Trend	-0.03 (-0.04, -0.01)	0.01 (0.00, 0.02)	0.07 (0.05, 0.09)	0.06 (0.04, 0.08)	-0.11 (-0.14, -0.07)	-0.06 (-0.08, -0.04)
Post-Intervention						
Level in Jan 2008	57.41 (57.09, 57.73)	12.51 (12.21, 12.80)	58.24 (57.73, 58.76)	47.15 (46.77, 47.52)	72.97 (72.81, 73.14)	80.62 (80.34, 80.89)
Monthly Trend	0.01 (0.00, 0.02)	0.03 (0.03, 0.04)	0.02 (0.00, 0.03)	0.04 (0.03, 0.05)	0.00 (-0.01, 0.00)	0.01 (0.00, 0.01)
Estimated Impact						
at Year 1 (Dec 2008)	1.50 (0.93, 2.07)	0.56 (0.08, 1.05)	-1.76 (-2.54, -0.98)	-1.36 (-2.23, -0.49)	2.53 (1.23, 3.83)	1.36 (0.61, 2.10)
at Year 3 (Dec 2010)	2.39 (1.52, 3.26)	1.17 (0.54, 1.79)	-3.11 (-4.25, -1.97)	-1.80 (-3.11, -0.50)	5.03 (2.89, 7.17)	2.86 (1.64, 4.08)
at Year 5 (Dec 2012)	3.28 (2.05, 4.52)	1.77 (0.94, 2.59)	-4.47 (-6.06, -2.87)	-2.24 (-4.04, -0.45)	7.53 (4.54, 10.53)	4.37 (2.64, 6.09)
60-Month Average	2.15 (1.37, 2.93)	1.00 (0.42, 1.58)	-2.75 (-3.77, -1.72)	-1.68 (-2.86, -0.51)	4.36 (2.45, 6.27)	2.45 (1.36, 3.54)

Notes: Reported values for counseling/psychotherapy and antidepressant therapy are percentages and 95% confidence intervals. Values for continuity of care represent means and 95% confidence intervals. Point-estimates with 95% confidence intervals that do not include 0 are statistically significant at $p < 0.05$. The formula used for the segmented regression with Newey-West standard errors is $\hat{Y}_t = \beta_0 + \beta_1 month_t + \beta_2 intervention_t + \beta_3 month_after_intervention_t + e_t$, where \hat{Y}_t is the level of the indicator at a given month; β_0 , the intercept; β_1 , the monthly rate of increase (or trend); β_2 , the post-intervention shift in the level observed in January 2008; β_3 , the post-intervention change in trend; and e_t , the residual. Estimated impact was calculated using the formula: $= \beta_2 + \beta_3(year*12)$.

Table 6.4 Model Estimates of the Impact of Physician Incentives on Six Mental Health-Related Indicators Using Data That Excluded Only Individuals Who Were Less Than 19 Years of Age

	Counseling or Psychotherapy		Antidepressant Therapy		Continuity of Care	
	One or More	Minimally Adequate	One or More	Minimally Adequate	All GP Visits	Mental Health GP Visits Only
Model Estimates						
β_0	57.37 (57.05, 57.69)	11.17 (10.81, 11.54)	56.08 (55.77, 56.39)	45.09 (44.75, 45.43)	75.29 (74.76, 75.82)	81.53 (81.17, 81.89)
β_1	-0.02 (-0.04, -0.01)	0.02 (0.00, 0.04)	0.07 (0.05, 0.09)	0.06 (0.04, 0.08)	-0.11 (-0.14, -0.07)	-0.06 (-0.09, -0.04)
β_2	0.88 (0.41, 1.35)	0.40 (-0.47, 1.26)	-0.96 (-1.59, -0.33)	-1.04 (-1.69, -0.39)	1.30 (0.38, 2.22)	0.77 (0.13, 1.41)
β_3	0.04 (0.02, 0.05)	0.04 (0.02, 0.07)	-0.06 (-0.08, -0.04)	-0.02 (-0.04, 0.00)	0.11 (0.07, 0.15)	0.08 (0.05, 0.10)
Pre-Intervention						
Level in Jan 2005	57.35 (57.04, 57.66)	11.20 (10.84, 11.55)	56.15 (55.85, 56.44)	45.15 (44.83, 45.47)	75.18 (74.68, 75.68)	81.47 (81.13, 81.80)
Monthly Trend	-0.02 (-0.04, -0.01)	0.02 (0.00, 0.04)	0.07 (0.05, 0.09)	0.06 (0.04, 0.08)	-0.11 (-0.14, -0.07)	-0.06 (-0.09, -0.04)
Post-Intervention						
Level in Jan 2008	57.35 (57.01, 57.68)	12.37 (11.76, 12.99)	57.70 (57.25, 58.15)	46.24 (45.89, 46.59)	72.59 (72.43, 72.76)	79.94 (79.66, 80.23)
Monthly Trend	0.01 (0.00, 0.02)	0.07 (0.05, 0.08)	0.01 (0.00, 0.02)	0.04 (0.03, 0.05)	0.00 (0.00, 0.01)	0.01 (0.01, 0.02)
Estimated Impact						
at Year 1 (Dec 2008)	1.30 (0.77, 1.84)	0.92 (0.04, 1.80)	-1.65 (-2.38, -0.92)	-1.25 (-2.05, -0.46)	2.63 (1.30, 3.97)	1.69 (0.82, 2.56)
at Year 3 (Dec 2010)	2.15 (1.36, 2.95)	1.97 (0.86, 3.09)	-3.02 (-4.10, -1.95)	-1.68 (-2.86, -0.51)	5.30 (3.11, 7.49)	3.54 (2.13, 4.94)
at Year 5 (Dec 2012)	3.00 (1.89, 4.11)	3.02 (1.52, 4.53)	-4.40 (-5.90, -2.89)	-2.12 (-3.72, -0.51)	7.97 (4.91, 11.02)	5.38 (3.41, 7.35)
60-Month Average	1.92 (1.21, 2.64)	1.69 (0.66, 2.72)	-2.65 (-3.62, -1.68)	-1.57 (-2.63, -0.50)	4.58 (2.62, 6.53)	3.04 (1.78, 4.29)

Note: Reported values for counseling/psychotherapy and antidepressant therapy are percentages and 95% confidence intervals. Values for continuity of care represent means and 95% confidence intervals. The formula used for the segmented regression with Newey-West errors is $\hat{Y}_t = \beta_0 + \beta_1 month_t + \beta_2 intervention_t + \beta_3 month_after_intervention_t + e_t$, where \hat{Y}_t is the level of the indicator at a given month; β_0 , the intercept; β_1 , the monthly rate of increase (or trend); β_2 , the post-intervention shift in the level observed in January 2008; β_3 , the post-intervention change in trend; and e_t , the residual. Estimated impact was calculated using the formula: $= \beta_2 + \beta_3(year*12)$.

Table 6.5 Model Estimates of the Impact of Physician Incentives on Six Mental Health-Related Indicators, Based on Analysis That Moved the Start of Intervention from January 2008 to January 2007

	Counseling or Psychotherapy		Antidepressant Therapy		Continuity of Care	
	One or More	Minimally Adequate	One or More	Minimally Adequate	All GP Visits	Mental Health GP Visits Only
Model Estimates						
β_0	57.32 (56.91, 57.73)	11.82 (11.61, 12.03)	56.49 (56.30, 56.68)	45.80 (45.54, 46.05)	76.08 (75.61, 76.55)	82.37 (82.17, 82.57)
β_1	-0.03 (-0.05, 0.00)	0.01 (0.00, 0.03)	0.09 (0.07, 0.10)	0.08 (0.06, 0.10)	-0.15 (-0.18, -0.12)	-0.08 (-0.10, -0.07)
β_2	0.18 (-0.35, 0.70)	-0.14 (-0.45, 0.17)	-0.16 (-0.77, 0.45)	-0.58 (-1.27, 0.11)	0.31 (-0.09, 0.70)	0.19 (-0.10, 0.49)
β_3	0.04 (0.02, 0.07)	0.02 (0.00, 0.04)	-0.08 (-0.09, -0.06)	-0.05 (-0.07, -0.03)	0.15 (0.12, 0.18)	0.09 (0.08, 0.11)
Pre-Intervention						
Level in Jan 2005	57.30 (56.91, 57.69)	11.84 (11.64, 12.04)	56.58 (56.40, 56.75)	45.88 (45.64, 46.12)	75.94 (75.49, 76.38)	82.29 (82.09, 82.48)
Monthly Trend	-0.03 (-0.05, 0.00)	0.01 (0.00, 0.03)	0.09 (0.07, 0.10)	0.08 (0.06, 0.10)	-0.15 (-0.18, -0.12)	-0.08 (-0.10, -0.07)
Post-Intervention						
Level in Jan 2007	56.86 (56.47, 57.25)	12.06 (11.84, 12.27)	58.46 (57.92, 59.01)	47.23 (46.61, 47.86)	72.69 (72.35, 73.03)	80.47 (80.28, 80.66)
Monthly Trend	0.02 (0.01, 0.03)	0.04 (0.03, 0.04)	0.01 (0.00, 0.02)	0.03 (0.02, 0.04)	0.00 (0.00, 0.01)	0.01 (0.00, 0.01)
Estimated Impact						
at Year 1 (Dec 2007)	0.71 (0.01, 1.40)	0.10 (-0.33, 0.53)	-1.09 (-1.69, -0.49)	-1.18 (-1.84, -0.52)	2.14 (1.54, 2.74)	1.30 (0.89, 1.70)
at Year 3 (Dec 2009)	1.77 (0.53, 3.02)	0.58 (-0.18, 1.35)	-2.95 (-3.71, -2.19)	-2.39 (-3.21, -1.57)	5.81 (4.57, 7.04)	3.51 (2.80, 4.22)
at Year 5 (Dec 2011)	2.84 (0.97, 4.71)	1.06 (-0.07, 2.20)	-4.81 (-5.87, -3.75)	-3.60 (-4.75, -2.44)	9.47 (7.55, 11.39)	5.72 (4.69, 6.75)
72-Month Average	1.75 (0.52, 2.98)	0.57 (-0.18, 1.33)	-2.91 (-3.67, -2.16)	-2.36 (-3.18, -1.55)	5.73 (4.51, 6.95)	3.46 (2.76, 4.16)

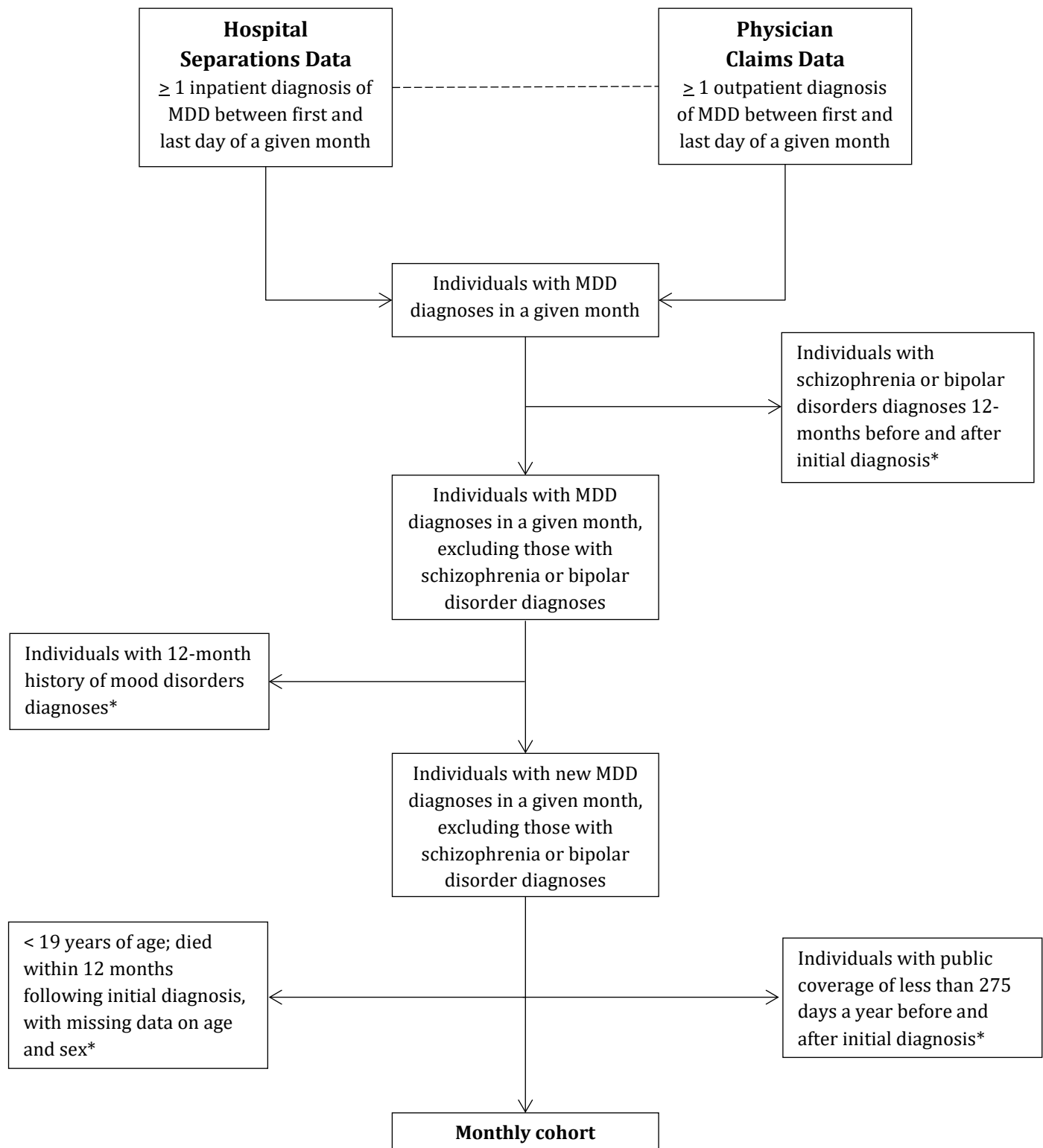
Note: Reported values for counseling/psychotherapy and antidepressant therapy are percentages and 95% confidence intervals. Values for continuity of care represent means and 95% confidence intervals. The formula used for the segmented regression with Newey-West errors is $\hat{Y}_t = \beta_0 + \beta_1 month_t + \beta_2 intervention_t + \beta_3 month_after_intervention_t + e_t$, where \hat{Y}_t is the level of the indicator at a given month; β_0 , the intercept; β_1 , the monthly rate of increase (or trend); β_2 , the post-intervention shift in the level observed in January 2008; β_3 , the post-intervention change in trend; and e_t , the residual. Estimated impact was calculated using the formula: $= \beta_2 + \beta_3(year*12)$.

Table 6.6 Model Estimates of the Impact of Physician Incentives on Six Mental Health-Related Indicators, Using Data Unadjusted for Seasonal Variation

	Counseling or Psychotherapy		Antidepressant Therapy		Continuity of Care	
	One or More	Minimally Adequate	One or More	Minimally Adequate	All GP Visits	Mental Health GP Visits Only
Model Estimates						
β_0	57.56 (57.21, 57.92)	11.82 (11.59, 12.05)	56.35 (55.79, 56.92)	45.59 (44.89, 46.30)	75.64 (75.14, 76.13)	82.19 (81.65, 82.73)
β_1	-0.04 (-0.06, -0.02)	0.01 (0.00, 0.02)	0.09 (0.07, 0.11)	0.08 (0.06, 0.11)	-0.11 (-0.14, -0.07)	-0.06 (-0.09, -0.04)
β_2	1.38 (0.58, 2.18)	0.14 (-0.24, 0.52)	-1.55 (-2.23, -0.86)	-1.83 (-2.56, -1.11)	1.33 (0.46, 2.20)	0.79 (0.20, 1.39)
β_3	0.04 (0.02, 0.07)	0.02 (0.01, 0.03)	-0.07 (-0.09, -0.04)	-0.03 (-0.07, 0.00)	0.11 (0.07, 0.14)	0.07 (0.04, 0.10)
Pre-Intervention						
Level in Jan 2005	57.53 (57.18, 57.87)	11.83 (11.61, 12.05)	56.44 (55.90, 56.98)	45.68 (45.00, 46.36)	75.53 (75.06, 76.00)	82.13 (81.61, 82.64)
Monthly Trend	-0.04 (-0.06, -0.02)	0.01 (0.00, 0.02)	0.09 (0.07, 0.11)	0.08 (0.06, 0.11)	-0.11 (-0.14, -0.07)	-0.06 (-0.09, -0.04)
Post-Intervention						
Level in Jan 2008	57.53 (57.06, 58.00)	12.46 (12.21, 12.71)	58.07 (57.47, 58.67)	46.89 (46.35, 47.43)	72.99 (72.80, 73.18)	80.69 (80.26, 81.11)
Monthly Trend	0.01 (-0.01, 0.02)	0.04 (0.03, 0.04)	0.02 (0.01, 0.04)	0.05 (0.04, 0.07)	0.00 (-0.01, 0.00)	0.00 (-0.01, 0.02)
Estimated Impact						
at Year 1 (Dec 2008)	1.91 (0.98, 2.84)	0.41 (0.00, 0.82)	-2.35 (-3.09, -1.60)	-2.24 (-3.15, -1.33)	2.59 (1.34, 3.85)	1.60 (0.82, 2.37)
at Year 3 (Dec 2010)	2.97 (1.65, 4.30)	0.95 (0.35, 1.54)	-3.95 (-5.13, -2.76)	-3.05 (-4.61, -1.49)	5.12 (3.06, 7.18)	3.20 (1.87, 4.54)
at Year 5 (Dec 2012)	4.04 (2.24, 5.83)	1.48 (0.64, 2.33)	-5.55 (-7.33, -3.76)	-3.86 (-6.17, -1.54)	7.64 (4.76, 10.52)	4.81 (2.85, 6.78)
60-Month Average	2.69 (1.48, 3.89)	0.80 (0.26, 1.34)	-3.51 (-4.55, -2.47)	-2.83 (-4.19, -1.47)	4.43 (2.59, 6.27)	2.77 (1.60, 3.94)

Note: Reported values for counseling/psychotherapy and antidepressant therapy are percentages and 95% confidence intervals. Values for continuity of care represent means and 95% confidence intervals. The formula used for the segmented regression with Newey-West errors is $\hat{Y}_t = \beta_0 + \beta_1 month_t + \beta_2 intervention_t + \beta_3 month_after_intervention_t + e_t$, where \hat{Y}_t is the level of the indicator at a given month; β_0 , the intercept; β_1 , the monthly rate of increase (or trend); β_2 , the post-intervention shift in the level observed in January 2008; β_3 , the post-intervention change in trend; and e_t , the residual. Estimated impact was calculated using the formula: $= \beta_2 + \beta_3(year*12)$.

Figure 6.1 Study Cohort Used in Chapter 6



* Counts of individuals excluded in each month (January 2005 to December 2012) were not shown. See Table 6.2 for a descriptive summary of the individuals excluded in the cohorts.

Figure 6.2 Individuals Initiating Depression Treatment in British Columbia, Canada

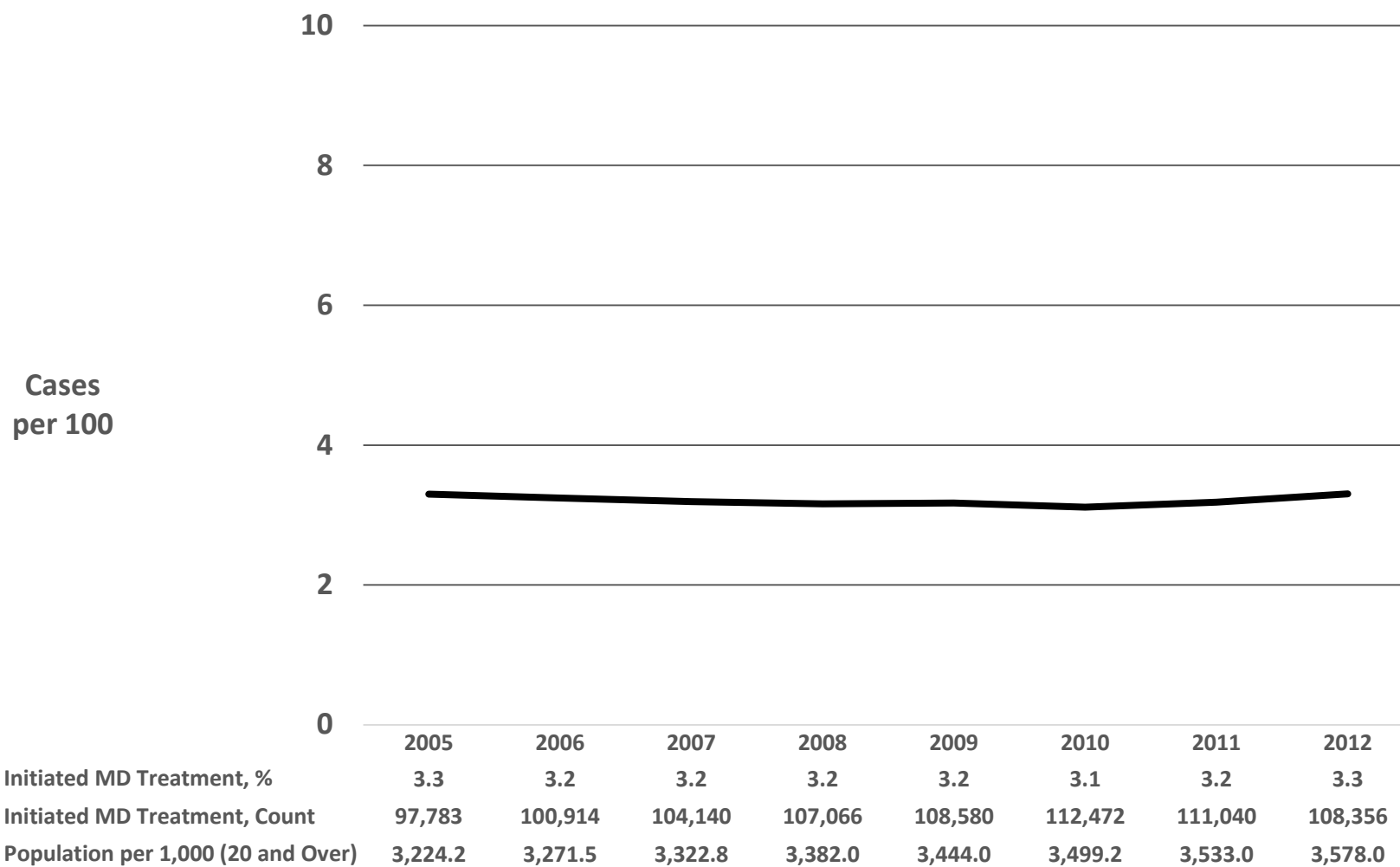


Figure 6.3 Impact of Physician Incentives on Counseling or Psychotherapy

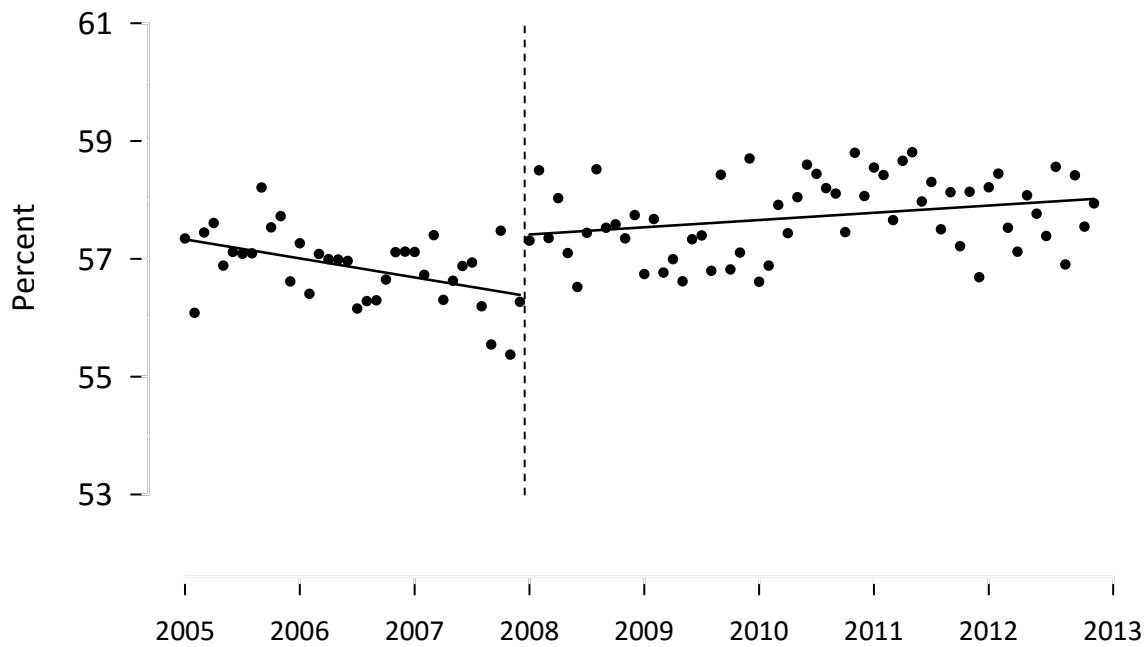


Figure 6.4 Impact of Physician Incentives on Minimally Adequate Counseling or Psychotherapy

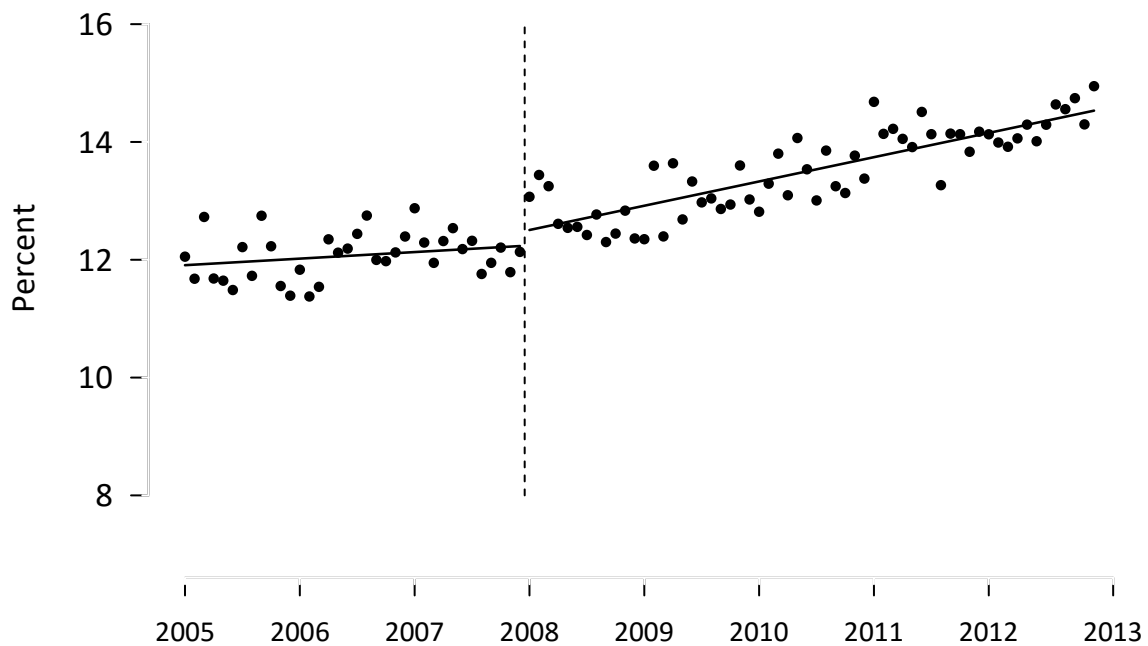


Figure 6.5 Impact of Physician Incentives on Antidepressant Therapy

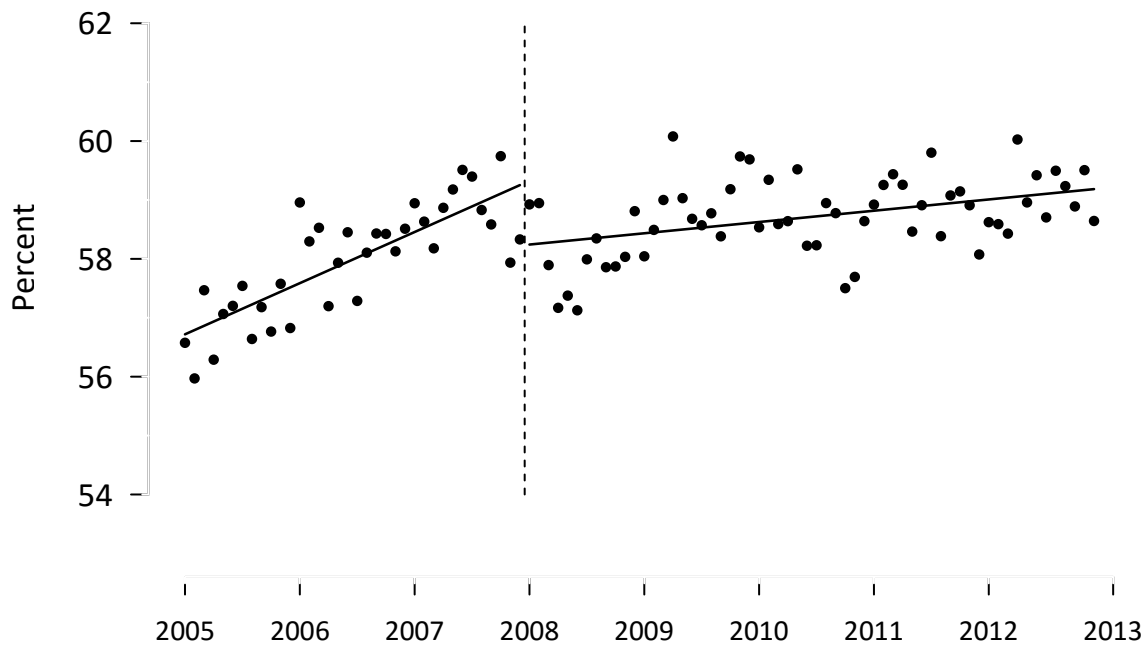


Figure 6.6 Impact of Physician Incentives on Minimally Adequate Antidepressant Therapy

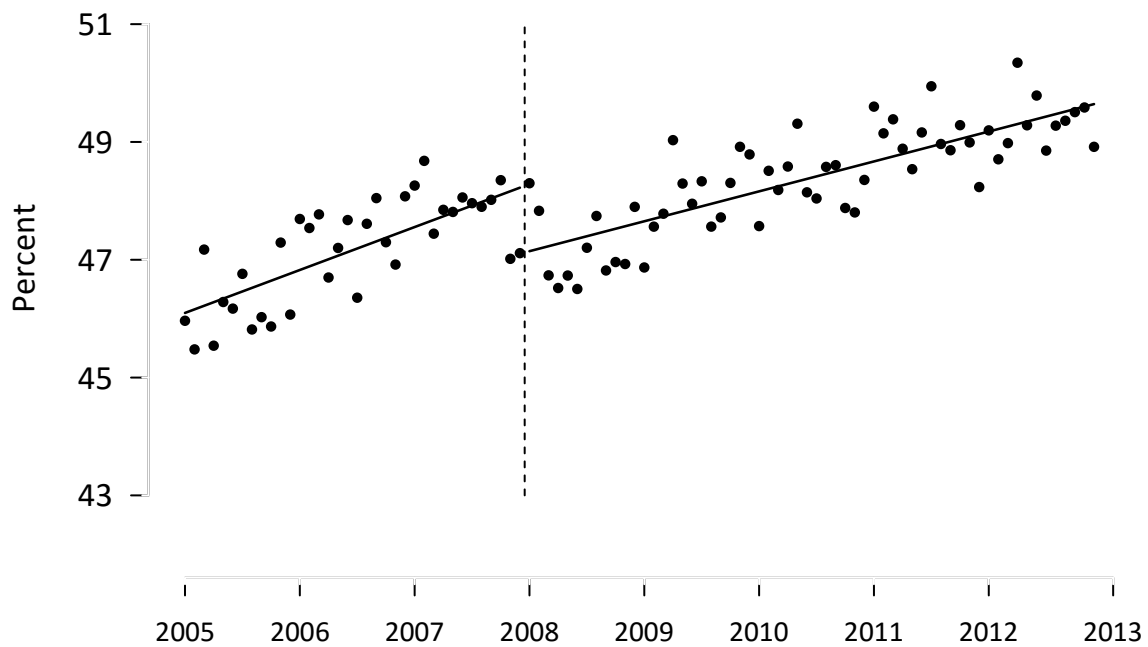


Figure 6.7 Impact of Physician Incentives on Overall Continuity of Care

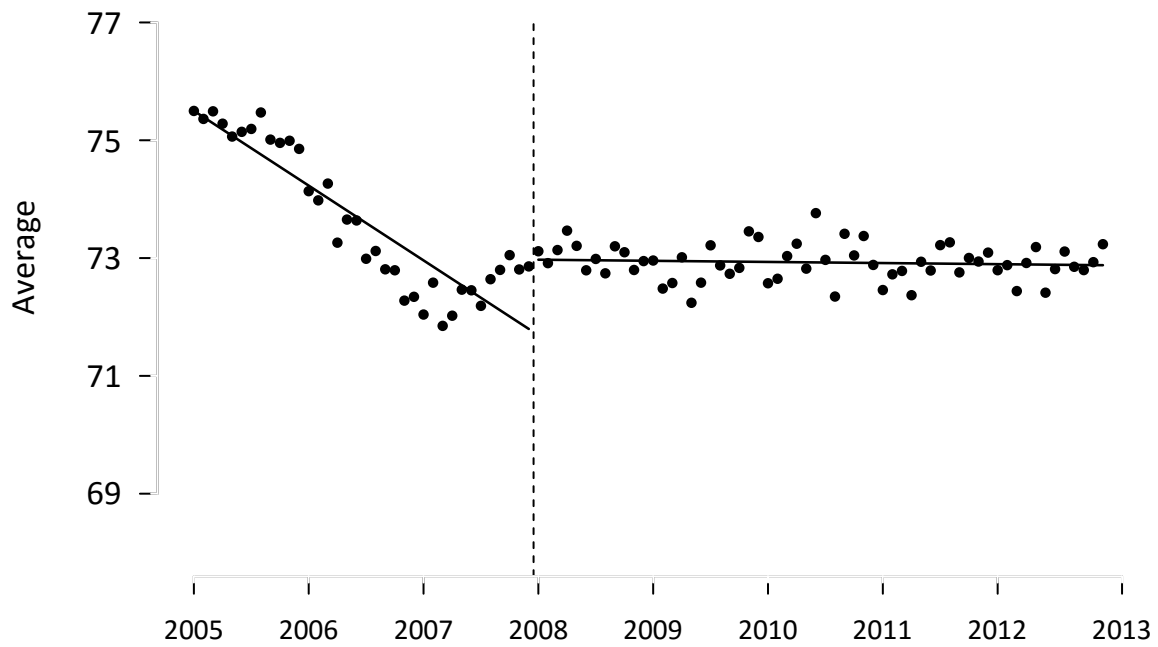


Figure 6.8 Impact of Physician Incentives on Continuity of Mental Health Care

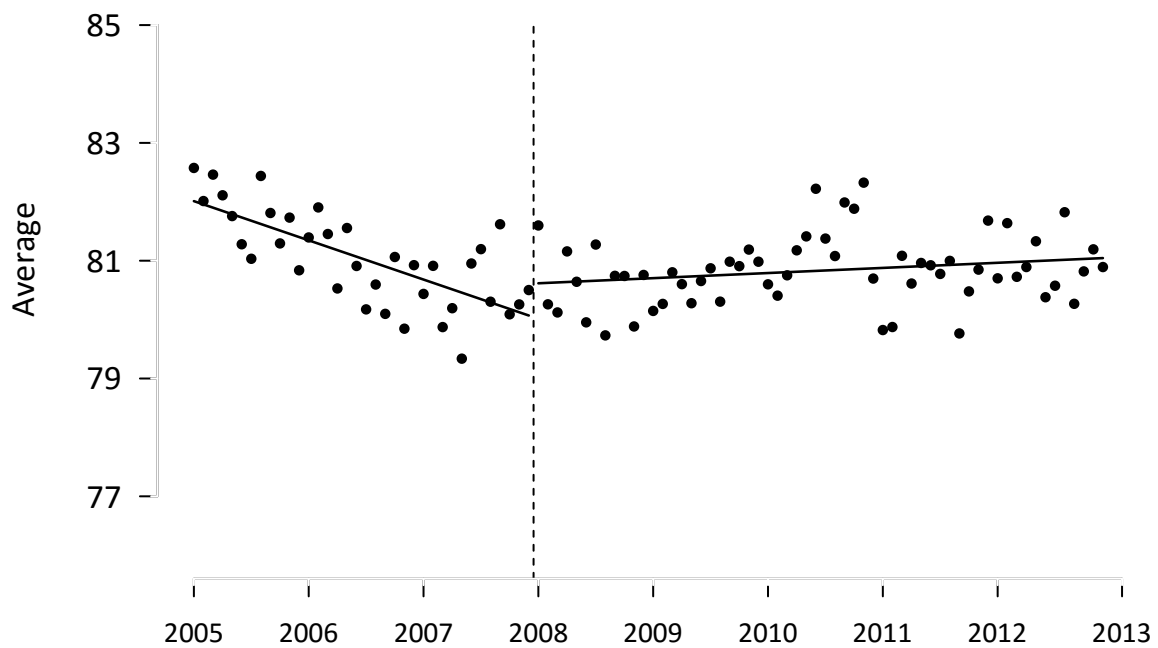


Figure 6.9 Population-Level Impact of Physician Incentives Introduced in January 2008 on Mental Health Care, Based on Data that Excluded Only Individuals Who Were Less Than 19 Years of Age

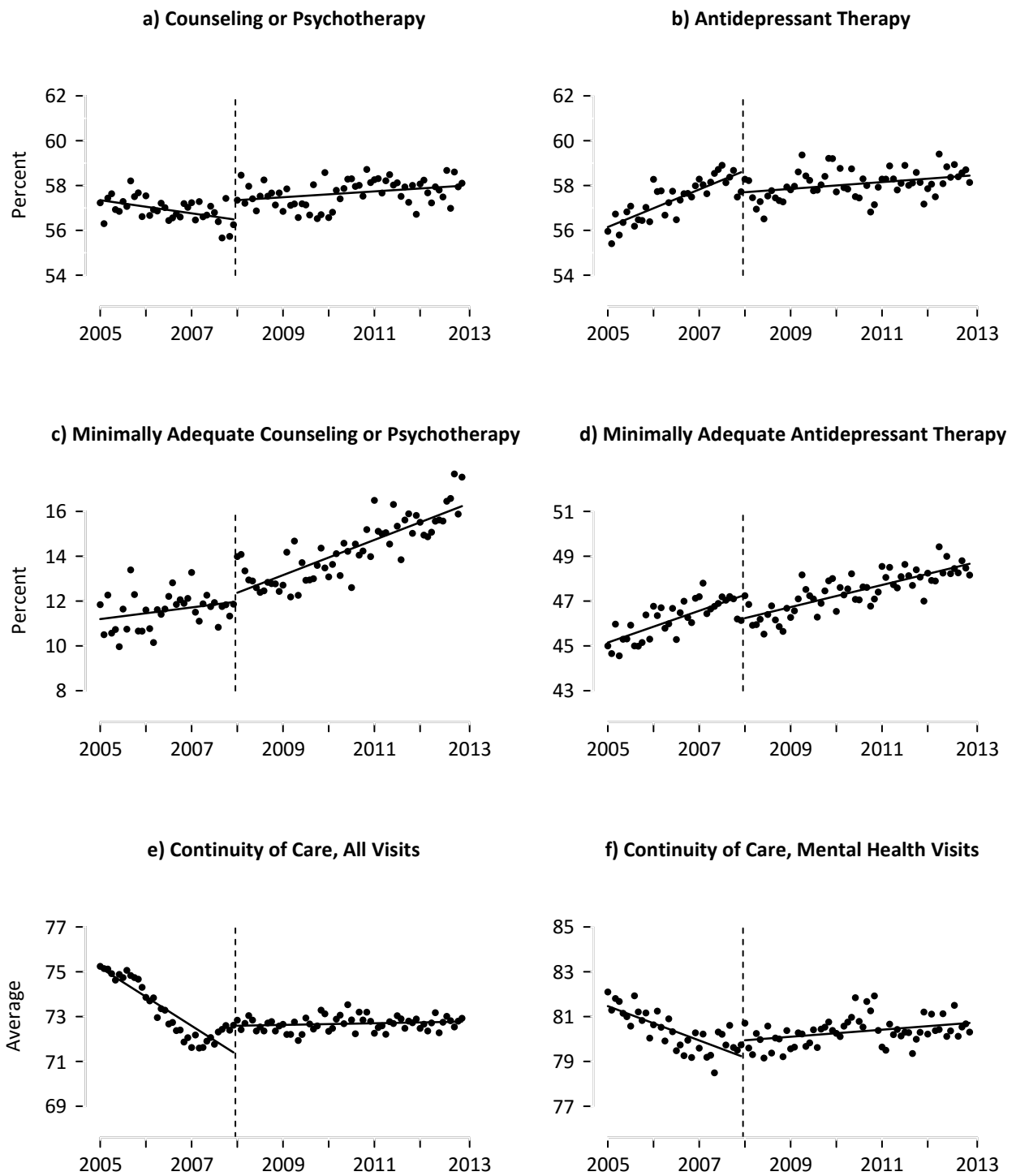


Figure 6.10 Population-Level Impact of Physician Incentives Introduced in January 2008 on Mental Health Care, Based on Analysis That Moved the Start of Intervention From January 2008 to January 2007

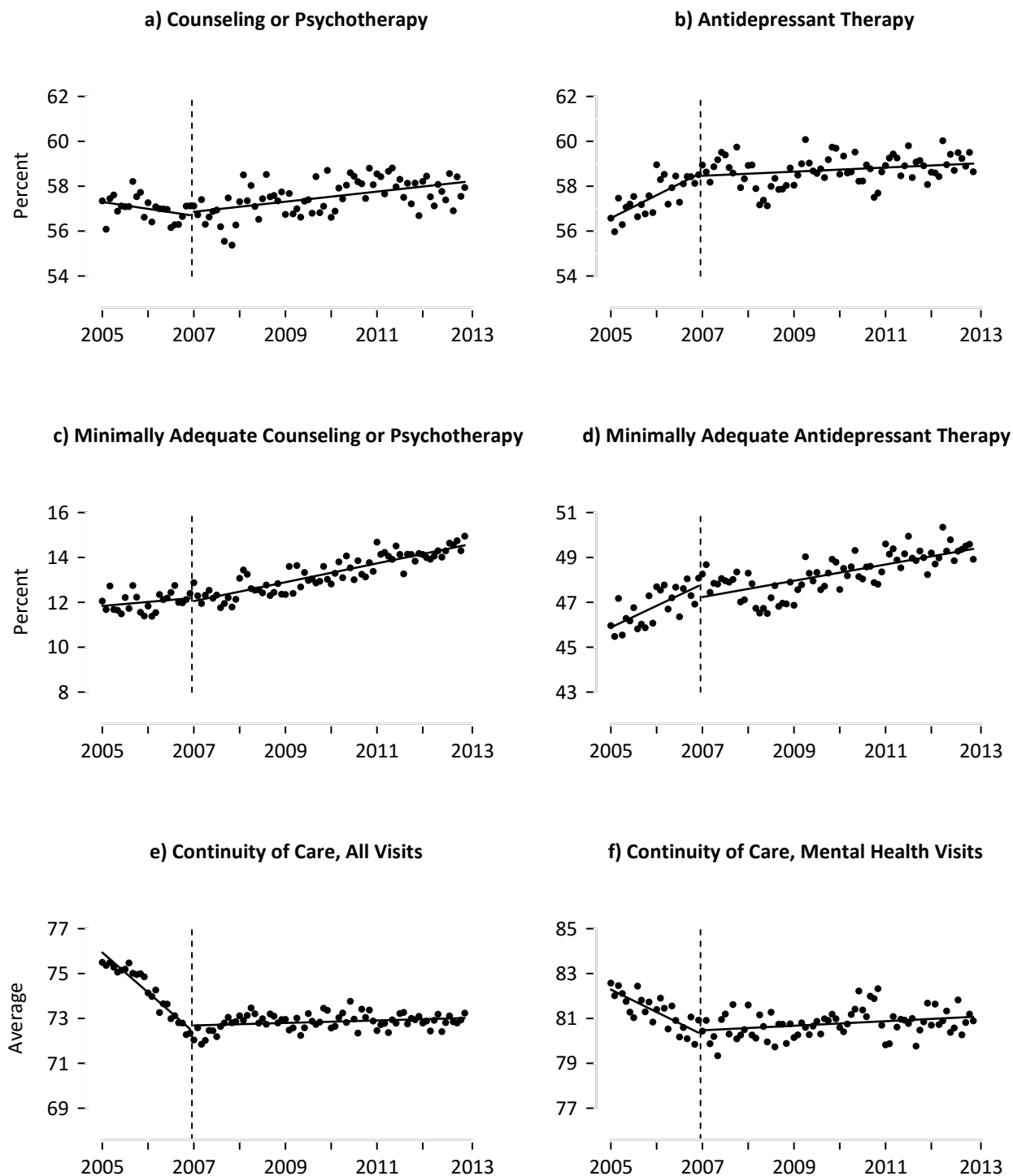
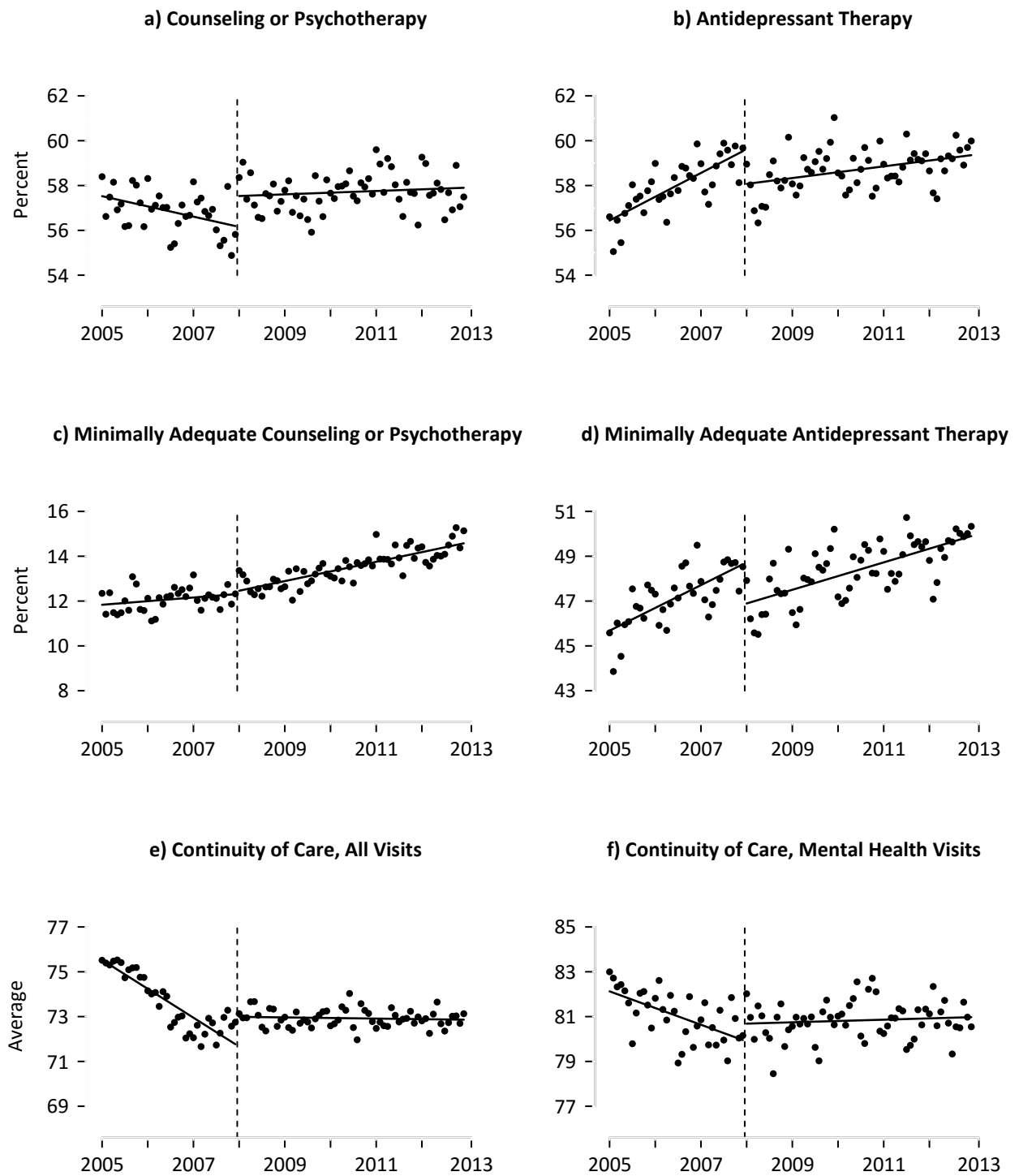


Figure 6.11 Population-Level Impact of Physician Incentives Introduced in January 2008 on Mental Health Care, Based on Data Unadjusted for Seasonal Variation



Chapter 7

Conclusions

The overarching goal of this thesis is to examine depression care patterns at the population-level and determine how amenable depression treatment patterns are to policy interventions aimed at improving mental health care. Accomplishing this goal is useful to current efforts aimed at addressing depression, which has increasingly become the leading cause of disability worldwide. This thesis undertook the following analyses to achieve its objectives:

1. An analysis of existing gaps in the provision of minimally adequate depression care and the factors associated with variations in treatment;
2. An analysis of the association between comorbid physical condition and receipt of depression care; and
3. An estimation of the magnitude of the impact of physician incentives on depression care.

In this final chapter of the thesis, I summarize the key findings from the three research chapters (Chapters 4, 5 and 6) and discuss their contributions to existing knowledge in the area. I conclude the chapter with an outline of the strengths and limitations of the thesis and some recommendations for research and policy.

7.1 Summary of Results and Contributions

7.1.1 Gaps and Variations in Depression Care

The objective of the first research chapter (Chapter 4) is to estimate the magnitude of the gaps in minimally adequate depression treatment and examine factors associated with variations in depression care. To estimate the proportion of people with depression who do not receive treatment, I used national data from the 2012 CCHS survey, as this is the only data source that can be used for this purpose. Then, I used linked health administrative data from BC to estimate the proportion of the treated population who receive inadequate care, focusing in particular on minimally adequate psychological and/or antidepressant therapy.

The overall results support the view that substantial gaps in depression care exist. Analysis of survey data suggest that nearly 3 out of every 10 individuals with depression are not getting any type of help and close to 4 out of 10 do not receive depression care from the formal health care system (i.e. hospitals or health care professionals like psychiatrists, GPs, psychologists, social workers and counselors).¹⁶ Gaps in treatment adequacy are even wider. Analysis based on administrative data shows that only about 1 in 2 individuals treated for depression receive minimally adequate care, mainly through antidepressant therapy.

Results also show that treatment adequacy also vary by sex, age, overall health status, place of residence and physicians. Women, older adults, residents of rural areas, and those with poorer health status have higher proportions of individuals who receive minimally adequate treatment (mainly due to greater use of antidepressants).

Physicians also differ more in regard to providing counseling or psychotherapy than with regard to prescribing antidepressants.

To my knowledge, this is the first population-based study in Canada that examines treatment inadequacy using administrative data. The few available Canadian estimates of the magnitude of the treatment inadequacy are based on self-report data that are either several years old¹⁴ or not population-based.¹⁵ More studies are available in the US, but aside from being from a different jurisdiction with a different health care system, these studies are also based mostly on self-report data.^{45,46,48,49,51–53,55,58–60,62} The few studies that employed administrative data examined specific subpopulations (patients in mental health specialty clinics⁵⁰ or the youth population⁵⁴) that produce estimates that may not apply to the general population. The results of my study therefore complement existing studies by deriving population-based estimates using data sources that do not share the same weaknesses as self-report data. The results also serve as a starting point for the examination of the impact of policy interventions on treatment gaps (Chapter 6).

7.1.2 Physical Comorbidity and Depression Care

The analytic work described in Chapter 5 addresses the role of physical comorbidity as an additional source of variation in the receipt of depression care among individuals. This work departs from most studies on the subject by treating the presence of physical comorbidities not merely as an indicator of overall health status that needs to be controlled for, but as conditions whose impact on depression care may vary depending on the nature of the physical comorbidity. I implemented this in

the analysis by modeling depression care as a function of the presence or absence of seven different chronic conditions in individuals that receive continuing treatment for depression. Additionally, the analysis included two cohorts that are seven years apart to determine if the impact of comorbid physical condition is stable over time, which is often not addressed in previous studies.¹²⁷

Results of this analysis indicate that the association between physical comorbid conditions and depression care vary by type of indicator and by specific comorbidity. By type of depression treatment, the findings generally indicate that those with comorbid physical conditions, compared with those without comorbidities, have higher use of psychological therapies but lower use of antidepressants. Notable exceptions to the general pattern can be observed in individuals with comorbid cerebrovascular disorders or congestive heart failures whose depression care, regardless of treatment modality, are relatively lower than those without these conditions. Over time, there have been changes in the relationship between physical comorbidity and depression care but no generally consistent pattern of decrease or increase can be identified.

The findings from this analysis are generally in line with the conclusions made by a systematic review, which found that comorbid physical does not have a consistent pattern of association with receipt of depression care.¹²⁷ By examining specific types of depression care and comorbidities, my study helps explain using linked health data that the inconsistencies are likely due to the type of depression care and conditions examined. My findings underscore further the limitations associated with the overall

approach of regarding physical comorbid conditions as a coherent set of patient characteristics that is adjusted for in a population-level analysis. Disparities in depression care for certain conditions like CVD and CHF will be missed if only indicators for the presence of one or more comorbid physical conditions were investigated.

7.1.3 Physician Incentives and Depression Care

The final research chapter (Chapter 6) was motivated by the need to examine whether the treatment gaps discussed in Chapter 4 is amenable to the influence of policies designed to improve mental health services in the population. BC, unlike other Canadian provinces, deliberately avoided altering the way it delivers health services to the population.^{66,73} Believing the problems to be primarily operational and not structural, the BC government and its robust association of physicians chose to institute operational changes, with introducing physician incentives as the most salient component. If effective, the initiative will be a fitting rejoinder to public demands that public investments must have demonstrable value. To determine the initiative's impact on depression care, I performed segmented regression analyses to estimate the effect of physician incentives introduced in 2008 on various aspects of depression care as measured by indicators discussed in Chapters 4 and 5.

Results of the analyses suggest that the introduction of physician incentives had measureable but largely modest impact on depression care. Specifically, the pre-policy declining trend in the receipt of counseling or psychotherapy policy was disrupted and replaced by a slight increase over a period of 5 years. The proportion of

those who received minimally adequate counseling or psychotherapy also increased, post-policy. These increases in the receipt of psychological therapy contemporaneously occurred with notable changes in the use of antidepressant therapy. Specifically, the average proportion of individuals initiated on antidepressant therapy shifted downward and the increasing trend was halted, post-policy. The average proportion of those who received minimally adequate antidepressant therapy also shifted downwards but the increasing trend continued at virtually the same rate. Finally, the declining trend in GP continuity, both for any and mental health visits only, was disrupted but did not increase, post-policy. Despite the lack of remarkable increase, post-policy, the impact of physician incentives on continuity of care is unmistakeably positive given that it could have been worse had physician incentives not introduced.

Before this study was completed, the impact of introducing physician incentives on mental health care in the Canadian setting has never before been investigated. Results from other countries that use physician incentives as a policy lever for effecting change in mental health cannot be relied upon due to the peculiarities of the Canadian health systems and policies. Also, reviews of the existing body of literature on the subject are consistently indifferent about the effectiveness of physician incentives in improving health care in general.^{29-32,150} This final chapter, therefore, makes a contribution that is meaningful for BC and other Canadian provinces who have started or looking to implement physician incentives as a component of mental health reforms. With the estimates of the magnitude of the impact, the BC government and taxpayers is now in a better position to appraise whether the initiative represents

good value for the money or to recalibrate its continued implementation. Other Canadian provinces looking to BC for ideas to improve mental health care also now have a more complete picture of what can be anticipated with a predominantly operational approach to mental health reforms.

7.2 Strengths and Limitations

Each research chapter of this thesis contains a more detailed description of the strengths and limitations of the data and analytic approach used. In this section, I will discuss only the ones that are common across the three chapters.

The first key strength of this thesis is the use of data from the entire province of British Columbia to identify the cohort and examine use of depression care. The majority of the available studies on the subject are either sampling based (e.g. survey) or based on a subpopulation (mental health specialty settings or youth), which affects the generalizability of the findings due to sampling error and differential rates of health service use by subpopulations. The use of population-based data makes the findings from this thesis applicable to the entire province of BC and to many jurisdictions where depression care is funded largely by public funds and delivered in primary care settings. More importantly, access to population-based data allowed me to estimate with a high degree of precision the prevalence of treated depression, the gaps and variations in depression care and the small changes in depression care that occurred over time.

Another key strength of this thesis is the use of data sources that do not have the same source of measurement error as self-report data. Self-report data have been shown to underestimate the prevalence of mental health conditions²⁰ and overestimate health service use.^{19,21,22} This is mainly because social desirability¹⁷ compel people to be less likely to disclose having stigmatized conditions, like depression, while recall biases¹⁸ predispose them to overstate frequency of health service use once they have identified themselves as having the condition. Findings from this thesis, therefore, complement available studies on the use of depression care, which are currently characterized by over dependence on self-reported data.

Having access to ten years (2004 through 2013) of population-based administrative data represents a third key strength of the research chapters presented in this thesis. The availability of multi-year data enabled me to create cohorts comprised of individuals that have identical look back and follow-up times, which consequently allowed me to operationally define new versus prevalent depression cases and track their health service use during follow-up. Without several years of data, I would be limited to using one to two years of data for ascertaining cases and tracking use of services, which inevitably introduces bias due to differences in look back and follow up times for each individuals. More importantly, the availability of several years of data enabled me to have adequate data points for estimating the impact of physician incentives, which was especially advantageous given the fairly small post-policy effects I am investigating.

A number of limitations need to be acknowledged when considering the findings reported in this thesis. First, health administrative data do not have the ability to represent individuals who have diagnosable depression symptoms but for various reasons are not in contact with the health system. As a result, I may have underestimated the magnitude of gaps and variations reported in this thesis. Nationwide surveys are probably the most viable source of data that can be used to estimate the extent of this under estimation.

Second, the data I examined do not capture a portion of the population whose health care is managed by the federal government. The findings I reported may or may not be generalizable to these group of individuals, which include members of the First Nations, the military and the Royal Canadian Mounted Police.

Third, it is possible that some of the individuals with recorded depression diagnosis do not have the condition and that some of those without recorded depression diagnosis actually have the condition. Physicians have been known to under and over diagnose depression in primary care¹⁶² and there is currently no information in the health administrative databases that I could have used to account for this.

Fourth, the health administrative data I examined currently lack details that can be used to qualify the depression care indicators used in this thesis. The absence of these type of data prevented me from inferring anything about the quality of the care provided or comment on whether they are evidence-based treatments (e.g., CBT or IPT).

Fifth, my indicators for antidepressant therapy are all based on prescription fills, which could underestimate prescribing practices and overestimate actual use since not everyone fills their prescriptions, and not all of those that do, end up consuming all their filled medications.

Sixth, health administrative data do not capture health service use of those who received depression treatment from other mental health care providers, including physicians who do not bill through the fee for service (FFS) system and clinical psychologists or other mental health professions whose services are not publicly covered. As of 2005 it has been estimated that FFS accounted for 90% of the total expenditures on physician services in BC and that 97% of the practicing physicians in BC can be identified through the FFS system.¹⁶³ Of the remaining 3%, a substantial portion, or 69%, is still identifiable using hospital and other records.¹⁶³ Likewise, analysis of self-report data from 2012 suggests that only up to 3% of the individuals with depression visit psychologists exclusively and are therefore likely to have been missed completely in my estimates.¹⁶ Additionally, it is possible that some individuals' use of depression care was only partially measured since up to about 14.8% of individuals with depression self-reported receiving treatment from both physicians and psychologists.¹⁶ Nevertheless, any potential effects these minor gaps in data have on the results are relevant only for the works presented in Chapters 4 and 5. The estimation of policy impacts in Chapter 6 should not be affected since the policy explicitly targets the provision of mental health care by FFS clinicians.

Seventh, my thesis lack analyses on mental health outcomes obtained using standardized instruments as these are currently not captured in the health administrative databases I examined. Estimating the population level impact of physician incentives on mental health outcomes would be additionally useful since it is ultimately outcomes that are most meaningful when evaluating the effectiveness of interventions. Given the difficulty of measuring outcomes, it has been acknowledged that assessing the technical processes of care, so long as they reasonably result in good outcomes, is useful when examining health care quality.⁷¹

Last, there is nothing in the administrative data I can use to infer severity of depression symptoms. I initially considered using hospitalization as an indicator but refrained from using it because inpatient service use is confounded by the processes of care investigated as dependent variables in my analyses. The absence of these data prevented me from generating estimates of treatment gap and variations stratified by severity, which could be useful for health service planners. In this thesis, I attempted to reduce the potential impact of differences in depression symptoms by restricting the analyses to two relatively homogeneous groups: 1) cohorts of individuals that initiated depression treatment (Chapters 4 and 6), and, 2) cohorts of individuals that receive depression treatment on an ongoing basis (Chapter 5). I also tried to reduce the likelihood that individuals who have depression symptoms that probably do not require treatment are included in my study cohorts by specifically considering only those with depression as a primary diagnosis (i.e. first column of the 5-column ICD9 diagnoses in the physician claims data and the first column of the 25-column ICD 10 diagnoses in the hospital data).

7.3 Study Implications

7.3.1 Research Implications

Findings from Chapter 4 raise a number of research questions whose answers are just as important as the findings reported on the magnitude of the gaps and variations in depression care. One such question pertains to why wide gaps in minimally adequate care exists, particularly in a region of a developed country that takes pride in having comprehensive and universal access to health care. I have already eliminated physician compensation as a potential solution as Chapter 6 has showed clearly that incentivizing depression care provided by physicians will not substantially close the treatment gap. Affordability of depression care, to some extent, has also been eliminated since services provided by physicians are publicly covered and Chapter 4 results indicate income is not associated with receipt of depression, although future studies could benefit from having a more sensitive measure of income measured at the individual level. Since the confluence of factors operating at the patient, physician, health delivery system and societal levels are likely behind the treatment gaps, future investigations should aim to consider all these levels of analysis when looking for answers.

Another area for further inquiry is the variations in depression care reported in Chapters 4 and 5. Some of the variations are understandable and probably acceptable. For example, the lower use of antidepressants and higher use of psychological therapy among the younger age group is likely due to the lower risk-benefit ratio of using antidepressants in the younger population, hence, this variation is probably not

unwarranted. Likewise, the lower use of antidepressants in people with cerebrovascular disease is similarly understandable as most practice guidelines encourages caution in prescribing antidepressants for this patient group. On the other hand, some variations deserve further investigation, like the apparent disparities related to women being more likely to be medicated than men, and men being more likely to receive psychological therapy than women. The reasons for and outcomes of such disparities need to be explored using sex and gender based lens.

Evidence for some geographic variation was provided in Chapter 4 in terms of differences in depression care between rural versus urban residents. This needs to be explored further using more sophisticated analysis and using identifiers for local health authority, which were not included in the data I was permitted to access. In the past, decision-makers in BC have justified their operational approach to closing the treatment gap by pointing out that BC's geography is distinct from Ontario's and Quebec's, where collaborative models of health service delivery have a greater chance of being successful.⁷³ This claim can be tested by examining geographic variations in depression care using Bayesian approaches that account for geographic clustering, followed by an examination of whether geographic variations decreased or increased after the introduction of physician incentives.

One potential threat to the validity of the conclusions regarding the impact of physician incentives on depression care is the possibility that the observed changes in care patterns are actually due to factors that are operating at the national level and not really to the introduction of physician incentives. To potentially invalidate the

findings reported in Chapter 6, such factors need to have exerted their impact at roughly the same time as physician incentives were offered, so it is unlikely that such factors exist. Nonetheless, the validity of the conclusions reached in Chapter 6 will be strengthened if the analyses could be performed in other Canadian provinces that collect health data similar to BC. To my knowledge the other Canadian provinces with comparable data holdings are Ontario and Manitoba. These provinces would be ideal comparison groups to use in an interrupted time series analysis where the difference in differences between intervention (BC) and comparison groups (Ontario and/or Manitoba) are used as data points for analysis.

7.3.2 Practice and Policy Implications

Results of the analysis of gaps and treatment variation underscore the need to improve depression care for everyone. As well, targeted interventions are needed for certain groups who are at higher risk of receiving inadequate treatment. This is important particularly for younger individuals, where the prevalence of depression is relatively higher.^{7,36} and where the modal treatment, antidepressant therapy, is considered to have the lowest risk-benefit ratio.⁹ The limited literature that has examined help-seeking in younger individuals point to stigma, poor mental health literacy and the desire to be self-reliant as barriers and previous positive experiences with help-seeking, social support and encouragement from others as important facilitators.¹⁶⁴ Interventions that target young adults need to consider all these factors to increase the probability of being successful. In particular, there is a lot to be gained if mental health programs could capitalize on younger individuals' desire to be self-reliant. This could be done, for example, by offering treatment options or

programs, such as supported self-management,^{165,166} that enable or encourage younger individuals to take a more active role in the management of their conditions. Similarly, the Internet could also be exploited to meet younger individuals' tendency to self-manage although regrettably, the Internet's potential for promoting mental health literacy and delivering supported self-management strategies have yet to be fully realized as recent studies demonstrate.^{167,168}

Next to the younger age group who are at risk of under treatment are men. Addressing the needs of this patient group may require creating intervention programs that are built around or that address men's perceptions of and beliefs surrounding mental disorders and treatment options. There is growing evidence that the differential socialization of men as robust, physically fit and strong individuals put them at risk of not seeking or delaying treatment^{169,170} or predispose them to choose forms of treatment that allow them to preserve traditional conceptions of what it means to be masculine. I suspect this explains a lot of what my findings indicate about women being medicated more while more men tend to "talk it out".¹⁷¹ With careful thought, it is possible to design interventions that integrate traditional attributes of what it means to be a man (i.e. responsibility, self-reliance and perseverance) with ideas that are compatible with or promote mental health seeking behavior.¹⁷²

Results of the analysis on the impact of physician incentives on depression care show that offering physician incentives alone results in modest improvement in depression care, and clearly will not close the existing wide gaps in mental health care. Additional reforms need to be considered, even if that means modifying the health

service delivery structure. In particular, efforts to integrate primary and mental health care need to be intensified, systematically implemented, and expanded to go beyond mainly motivating or helping GPs manage patients with mental disorders. Various strategies or models of integration have been developed and tested in the past and there are many that are well supported by evidence.¹⁷³ BC can adapt these models, some of which are already being used in a few areas, to develop a province-wide and coherent strategy. It is encouraging to note that there seems to be a strong appetite for doing just that as evidenced by a 2015 BC MoH document entitled, “Primary and Community Care in BC: A Strategic Policy Framework,” which advocates, among many things, for the establishment of team-based family practices.¹⁷⁴

Finally, there is evidence that psychological treatment is preferred over pharmacological treatment¹⁷⁵ and some evidence that preference for certain forms of depression care (psychological versus antidepressant therapy) influence patient’s decision to initiate and continue treatment.¹⁷⁶ It follows from these that some of the treatment gaps reported in this thesis are probably due to the lack of adequate public coverage for psychological therapy since “what is not insured is simply not accessible”¹⁷⁷ and that when left with little choice, some patients may just forgo treatment altogether. It is reasonable, therefore, to expect that augmenting publicly-funded mental health services by providing public coverage for psychological therapy administered by other mental health professionals (i.e. clinical psychologists and counselors) would enhance treatment choice and consequently help close gaps in depression care.

7.4 Conclusions

Depression has increasingly become the leading cause of disability worldwide. Despite availability of evidence-based treatments, many with depression remain untreated. Findings from this thesis show that even when treated, only about half of the patients treated for depression receive minimally adequate care, mostly through the provision of antidepressant therapy. Treatment disparities also exist affecting mostly younger adults and men who are less likely to receive any type of depression care overall. The presence of physical comorbidity is also another source of treatment variation, with the likelihood of receiving treatment varying based on types of depression care indicator and the specific physical comorbidity examined. Concerns about the quality of mental health care in BC was recently addressed by introducing physician incentives. My research shows that this policy has had measurable impact on depression care. It increased the proportion of people who initiated and received minimally adequate psychological therapy and decreased the proportion of those who initiated and received minimally adequate antidepressant therapy. It also arrested further declines in physician continuity of care. However, the overall impact of physician incentives has been modest at best and will not close the wide gap in depression care that currently exists. Reforms that emphasize the development of integrated primary mental health care are therefore needed and may require fundamental changes in the way mental health services are delivered.

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