Disparities in Antipsychotic Medication Use

by

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Abstract

Objectives: To examine ethnic and income-related disparities in the use of antipsychotic medication by conducting a systematic review of the related literature and a secondary data analysis.

Methods: The review was conducted using a protocol developed to systematically search, select and review peer-reviewed articles on ethnic disparities in antipsychotic use. Study selection and data abstraction were performed by two independent reviewers. The secondary data analysis was conducted to examine income-related disparities in antipsychotic use in three cohorts. The first cohort was comprised of 19 to 64-year olds who had a recorded schizophrenia diagnosis. Income-related differences in the essential use of antipsychotics were assessed in this cohort. The second cohort was comprised of seniors (65 years and older) who had a recorded dementia but not schizophrenia or bipolar disorder diagnosis. The third cohort was of children and youth (18 years and younger) who had no recorded schizophrenia or bipolar disorder diagnosis. Income-related differences in the potentially inappropriate use of antipsychotics were studied in these last two cohorts. Disparities in antipsychotic use were assessed using logistic regression, adjusting for factors that influence medicine use (i.e., age, sex, health status, relevant diagnoses and residence in urban areas).

Results: The systematic review found no consistent evidence of ethnic disparities in the receipt of antipsychotic treatment. However, among those who were treated, ethnic minorities were found to be consistently less likely than non minorities to receive the newer type of antipsychotics. Results of the secondary data analyses indicate that the odds of essential antipsychotic use were lower in low-income individuals than those with higher incomes. Odds of exposure to potentially inappropriate antipsychotic use, on the other hand, were higher among low-income individuals and seniors in long-term care.

Conclusion: There is evidence of persistent disparities in the use of antipsychotic medication. Periodic examination and studies that identify causal factors and effective interventions are needed to reduce disparities.

Preface

The research presented in this thesis was conceptualized, conducted and written by Joseph Puyat (JP) with the assistance, guidance and critical feedback from the members of his thesis committee – Drs. Steve Morgan, Michael Law, Sabrina Wong and Jason Sutherland.

JP conducted and completed the systematic review with help from his thesis committee members and colleagues from the UBC Centre for Health Services Policy and Research (CHSPR). JP developed the protocol, performed independent reviews and data abstraction, and wrote the entire systematic review chapter. CHSPR information specialist, Devon Greyson, helped develop the literature search parameters and performed the actual electronic database searches. Drs. Steve Morgan and Mike Law and CHSPR research associates, Jamie Daw and Colleen Cunningham, acted as second reviewers, adjudicators and data abstractors.

JP designed the study, performed the specified analyses and wrote the chapter on income-related disparities in antipsychotic medication use. The study was conducted as part of Dr. Steve Morgan's research programme on equity in access to prescription drugs. Ethics approval was granted by the Behavioural Research Ethics Board at the University of British Columbia (certificate number: H10-01058). Data access permissions were provided by the BC Ministry of Health Services and the PharmaNet Stewardship Committee. The preparation and submission of data access request to Population Data BC (PopData BC) was facilitated by Gillian Hanley and PopData BC staff. CHSPR programmer, Lixiang Yan, performed the data extraction and de-identification in accordance with existing confidentiality and privacy regulations.

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List of Abbreviations

ATC	Anatomical Therapeutic Chemical
ACG	Adjusted Clinical Groups
ADG	Aggregated Diagnostic Groups
BC	British Columbia
CHSPR	Centre for Health services and Policy Research
CI	Confidence Interval
ICD	International Classification of Diseases
MSP	Medical Services Plan
NZ	New Zealand
NL	Netherlands
OR	Odds Ratio
UBC	University of British Columbia
UK	United Kingdom
US	United States
WHO	World Health Organization

Glossary

Antipsychotics – psychiatric drugs used primarily for the treatment of schizophrenia and psychotic disorders

Atypical antipsychotics – newer (second-generation) type of antipsychotics identified by practice guidelines as first-line therapy for schizophrenia

Bipolar disorder – severe mental disorder characterized by mania, with or without the presence of depressive episodes

Disparities – differences in health status or care that are not attributable to differences in clinical need

Ethnicity – a concept pertaining to perceived membership in groups by virtue of shared ancestry, language or culture

Race – socially-constructed categories of people based on physical characteristics

Schizophrenia – a severe mental disorder characterized by acute disturbances in thought, affect and behaviour

Typical antipsychotics – older (first-generation) type of antipsychotics

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1 Introduction

Concerns about unequal access to a breakthrough drug for the treatment of schizophrenia and other psychotic disorders have generated interest and several studies on ethnic disparities in antipsychotic treatment. Many of the earlier investigations have focused on racial or ethnic differences in the pharmacokinetic response to antipsychotics as well as in the search for biologically plausible mechanisms that could explain these variations.[1]

While the existing body of research on ethnic or race-based disparities in antipsychotic medicine use has increased steadily over the years, the growth in knowledge regarding income-based disparities has been sluggish, partly because of the overall lack of attention that has been paid to the examination of the effect of socioeconomic status on health.[2] In the case of antipsychotic medication use, the lack of income-based analyses is regrettable since schizophrenia is strongly linked to socioeconomic status.[3] This gap in knowledge seriously limits efforts to improve this patient group's access to essential health services.

The examination of these two determinants of disparities in access to an essential mental health treatment was the overarching theme that guided the research described in this thesis. As important factors that contribute to health disparities, ethnicity and socioeconomic status were given equal importance and were regarded as having independent effects on health and access to essential health care. This approach was taken in recognition of the presumption that both determinants need to be addressed to reduce health disparities since the reduction in or elimination of one source does not always bring about the same effect on the other.[4]

1.1 Research objectives

In spite of the interest and the amount of research that have accumulated over the past three decades on ethnic and racial disparities in antipsychotic treatment, studies that summarize the state of knowledge in the area have been scarce. Previous syntheses focused mostly in the area of ethnopsychopharmacology[5-8] and no prior synthesis was found that specifically examined ethnic differences in antipsychotic drug use.

To fill this research gap, and as the first objective of this thesis, a systematic review was conducted to:

1) Gather and synthesize the existing evidence from peer-reviewed scientific literature on racial and ethnic disparities in the use of antipsychotic medication.

In contrast to the relatively extensive knowledge base developed around ethnicity and race-based disparities in antipsychotic use, there is a dearth of studies that focus on socioeconomic status. As a contribution to current efforts at examining income-based disparities in use and as its second objective, this thesis aimed to:

2) Examine differences in two facets of antipsychotic medicine use – essential and potentially inappropriate use – across different levels of a commonly used measure of socioeconomic status (income).

The examination of income-related disparities was first conducted in light of antipsychotic medicine's role as an essential treatment for schizophrenia. In this view, higher levels of antipsychotic use that are consistent across all income levels were viewed as desirable. A complementary analysis was conducted to examine income-related disparities in the potentially inappropriate use of antipsychotic medication. In this second facet of antipsychotic medicine use,

lower levels of use were regarded as desirable and disparities in use were seen as income-related inequalities in exposure to the drug's potential adverse effects.

1.2 Thesis outline

This thesis is comprised of four sections, including this introduction. The second chapter is composed of the systematic review of the peer-reviewed scientific literature on racial and ethnic disparities in the use of antipsychotic medication. The third chapter is a presentation of the analyses on income-related disparities in the essential and potentially inappropriate use of antipsychotic medicine. The rationale, methods, discussions, and conclusions for these two independent studies are presented in their respective chapters. The last chapter concludes this thesis with a summary of key findings and a discussion of the study's strengths and limitations and some recommendations.

1.3 Brief background on schizophrenia and antipsychotics

1.3.1 Schizophrenia

Schizophrenia is a severe and persistent form of mental illness characterized by profound disturbances in thinking and feeling which severely impair social and occupational functioning. The wide range of symptoms used in diagnosing this condition include auditory and visual hallucinations, delusions, disorganized thinking and speech, grossly disorganized behaviour (e.g., extreme lack of hygiene, dressing inappropriately), catatonic behaviours, reduction in the range and intensity of emotional expression, lessening of speech fluency and productivity and reduction in goal-directed behaviour.[9] Although advances in the understanding of the neurobiochemical processes associated with schizophrenia have been made in the past few decades, the aetiology of the

disorder remains largely unknown.[10] At present, there is no cure for this illness, although the symptoms are usually treated and respond well to medications.[11]

In the US and Canada, around one percent of individuals, 18 years and older, are estimated to be living with schizophrenia.[10,11] In British Columbia, the yearly proportion of individuals who received a diagnosis of schizophrenia while receiving ambulatory, hospital, or community mental health treatment ranged from 0.42% to 0.45% between the years 1996 and 1999.[12] Treated prevalence varied across health service delivery areas with Vancouver (0.64%) registering the highest rate in 1996-97 and the relatively more affluent North Shore-Coast Garibaldi (0.23% in 1998-99) and Richmond (0.25% in 1998-99) registering the lowest rates in the period examined.[12] The BC prevalence is likely to be a conservative estimate given that the study was based on administrative data which do not record cases who did not seek treatment in the years examined.

Aside from the extreme human suffering schizophrenic disorders impose on individual patients and their families, the disorder also results in substantial economic burden. In 2004, schizophrenia was estimated to have resulted in direct healthcare and non-healthcare costs of CAN$2.02 billion, and, productivity, morbidity and mortality loss of CAN$4.83 billion, for a total cost of about CAN$6.85 billion.[13]

1.3.2 Antipsychotics

Antipsychotics are prescription drugs (e.g., haloperidol, risperidone, olanzapine, etc.) used primarily to treat the clinical symptoms of schizophrenia and other psychotic disorders.[14,15] Off-label, they are also used for conditions such as Tourette's syndrome and the behavioural and psychological symptoms of dementia (BPSD).[16]

Antipsychotics were first discovered in the early part of the 1950s by drug developers experimenting with pharmaceutical adjuncts for postsurgical

shock treatment. In the 1990s, a newer class of antipsychotics, also known as the atypical antipsychotics, were introduced and later became widely used. Many clinicians believe these newer medications are better in producing cognitive and functional improvements and have lower risks of causing movement disorders.[17] More recent studies suggest that atypical antipsychotics are likely to be just as effective as the older antipsychotics. In addition, atypical antipsychotics have been associated with increased risks of cerebrovascular events, metabolic side effects, upper respiratory infections and death.[18-21]

In BC, the use of antipsychotic drugs among individuals aged 20 years and older has increased dramatically from 13.5 per thousand in 1997-98 to 25 per thousand in 2005-06. [22] The increase in rates is driven by the higher use of the more expensive atypical antipsychotics. Older individuals (75 years and older) and women appear to have disproportionately higher rates of use.[22] Among children below the age of 15, use has also increased over the past few years.[23]

2 Racial and ethnic disparities in antipsychotic drug use: a systematic review of the literature

2.1 Introduction

The serendipitous discovery of the first antipsychotic drug, chlorpromazine, in the early part of 1950s paved the way for a new era in psychiatric care. Since then the pharmacological treatment of mental disorders successfully displaced controversial procedures like prefrontal lobotomy and electroconvulsive shock therapy. With antipsychotic therapy, patients experienced dramatic reduction in symptoms and improvement in overall function and quality of life, consequently enabling them to be integrated back to the community. Unfortunately, treatment with chlorpromazine and similar first generation antipsychotics produced very unpleasant side effects (e.g. extrapyramidal symptoms, tardive dyskinesia and other related movement disorders) that discouraged many patients from continuing with their regimen.

A few decades later, a new generation of antipsychotics, known as atypical antipsychotics, were developed and became widely used. These drugs were found to have comparable efficacy to earlier antipsychotics, but without the often irreversible movement disorders associated with typical antipsychotic use.[17] The earliest of these atypical antipsychotics was clozapine, a medication that was found to be superior to chlorpromazine and haldol[24] and which is now considered to be an effective medication for treatment-resistant schizophrenia.[25] Clozapine use, however, requires enrolment in a registry of patients who must submit to regular blood work to detect the onset of the drug's potentially fatal side effect – agranulocytosis (fatal lowering of white blood cells). Other atypicals (e.g., risperidone, olanzapine, and quetiapine) were later developed which do not have the risk profiles of the typical antipsychotics or clozapine, but

carry a host of other health risks such as cerebrovascular events, metabolic syndrome, upper respiratory infections, and increased mortality.[18-21]

Notwithstanding potential adverse effects, antipsychotic therapy is now regarded as an essential component of today's treatment programs for schizophrenia and bipolar disorders. Clinical practice guidelines clearly identify pharmacotherapy, particularly atypical antipsychotics, as first-line treatment for acute and chronic schizophrenia.[14,15,26-30]

Because of these drugs' demonstrated efficacy in reducing symptoms as well as in the prevention of relapse and re-hospitalization,[31,32] it is imperative that patients with conditions that merit treatment with these drugs experience no barriers in obtaining them. Similar to disparities in access to other important health services, the presence of disparities in the use of antipsychotic medication could indicate poor care quality. Health systems need to be concerned about these disparities as their presence either point to underlying inequalities in the provision of care or to potential disparities in mental health outcomes.[33]

An Institute of Medicine report, which has documented persistent disparities across a wide range of medical conditions and health care services, defined disparities in health care as "... racial or ethnic differences in the quality of health care that are not due to access-related factors or clinical needs, preferences, and appropriateness of intervention."[34] Since the release of the report, other studies have been conducted to uncover evidence of disparities that have not been previously addressed.

In line with these efforts, we conducted this review to systematically gather and synthesize the available evidence regarding racial and ethnic disparities in the use of antipsychotic medication.

2.2 Methods

2.2.1 Search strategy

We searched the following electronic subscription databases to identify potentially relevant studies: CINAHL (Ebsco), EMBASE (OvidSP), International Pharmaceutical Abstracts (OvidSP), MEDLINE (OvidSP), PsycINFO (Ebsco), ScienceDirect, and Web of Science (Thompson Reuters). The electronic database search was implemented between November 29 and December 1, 2010 by a master's-trained information specialist (DG). The search parameters used a combination of subject headings and keywords for ethnic or racial groups, and those for antipsychotic agents and specific antipsychotic medications (see Table 2-1 for an example of the search parameters).

2.2.2 Inclusion criteria

We developed a review protocol detailing the inclusion criteria and the study selection process that guided this review. Specifically, we included studies that report measures of prevalence or disparity in the use of antipsychotic drugs in at least two clearly defined racial or ethnic groups drawn from the general population or from specific subpopulations (e.g., defined by disease category, demographics, socio-economic status or health insurance coverage) in any treatment setting (inpatient, outpatient, or both). In addition, we only included studies that had a primary focus on ethnic or racial disparities with adjustments for the effects of any factors known to influence medicine use such as age, sex, health status, income, insurance, and related diagnosis. Because of this, only studies that reported differences across ethnic groups in the likelihood of using antipsychotic medicine in terms of adjusted prevalence, odds ratios or probit coefficients were included. Studies that reported only ethnic differences in dose, adherence or compliance rates, initiation rates, route of administration (oral versus depot) and prevalence of polypharmacy were excluded. Also excluded

were clinical trials, case studies, literature reviews, articles from non-peer reviewed periodicals, commentaries and letters to the editor, books and book reviews, preliminary reports, meetings and conference proceedings, and studies from the grey literature. Literature searches were limited to peer-reviewed studies published in English between January 1, 1980 and December 30, 2010. The full inclusion criteria are detailed in Table 2-2.

2.2.3 Study selection process

Study selection was done in three stages: title review, abstract review and full-text review. In the first two stages, JP and SM independently screened titles and reviewed all abstracts. Entries that were deemed relevant by at least one of these reviewers were included in the subsequent stages. In the final selection process (full-text review), JP and JD reviewed the full-texts of articles that were included in the abstract review. Only those studies that were considered potentially-relevant by both reviewers were included in the pool of studies for data abstraction and analysis. Although a third author (ML) was available to help resolve differences in inclusion assessment, consensus was achieved after discussion between the two full-text reviewers. Inter-rater reliability was assessed by calculating kappa coefficients between reviewers at each stage.

2.2.4 Data collection

A data collection form (Appendix B) for extracting data from the included studies was piloted by five reviewers (JP, JD, CC, ML and SM) using two studies drawn at random from the pool of included studies. After revision, the form was used to extract data from each study by at least two reviewers based on the following allocation: JP – 100%; JD – 25%; CC – 25%, ML – 12.5% and SM – 12.5%. Any disagreements in data abstractions were resolved by consensus. The following data were extracted from each study: sample size, sampling frame, prescription data source, year(s) of data collection, covariates used for

adjustment, crude prevalence and measures of disparity, specifically, adjusted odds ratios. Study authors were contacted via email for clarification or when some of the data were not provided in the article.

2.2.5 Analysis

Although adjusted odds ratios from most of the studies included in this review were available, important differences in sampling methodology, prescription data sources and time periods precluded us from performing a meta-analysis. Thus, data synthesis was performed by grouping the obtained odds ratios by type of comparison (use versus non use of antipsychotics or receipt of atypical versus typical antipsychotic among those that received the treatment), type of antipsychotics (any antipsychotic, atypical, typical and clozapine), racial or ethnic categories (white, African American, Latino, and others) and treatment setting (inpatient, outpatient, or both). Authors of published studies were not consistent in their use of ethnic or racial categories. To maintain parsimony, studies that reported results for "Blacks" were coded as African Americans while those that reported results for "Hispanics" were coded as Latinos. Also, the "non-Blacks" or "non-Hispanics" categories examined in some studies were coded as whites.

2.3 Results

A total of 1,825 unique citations were obtained and subjected to the three-stage review process. In the first stage of the study selection process, title reviewers read and identified 532 (29% of the unique citations) potentially relevant studies (Agreement: 85.8%; Kappa: 0.59, 95% CI=0.55-0.64). Abstracts of these studies were then reviewed in the next stage for inclusion in the full-text review which returned 121 studies (Agreement: 96.6%; Kappa: 0.91, 95% CI=0.86-0.95). In the final selection process (full-text review), 28 studies were

found to have met our inclusion criteria and subsequently constituted our final set of studies (Agreement: 96.7%; Kappa: 0.92, 95% CI=0.83-0.99). Differences in assessments were resolved after discussion between the two primary reviewers without involving the third reviewer.

Key features of each study that met our inclusion criteria are presented in Table 2-3. Of the 28 studies, 25 were from the US and the rest were from the Netherlands,[35] New Zealand[36] and United Kingdom.[37] Only one study[38] was based on data collected before 1989 – the year the first atypical antipsychotic, clozapine, was introduced in the market; the rest of the studies were based on data collected from 1998 onwards. Sixty one percent (n=17) of the included studies used prescription drug data from administrative sources[35,37,39-53] while 32% (n=9) and seven percent (n=2) utilized medical chart reviews[36,38,54-60] and survey/interviews,[60,61] respectively. Only a small number of studies assessed the use of antipsychotic medication in inpatient or hospital settings[38,48,58,59] (n=4, 14%); most of the studies examined use in either outpatient[36,37,39,41,42,45,46,49,52-54,56,61] (n=13, 47%) or all treatment settings[35,40,43,44,47,50,51,55,57,60,62] (n=11, 40%). Population-based studies comprised more than half (n=18, 64%) of the studies that satisfied our inclusion criteria; the rest used purposive[46,55-57,60] (n=5, 18%), random[49,54,62] (n=3, 11%) and convenience (n=2, 7%) samples.

The majority (n=23, 82%) of the included studies examined antipsychotic medication use among patient groups diagnosed with severe mental disorders such as schizophrenia (n=20) and bipolar disorders (n=2). Most of the studies examined populations that included only the adult population (individuals between the ages of 19 and 60 years); there was only one that looked at the children and youth population,[53] and two that examined medication use specifically among individuals aged 60 years and older.[45,49]

White, African American and Latino ethnicities were the groups most frequently examined in the 25 US-based studies included in this review. Ethnic groups such as Asian, Maori and Pacific Islanders were examined only in a study conducted in New Zealand (NZ).[36] Similarly, Dutch, Moroccan and Turkish ethnicities were examined in the Netherlands (NL) study only.[35]

We found wide variation in the number and type of covariates used in adjustment for the odds ratio, but the most frequently examined covariates were psychiatric morbidity, age and sex. Only one study included in this review, the NL study, did not control for the effect of psychiatric morbidity either by restricting the analysis to those with mental disorders or including mental disorder diagnoses in the regression model.

To maintain uniformity in the reporting of odds ratios in the following summary figures, all odds ratios (OR) were expressed using the majority ethnic group as the reference group. For example, in studies that reported African Americans as the reference group, the reciprocal of the reported odds ratio was calculated to obtain the odds ratio for whites as the reference group. Similarly, typical antipsychotics use was the reference group when reporting results of studies that compare odds of receiving typical versus atypical antipsychotics.

Not all studies provided odds ratios and/or confidence intervals when reporting ethnic or racial disparities. When a study merely stated that no ethnic or racial disparities were observed, the study's OR was plotted in the figures using a value of one with no confidence intervals. Odds ratios that have no confidence interval were plotted using just the point-estimate.

2.3.1 Racial or ethnic disparities in the use versus non use of antipsychotic drugs

There were 10 (36%) studies that examined disparities in the use versus non use of any antipsychotics across all treatment settings (Figure 2-2).

Significant disparities were reported in four of these studies: two from the US and one each from NZ and NL. One of the US studies analyzed disparities among hospitalized patients diagnosed with schizophrenia and found African Americans marginally less likely than whites to have received any antipsychotic medication.[52] The other US study assessed disparity among individuals with bipolar disorders receiving treatment in the community and found African Americans more likely than whites to have used an antipsychotic as adjunct medication.[47] The NZ study reported that two ethnic minorities, Maori's (in 2000 and 2004) and Pacific Islanders (in 2004) were less likely to have used an antipsychotic compared to the reference group (white Europeans).[36] In the NL study, the Moroccan and Turkish ethnic groups were reported to have significantly higher odds of use than the Dutch reference group.[35] The NL and NZ studies did not control for the presence of medical conditions usually treated with antipsychotic medications.

There were six studies that examined ethnic disparities in the use of atypical antipsychotics compared to non use (Figure 2-3). Two US studies[40,48] and the NZ study[36] reported significant disparities in the likelihood of atypical antipsychotic use. In the two US studies, African Americans were less likely to have received atypical antipsychotic treatment compared to their white counterparts. In the NZ study, Maoris had lower odds of use compared to residents of European ethnicity in 2000, but the trend appears reversed in 2004. Similarly, Pacific Islanders had lower odds of use in 2000 only.

There were five studies (n=3, US; n=1 NZ; n=1, UK) that examined ethnic disparities in the use of typical antipsychotics versus non use (Figure 2-4). Two of the three US studies found that African Americans were significantly more likely to receive typical antipsychotics than whites.[38,47] In the NZ study, Maoris were more likely, in 2000, but less likely in 2004, to be treated with typical

antipsychotics compared to the reference group (white Europeans). The Pacific Islander group in the NZ study was consistently less likely to receive typical antipsychotic treatment.

The three studies that reported ethnic disparities in the use of clozapine versus non use indicate a consistent pattern of significantly low likelihood of clozapine use among ethnic minorities (Figure 2-5). African Americans in the US had about 40%[40] to 60%[48] less odds of receiving clozapine treatment than their white counterparts. In the NZ study, the Asian, Maori (in 2000 only) and Pacific Islander groups had lower odds of being treated with clozapine.

2.3.2 Racial or ethnic disparities in the use of atypical versus typical antipsychotic medication

There were 15 studies, all US-based, that examined the likelihood of being treated with atypical versus typical antipsychotics among the subpopulation of individuals treated with antipsychotics (Figure 2-6). Of these, 12 studies reported odds ratios that were below one, indicating that minorities, such as African Americans and Latinos, were less likely than whites to be treated with atypical antipsychotics. The finding of lower likelihood for these groups was consistent across all treatment settings and types of patient populations. The other three studies also found lower likelihood of use for African Americans and Latinos, but the point-estimates were not statistically significant.[39,42,49]

2.4 Discussion

Our review of studies published over the past few 30 years found neither large nor consistent ethnic disparities in the receipt versus non-receipt of any antipsychotic treatment. However, among those who had been treated with antipsychotics, we found consistent evidence suggesting that ethnic minorities were less likely than non-minorities to receive atypical antipsychotics.

It is possible that the lack of a distinct pattern of disparity in the use versus non use of any antipsychotics reflects genuine absence of ethnic differences in the receipt of any antipsychotic treatment among people with schizophrenia. This interpretation seems consistent with the finding that only four studies reported statistically significant disparities in use. One of these studies reported a marginal difference while another reported a possibly important disparity but from a sample of individuals with bipolar disorders, not schizophrenia. The two other studies (NZ and NL) did not adjust for differences in psychiatric diagnosis; hence, the reported differences, though statistically significant, were likely to be confounded by differences in prevalence of schizophrenia diagnoses.

The finding of consistent ethnic differences in the receipt of atypical versus typical antipsychotics merits further investigation. This finding seems to suggest that ethnic minorities received poor care quality when viewed in the context of existing practice guidelines that recommend the use of atypical antipsychotics as first-line treatment for psychotic disorders such as schizophrenia.[14,15] Atypical antipsychotics have been regarded as better in improving cognitive functions (i.e., verbal fluency, attention, memory for facts and events) while at the same time have lower risks of causing irreversible movement disorders (i.e., extrapyramidal syndromes and tardive dyskinesia).[17]

It is also worth examining further if the lower prevalence of atypical use among ethnic minorities may have been motivated by concerns about adverse effects. Previous research has linked prolonged use of atypical antipsychotics with increased risks of cardiovascular events and metabolic syndrome.[17] Since epidemiological studies have determined that the prevalence of hypertension and diabetes is higher among African Americans and Latinos,[63,64] it is possible that the lower likelihood of atypical antipsychotic use among ethnic minorities

may have been inadvertently caused by efforts to minimize these risks. Some authors have hypothesized about this[48] but none of the studies we reviewed offered conclusive evidence.

The observed lower likelihood of clozapine use among African Americans is a cause for concern.[40,48] The disparity has generally been attributed to clinicians' hesitance to prescribe clozapine to African Americans because of the perception that members of this ethnic group are less likely to adhere to a clozapine regime and also are at greater risk of agranulocytosis.[40,48,65] Others challenge this practice. Apparently, the limits established by existing guidelines for safe clozapine use failed to account for the typically normal low counts of white blood cells (benign leukopenia) among African Americans,[66,67] thus, effectively limiting their access.

The lower likelihood of clozapine use among Asians also deserves further investigation.[36] It is possible that previous findings about Asians requiring lower doses of clozapine than whites[68] may have prompted some clinicians to consider this particular antipsychotic as too potent for most Asians. This seems consistent with the finding that Asians in San Francisco were found to be less likely to be eligible for clozapine treatment even when the most lenient interpretation of the requirements for use were applied.[69] Alternatively, cultural factors may have contributed to the observed disparities. It has been noted, for instance, that beliefs about the act of drawing out blood discouraged some Chinese patients from enrolling in clozapine registries. These patients have expressed concerns that the regular blood monitoring was detrimental to their overall health and vitality.[70]

2.5 Conclusions

Our review found neither strong nor consistent ethnic disparities in the use versus non use of any antipsychotics. However, among those who received antipsychotic treatment, ethnic minorities such as African Americans and Latinos were found to be consistently less likely than members of non minorities to be treated with atypical antipsychotics and more likely to have used typical antipsychotics. Prescribing practices influenced by guidelines regulating the use of antipsychotics and concerns about increased risk of potential adverse events may have contributed to this observed disparity.

Table 2-1 Example search strategy

MEDLINE (OvidSP)
1. exp neuroleptic agent/bd, ct, ad, cm, do, it, dt, ih, ia, ce, cv, dl, ig, im, na, ip, tl, iv, po, pa, pr, pe, pd, rc, sc, sb, li, tp, td 2. (Acepromazine or Acetophenazine or Amisulpride or Aripiprazole or Benperidol or Bromperidol or Butaperazine or Chlorproethazine or Chlorpromazine or Chlorprothixene or Clopenthixol or Clotiapine or Clozapine or Cyamemazine or Dixyrazine or DOGMATIL or Droperidol or Fluanisone or Flupentixol or Fluphenazine or Fluspirilene or Haloperidol or Levomepromazine or Levosulpiride or Loxapine or Melperone or Mesoridazine or Molindone or Moperone or Mosapramine or Olanzapine or Oxypertine or Paliperidone or Penfluridol or Perazine or Periciazine or Perphenazine or Pimozide or Pipamperone or Pipotiazine or Prochlorperazine or Promazine or Prothipendyl or Quetiapine or Remoxipride or Risperidone or Sertindole or Sulpiride or Sultopride or Thiopropazate or Thioproperazine or Thioridazine or Tiapride or Tiotixene or Trifluoperazine or Trifluperidol or Triflupromazine or Ziprasidon or Zotepine or Zuclopenthixol or Methotrimeprazine).mp. 3. 1 or 2 4. exp ethnic difference/ or exp ethnic group/ or exp "ethnic or racial aspects"/ or exp race/ or exp "ethnic, racial and religious groups"/ or exp ethnicity/ 5. 3 and 4 6. limit 5 to (human and english language and yr="1980 -Current")

Table 2-2 Inclusion/exclusion criteria

Included studies	Population	Intervention	Comparison	Outcome
• Observational studies including: cross-sectional, case-control, prospective and retrospective cohort studies • January 1, 1980 to October 31, 2010 • English language	• OECD countries • General population	Use of: • any antipsychotics • typical and antipsychotics • clozapine	• At least *two clearly defined racial or ethnic groups* compared with each other • *Ethnicity or race was analyzed as a primary variable with adjustments* for factors such as age, sex, health status and income	• Odds ratios or prevalence rates describing ethnic disparities in use

Table 2-3 Design and sample/population characteristics of the studies included in the systematic review.

Study (Author, Year)	Study design				Sample/Population characteristics				Covariates
	Sampling Frame	Sampling Method	Data collection years	Rx data source	Diagnoses	N	Sex (%) M/W	Age	
Segal et al., 1996[38]	Inpatients of psychiatric ERs in 4 urban general hospitals in California, US	Convenience	1981-1986	Chart review	60% with psychotic disorders; 9% had to be restrained	442	60/40	np	Psychotic disorders; severity of psychiatric disturbance; dangerousness; psychiatric history; physical restraints; hours spent in ER; treatment engagement; optimum time spent on evaluation
Baillargeon & Contreras, 2001[39]	Prisoners in the Texas Dept of Criminal Justice, US	Population	1998	Administrative	Schizophrenia and other psychotic disorder	4,316	93/7	18+	Age, sex, violent offense, presence of schizophrenia diagnoses or other psychotic disorders
Kuno & Rothbard, 2002[40]	In/outpatient Medicaid recipients, US	Population	1995	Administrative	Schizophrenia	2,515	56/44	18-64	Age, sex, insurance (all Medicaid), supplementary security income recipient, psych hospitalization; ER visit; use of intensive case management service; partial hospitalization; medical care; drug or alcohol treatment; depot use
Covell et al., 2002[54]	Outpatients of the Connecticut public mental health system, US	Random	1996-1998	Chart review	Schizophrenia, schizoaffective, and psychotic disorders NOS	386	58/42	np	Age, sex, SES(education), marital status

Study (Author, Year)	Study design				Sample/Population characteristics				Covariates
	Sampling Frame	Sampling Method	Data collection years	Rx data source	Diagnoses	N	Sex (%) M/W	Age	
Mark et al., 2002[55]	In/outpatient participants of the Schizophrenia Care and Assessment Program (North Carolina site), US	Purposive	1997-1999	Chart review	Schizophrenia, schizoaffective and schizophreniform	752	65/35	18+	Age, age at onset, sex, insurance, SES (education), Clinical status (PANSS, MADRS and AIMS), schizophrenia (paranoid, undifferentiated and other), marital status, treatment site, physician char (i.e., sex, age, board certification etc.)
Woods et al., 2003[61]	Outpatients from a Connecticut community mental health centre, US	Convenience	2000-2002	Survey	participants from tardive dyskinesia study and receiving at least 1 AP	501	54/46	np	Age, sex, SES (education), substance abuse or disorder
Copeland et al., 2003[41]	Outpatient Veterans Affairs recipients, US	Population	1998-1999	Administrative	Schizophrenia	69,787	95/5	18+	Age, sex, substance use, bipolar, other psychoses
Kreyenbuhl et al., 2003[56]	Outpatient participants of the Schizophrenia Patient Outcomes Research Team in Maryland, US	Purposive	1994-1996	Chart review	Schizophrenia or schizoaffective	344	36/64	18-64	Age, sex, SES (years of education), health status (medical comorbidity), psychiatric diagnoses (schizo vs. schizoaffective), marital status, state of residence, urban/rural, treatment facility type

Study (Author, Year)	Study design				Sample/Population characteristics				Covariates
	Sampling Frame	Sampling Method	Data collection years	Rx data source	Diagnoses	N	Sex (%) M/W	Age	
Mark et al., 2003[57]	In/outpatient participants of the Schizophrenia Care and Assessment Program (North Carolina site), US	Purposive	1999-2001	Chart review	Schizophrenia or schizophreniform disorders	2,239	62/38	18+	Age, sex, insurance (Medicare, private, veteran), SES(education), psych dx (affective, undifferentiated, other schizo), veteran, marital status, depot use, adherence, PANSSGP, GAF, QLS,MADRS, CHAMPUS
Valenti et al., 2003[58]	Inpatients from New York(?), US	Population	2000	Chart review	Schizophrenic, schizophreniform, schizoaffective, psychosis NOS	276	54/46	np	Age and substance abuse diagnosis
Bagchi et al., 2004[42]	Outpatient Medicaid recipients identified in the New Jersey HIV/AIDS registry, US	Population	1992-1998	Administrative	Schizophrenia and HIV	350	54/46	18+	Age at HIV diagnosis, sex, insurance (Medicare), health status (vital stat as of 1998) county of residence, mode of transmission; year of HIV diagnosis
McFarland et al., 2004[43]	In/outpatient Medicaid recipients in Florida, Oregon and Pennsylvania, US	Population	1997-1998	Administrative	Psychotic disorders including schizophrenia and affective and substance use disorders with psychosis	894	39/61	np	Age, sex, insurance (duration of Medicaid eligibility) and psychiatric diagnosis (affective only, psychosis only, substance only and combinations of all 3)

Study (Author, Year)	Study design				Sample/Population characteristics				Covariates
	Sampling Frame	Sampling Method	Data collection years	Rx data source	Diagnoses	N	Sex (%) M/W	Age	
Sohler et al., 2004[59]	Inpatient participants of the Suffolk County Mental Health Project, Massachusetts, US	Population	1989-1995	Chart review	Schizophrenia and other psychosis	501	57/43	15-60	Age, sex, marital status, educational status, occupational status, and insurance status
Herbeck et al., 2004[62]	In/outpatients who received care from psychiatrist members of the American Psychiatric Institute for Research and Education's Practice Research Network, US	Random	1997-1999	Survey	not specified, but everyone was treated by psychiatrists and received at least one AP	700	51/49	18 up	Age, sex, insurance, education, schizophrenia and substance use diagnoses, GAF score, previous hospitalization, treatment duration, marital status, region, treatment setting, type of health care plan
Opolka et al., 2004[44]	In/outpatient Medicaid recipients in Texas, US	Population	1997-1998	Administrative	Schizophrenia	3,583	47/53	21-65	Age, sex, psychiatric diagnoses (bipolar disorder, other mental illness, substance use), region, medication and resource use in the previous 12 months
Hudson et al., 2005[45]	Nursing home residents with Medicaid coverage in Arkansas, US	Population	2001	Administrative	not specified, but everyone were nursing home residents; had at least one AP claim	2,717	26/74	65+	Age, sex and location of nursing home

Study (Author, Year)	Study design				Sample/Population characteristics				Covariates
	Sampling Frame	Sampling Method	Data collection years	Rx data source	Diagnoses	N	Sex (%) M/W	Age	
Van Dorn et al., 2005[46]	Outpatient participants of the Schizophrenia Care and Assessment Program (North Carolina site), US	Purposive	1997-1999	Administrative	Schizophrenia	224	64/36	18+	Sex, insurance, GAF, psychiatric diagnosis (high psychotic symptoms, substance abuse), other (initial treatment setting, visits with a psychiatrist, compliance, arrest history)
Chakos et al., 2006[60]	In/outpatient participants of the Clinical Antipsychotic Trials of Intervention Effectiveness study, US	Purposive	2001-2003	Chart review & Interview	Schizophrenia, schizoaffective and depression with schizophrenic features	1,138	77/23	np	Lehman QOL interview, SCI DSM-IV Axis I depression, Abnormal Involuntary movement
Kilbourne & Pincus, 2006[47]	In/outpatient Veterans Affairs recipients in Pennsylvania, Delaware, West Virginia, Ohio, New Jersey & New York, US	Population	2000-2001	Administrative	Bipolar disorders	2,958	89/11	np	Age, sex, income (copayment waiver eligibility status) health status (comorbid medical condition), psychiatric diagnoses (bipolar disorder subtype, inpatient/outpatient status), other (marital status)
Mallinger et al., 2006[48]	Inpatients of the University of Rochester hospital in New York, US	Population	2003-2004	Administrative	Schizophrenia and schizoaffective disorder	456	65/35	18+	Age, insurance (Medicaid vs. non-Medicaid), SES (education), psychiatric diagnoses, other (living situation)

Study (Author, Year)	Study design				Sample/Population characteristics				Covariates
	Sampling Frame	Sampling Method	Data collection years	Rx data source	Diagnoses	N	Sex (%) M/W	Age	
Jano et al., 2008[49]	Outpatient participants of the Medical Expenditure Panel Survey, US	Random	1996-2004	Administrative & Survey	Schizophrenia, bipolar disorder, anxiety and dementia	551	30/70	60+	Age, sex, Insurance (private vs. not), SES (income), health status (perceived gen health and perceived mental health), psychiatric diagnosis (anxiety, schizophrenia, bipolar, dementia), other (region, time, metro stat area)
Yang et al., 2008[50]	In/outpatient Veterans Affairs recipients in Texas, US	Population	1997-2002	Administrative	Majority (83.4%) had at least one mental illness	8,096	93/7	18+	Age, sex, health status (physical comorbidities including dyslipidemia and hypertension), psychiatric diagnosis (bipolar, depression, PTSD, schizophrenia, and substance abuse), treatment initiation years
Wheeler et al., 2008[36]	Outpatients of community health services in Auckland, New Zealand	Population	2000 & 2004	Chart review	Schizophrenia and schizoaffective disorder	4,821	np	np	Age and sex
Busch et al., 2009[51]	In/outpatient Medicaid recipients in Florida, US	Population	1997-2005	Administrative	Bipolar I disorder	13,497	29/71	18-64	Age, sex, insurance (Medicaid eligibility), health status (comorbid conditions that discourage/encourage mood stabilizer prescribing, and encourage antipsychotic prescribing), substance use disorders

Study (Author, Year)	Study design				Sample/Population characteristics				Covariates
	Sampling Frame	Sampling Method	Data collection years	Rx data source	Diagnoses	N	Sex (%) M/W	Age	
Busch et al., 2009[52]	Outpatient non-HMO Medicaid recipients in Florida, US	Population	1996-2001	Administrative	Schizophrenia	28,153	47/53	18-64	Age, sex, comorbid substance abuse, fiscal year, region of residence, number of months of Medicaid enrolment
Pinto et al., 2010[37]	Outpatients from 29 out of 54 borough practices contributing data to Lambeth DataNet (primary care database) in London, UK	Population	2006	Administrative	Schizophrenia, bipolar disorders and any psychotic disorders not related to substance abuse	1,694	60/40	16-74	Age, sex, SES (area-based social deprivation measure)
Sleath et al., 2010[53]	Outpatient Medicaid recipients in North Carolina and Georgia, US	Population	2000-2001	Administrative	Schizophrenia	11,241	62/38	<18	Age, sex, state of residence
Wittkampf et al., 2010[35]	In/outpatient Agis (major insurance provider) recipients, Netherlands	Population	2001-2006	Administrative	none	1,220,338	47/53	np	Age, sex, SES (income), urbanization

Figure 2-1 Study selection and review process

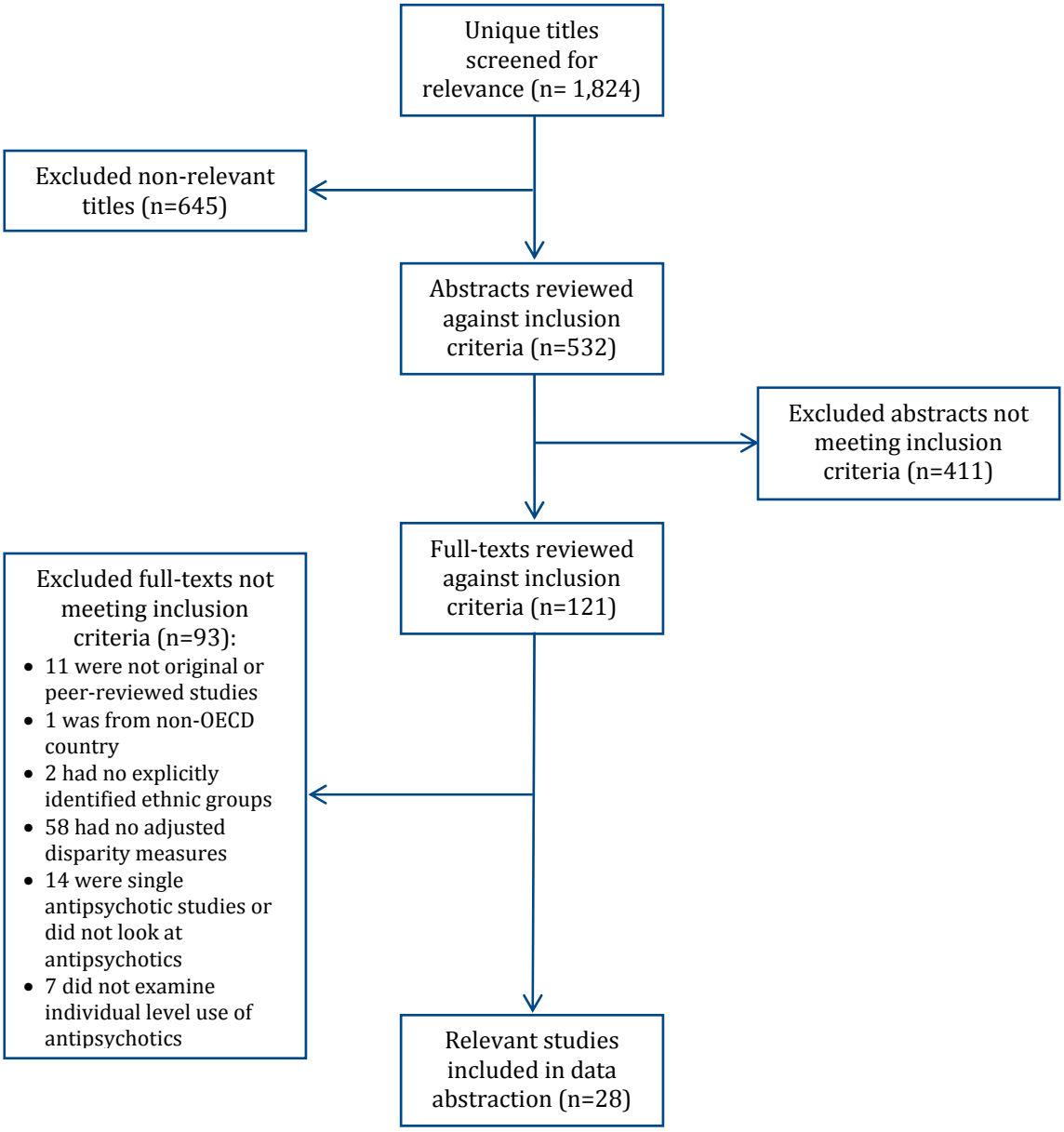


Figure 2-2 Ethnic disparities in the use versus non use of any antipsychotics

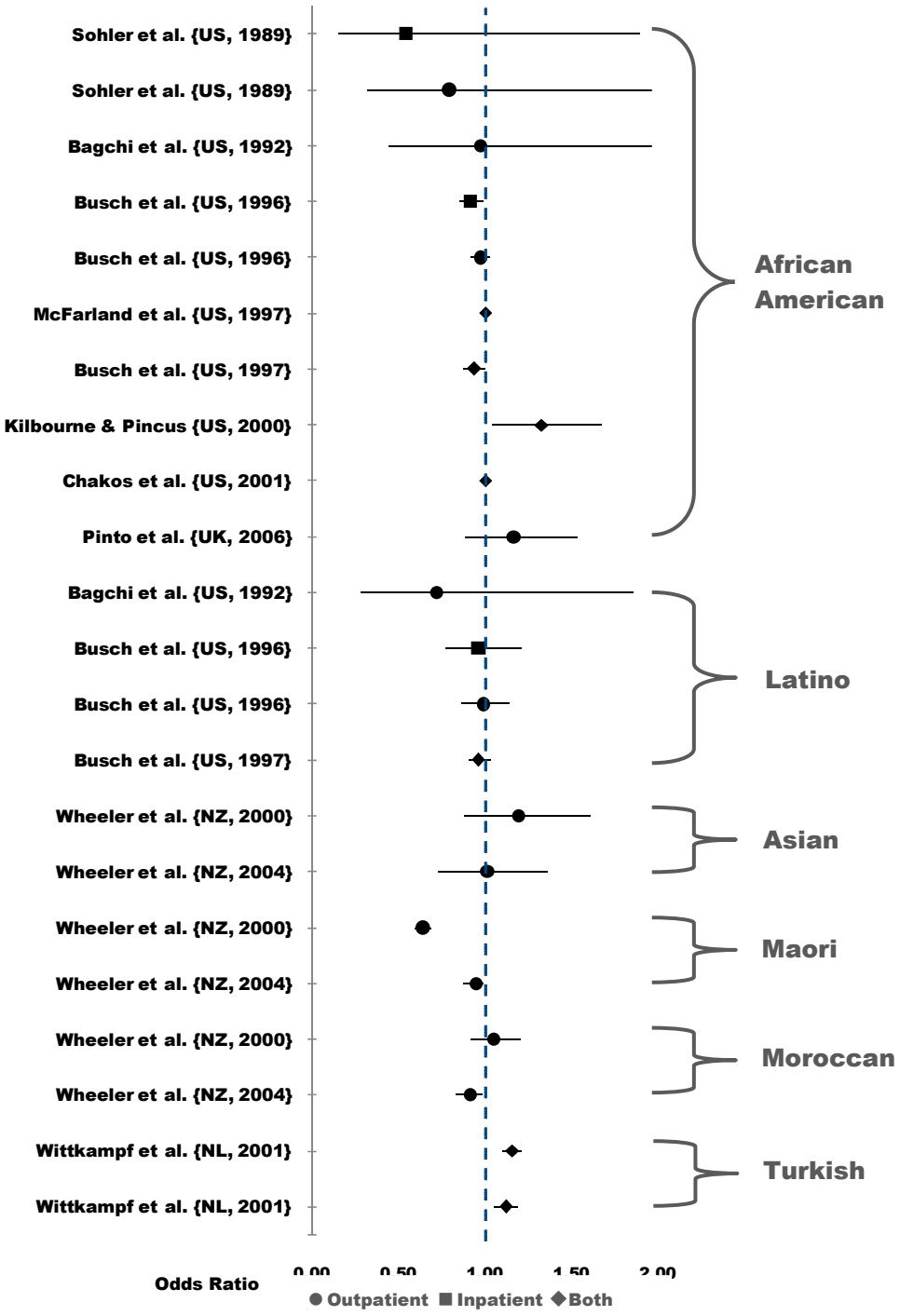


Figure 2-3 Ethnic disparities in the use versus non use of atypical antipsychotics

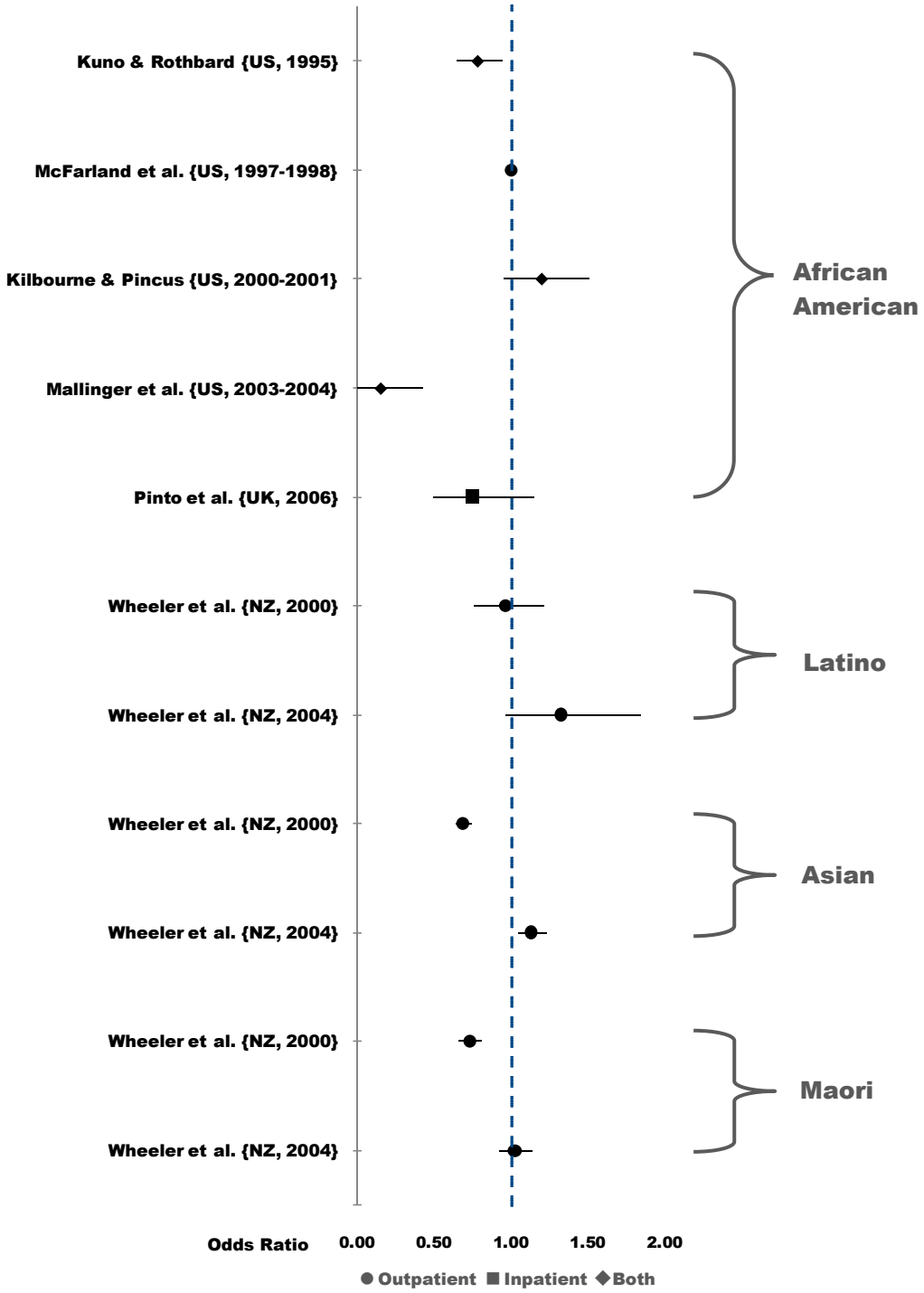


Figure 2-4 Ethnic disparities in the use versus non use of typical antipsychotics

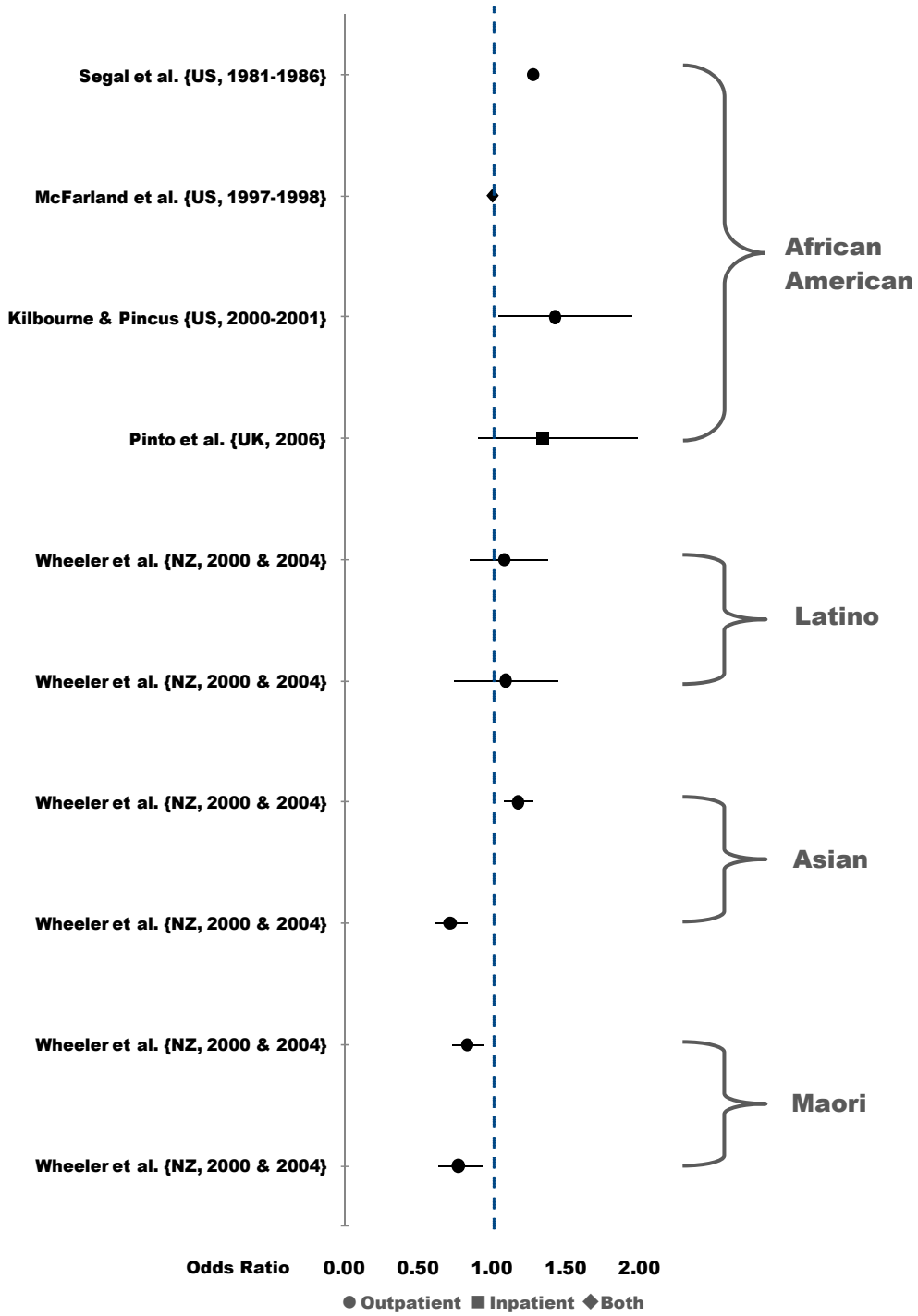


Figure 2-5 Ethnic disparities in the use versus non use of clozapine

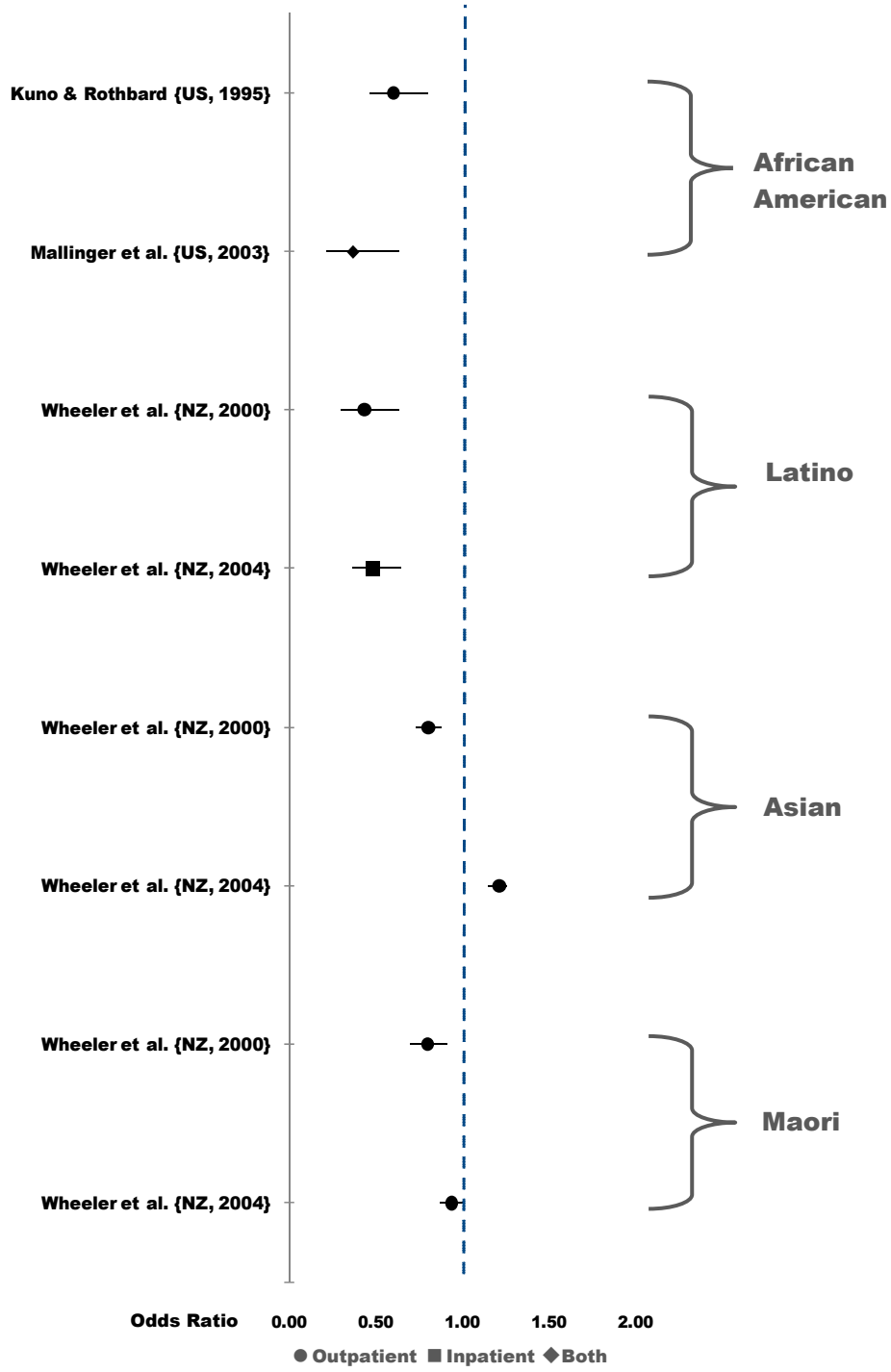
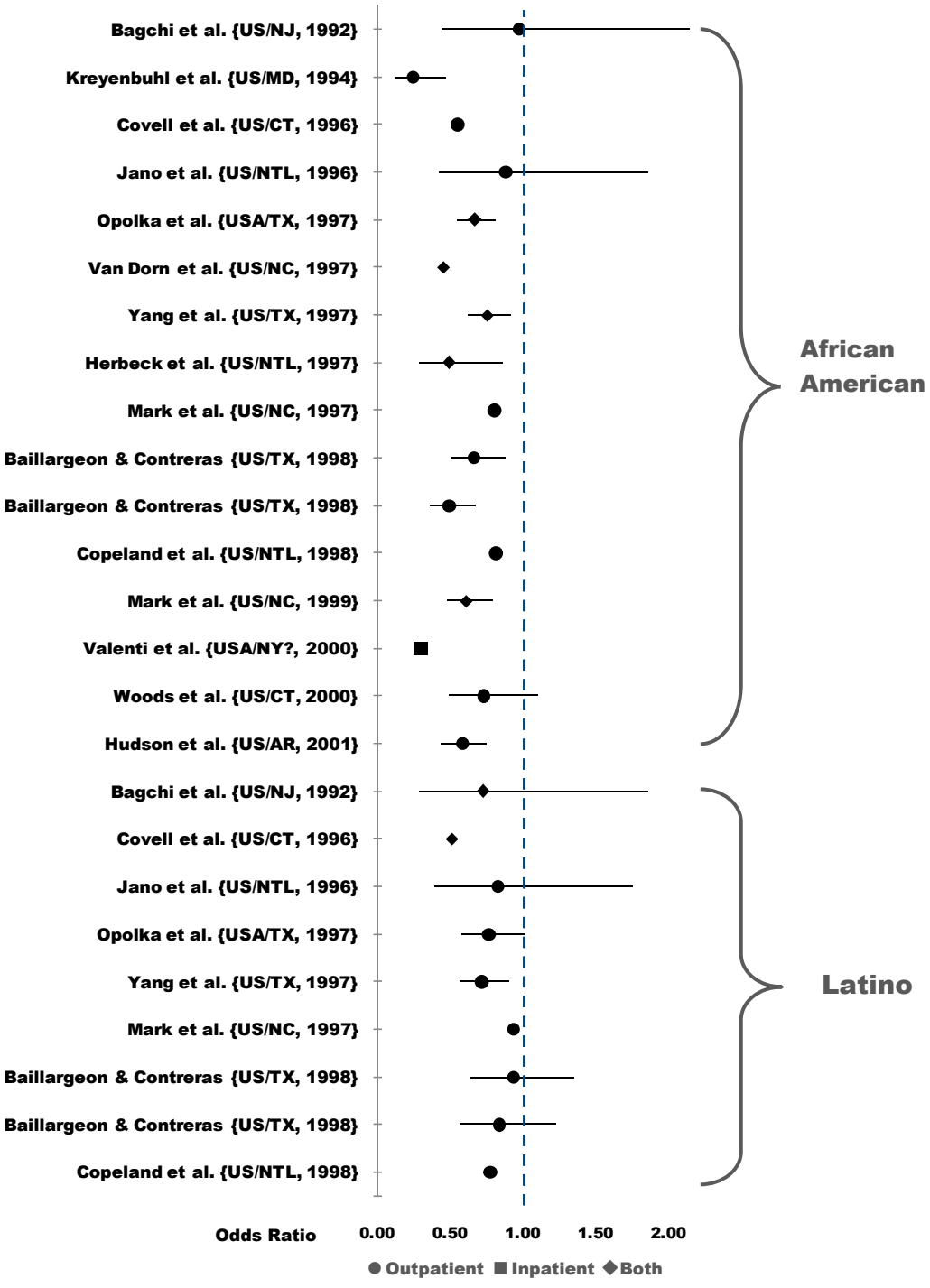


Figure 2-6 Ethnic disparities in the use of atypical versus typical antipsychotics



3 Income-related disparities in antipsychotic use: an analysis of linked administrative data

3.1 Introduction

The discovery of the first antipsychotic, chlorpromazine, in the middle of the twentieth century marks an important milestone in the treatment of severe mental disorders. Through the years, this class of medicines has helped thousands of individuals living with schizophrenia manage the disorder's symptoms and improve their overall quality of life. Newer drugs have since been developed and are currently specified in many clinical practice guidelines as mainstay treatments for psychotic disorders.[14,15]

In recognition of the potential of antipsychotic medicines to meet the treatment needs of people with psychotic disorders, the World Health Organization has listed three older generation antipsychotic agents (chlorpromazine, fluphenazine and haloperidol) in its Model List of Essential Medicines, which is a prescriptive document for other countries and institutions.[71] More antipsychotic agents are likely to be listed in the future as some of the newer agents are currently under review for inclusion.[72]

While antipsychotics are deemed essential for the treatment of psychotic disorders, the use of antipsychotic medicines has expanded beyond this indication. Their prescription for a host of other conditions[16] has been criticized on the grounds that such uses are not strongly supported by evidence. Worse, such uses may unnecessarily expose individuals to risks of adverse reactions (e.g., movement disorders, metabolic syndrome, cardiovascular events and death). One example of potentially inappropriate use is the antipsychotic treatment of behavioural and psychological symptoms associated with dementia among seniors. Evidence from systematic reviews of high quality studies

indicates that antipsychotic treatment in these patients has limited efficacy, and, results in higher risks of cardiovascular events, weight gain or death.[18,73-75] A number of warnings from manufacturers and regulatory agencies were issued in 2005 to discourage such use, which, regrettably, continued to increase in 2007, albeit, at a significantly slower rate.[76,77]

Another instance of the potentially inappropriate use of antipsychotic medication is its use among children and youth. The rare prevalence[78] and lack of consensus regarding the validity of schizophrenic disorder diagnoses among children and youth are among the reasons antipsychotic treatment in this population has been questioned. Another reason is the lack of high quality data supporting its use among children and youth diagnosed with schizophrenic disorders.[79] Broadened use of this medication to treat behavioural symptoms associated with attention deficit disorder and hyperactivity is also not backed by strong evidence.[16] Even if this medication could provide symptomatic relief from nonpsychotic symptoms, such off-label use still raises serious concerns about early exposure to the medication's adverse effects (e.g., hormonal, metabolic and cardiovascular) and the potential for more severe and long-term health consequences.[80,81]

These two facets of antipsychotic use – essential and potentially inappropriate use – are important indicators of care quality that can be examined at the same time using linked health data. We sought to explore socioeconomic disparities in these indicators of quality of care linked to antipsychotic use.

Specifically, this analysis addressed two objectives: 1) to examine income-related disparities in essential antipsychotic use among adults with a recorded diagnosis of schizophrenia; and 2) to examine income-related disparities in the potentially inappropriate use of antipsychotics among seniors,

children and youth who had no recorded schizophrenia or bipolar disorder diagnosis. At the time we conducted our analyses, we were not aware of studies that examined these aspects of antipsychotic use.

This study used data obtained from the Canadian province of British Columbia (BC) where commonly prescribed antipsychotic medications are provided free or at reduced cost to individuals with a demonstrated clinical and financial need (see Appendix C for antipsychotics listed in the formulary). The list of BC residents with enhanced access to these medications include children with severe disabilities, registered mental health clients, recipients of income assistance and residents of long-term care facilities (see Appendix D for a list of the public drug coverage plans).

3.2 Methods

We used de-identified linked administrative health care records for calendar years 2004 and 2005 obtained from a population-based data repository in BC. Data access permissions were granted by the BC Ministry of Health Services and the PharmaNet Stewardship Committee. The Behavioural Research Ethics Board of the University of British Columbia reviewed and provided ethics approval for the project.

3.2.1 Study cohorts

In order to assess three patterns of antipsychotic use (one essential and two potentially inappropriate uses) we constructed three mutually exclusive study cohorts from population-based data. In all study cohorts we excluded individuals whose health use data were unlikely to be fully reflected in the claims data we examined. These were individuals who were enrolled in the provincial health registry for less than nine months in a year and those who resided in health service delivery areas that had a high proportion of non-fee-

for-service claims. We preformed this to mitigate possible bias in case ascertainment and health status measurement – known issues in claims data analysis.[82] We also excluded all individuals with missing data on income and sex to ensure comparability of data.

3.2.1.1 Essential antipsychotic use cohort

Our first cohort included only individuals, aged 19 to 60 years, who had a recorded diagnosis of schizophrenia (Figure 3-1). Age was restricted to the adult population to maximize the chances of selecting individuals who had the disorder (schizophrenia is rare in both the youth[83] and senior populations[84]) and also to reduce the chances of confounding antipsychotic use for schizophrenia with use for other conditions (e.g., dementia, behavioural disorders in children). The cut-off age of 19 years was used as this is the actual threshold in BC for adult health services and insurance coverage.

We searched for evidence of schizophrenia diagnoses from the physician and hospital diagnostic records using ICD-9 295 and ICD-10 F20 diagnostic codes. Although we examined antipsychotic use in 2005 only, we deemed it important to search for evidence of schizophrenia diagnoses both for 2005 and the preceding year. This allowed us to include patients who received the diagnoses and were on antipsychotics since 2004, and continued to adhere to their medication through 2005 without further physician or hospital visits. We applied a previously validated procedure for ascertaining schizophrenia cases using health administrative data. The method involves identifying individuals who received at least two physician visits or at least one hospital stay where schizophrenia was listed as the most responsible diagnosis.[85]

3.2.1.2 Potentially inappropriate antipsychotic use cohorts

The second cohort was comprised of seniors (65 years and older) who had a recorded dementia but not severe mental disorder diagnosis (Figure 3-2).

This cohort was restricted to seniors primarily because this is the population that would be expected to have the highest prevalence of dementia[86] and at the same time lower prevalence of schizophrenic disorders.[84]

Physician and hospital claims data were used to identify relevant diagnoses. We excluded patients who had at least one recorded schizophrenia diagnosis in either 2004 or 2005. We also excluded individuals with a recorded bipolar disorder diagnosis (ICD-9 296 but not 296.2, 296.3 and 296.9; and ICD-10 F30 and F31) since antipsychotic medication is an approved adjunctive therapy for bipolar disorders with psychotic symptoms.[87] Finally, we searched for and excluded all who did not have inpatient or outpatient dementia diagnoses (ICD-9 294, 298, 331, 348; and ICD-10 F00 to F03).[88]

The third cohort was composed of individuals who were 18 years old and younger (Figure 3-3). As with the second cohort, we used physician and hospital data to identify and exclude those who received at least one schizophrenia or bipolar disorder diagnoses in 2004 or 2005.

3.2.2 Variables of interest

3.2.2.1 Antipsychotic medication use

The primary outcome measure we analyzed is a dichotomous variable indicating whether or not individuals filled one or more prescriptions for antipsychotic drugs in 2005. Prescription data were obtained from PharmaNet, a centralized database that records every prescription filled in community pharmacies throughout BC, regardless of patient age or insurance status (except for about four percent of the population who are covered by federal drug plans, i.e., veterans, registered status Indians, federal penitentiary inmates, and members of the Royal Canadian Mounted Police). We identified all prescriptions filled for antipsychotics by using the third level of the WHO-Anatomical

Therapeutic Chemical (ATC) classification system (i.e., N05Axx; not including Lithium).[89] Antipsychotics were further classified as typical or atypical (second generation antipsychotics). A list of all antipsychotics identified in our data is available in Appendix C.

To examine long-term use, we constructed additional variables based on the accumulated number of days' supply. In the analysis of essential antipsychotic use, a dichotomous measure indicating more than 180 days' supply was constructed. For potentially inappropriate use, a variable based on a 90-day period was derived.

3.2.2.2 Income and other covariates

Our primary independent variable is an ordinal measure of income – quintiles – derived from a combination of household-specific (83% of the individuals in our cohorts) and neighbourhood-level income data for 2005.[90] The household-specific income data were income percentiles assigned by the BC Ministry of Health Services (using Canada Revenue Agency data) for the purpose of administering the income-based public drug benefit program in BC. For the rest of the individuals in our cohort (17%), income percentiles were imputed using the average tax returns filed by households residing in the smallest census unit defined and used by Statistics Canada (Census Dissemination Area with a population of 400-700).

To measure schizophrenia severity, we created a dichotomous variable indicating whether an individual was hospitalized with schizophrenia as the most responsible diagnosis in 2004 or 2005. We used this variable in our analysis of essential antipsychotic use to adjust for possible bias arising from the uneven distribution of severe schizophrenia cases across income strata.

We controlled for overall health status in our analyses by including a variable based on the Johns Hopkins ACG Case-Mix system for deriving

Aggregated Diagnostic Groups (ADGs). ADGs are groupings of diagnosis codes that are similar in severity and chronicity. A higher count of ADGs is generally indicative of greater overall clinical complexity and increased likelihood of health service use (including the use of prescription medications).[91]

Other covariates used in the study include long-term care status (yes/no), sex (male/female), age (five-year bands) and residence in urban versus non-urban areas. Long-term care status is a dichotomous variable derived from a flag in the prescription drug database that identifies individuals in long-term care (see Appendix D for a list of the patient-specific drug plans in BC). Sex, age and place of residence were all determined from the provincial health plan registry.

3.2.3 Analysis

In each study cohort, we performed logistic regression analyses to examine income-related disparities for two outcome variables: the use of one or more antipsychotics and long-term use of antipsychotics. These regression models adjusted for the effects of age, sex, health status, schizophrenia hospitalization (for essential use analysis only) and place of residence on antipsychotic medication use. The selection of predictors and covariates used in the model was informed by Anderson-Newman's framework of health service use,[92] which specifies three broad categories of factors that influence individual health service use: predisposing characteristics (sex and age), enabling resources (income and urban residence) and need characteristics (health status, psychiatric and dementia diagnoses). As the main objective of this study was to examine income-related differences in antipsychotic use that are not due to the other factors in the framework, all variables were simultaneously entered in the logistic regression model.

The highest income quintile was used as the reference group in calculating the odds ratios for all the logistic regression models. Income quintile

groups with adjusted odds ratios that have associated confidence intervals not containing the value of one were interpreted as having statistically significantly different odds of antipsychotic use compared to the reference group.

All statistical analyses were performed using Stata 10.1.[93]

3.3 Results

3.3.1 Essential antipsychotic use

A total of 11,417 adults, aged 19-64 years with a recorded schizophrenia diagnosis in 2004 or 2005 met our criteria for inclusion to the essential antipsychotic use cohort (Figure 3-1). Members of this cohort were predominantly men (60%), lived in urban areas (84%) and had five chronic conditions on average. More than a quarter had been hospitalized (27%) with schizophrenia as the most responsible diagnosis (Table 3-1).

The prevalence of essential (85%) and long-term (more than 180 days) antipsychotic use (71%) were high in this cohort. The majority of the individuals have used at least one atypical antipsychotic (75%) medication while only 10% appeared to have been exclusively treated with typical antipsychotics.

Results of the bivariate analyses suggest that individuals in the third quintile group had the highest prevalence of essential use. This trend was observed both for essential (χ^2 [4] =56.7, p<.001) and long-term antipsychotic use (χ^2 [4] =114.9, p<.001).

Logistic regression analyses that controlled for a number of covariates (Table 3-2) also indicated an inverted-U-shaped relationship between income and odds of essential antipsychotic use. Individuals in the lowest income group (OR=1.05, 95% CI=.90-1.23) had about the same odds of essential use as those in the highest income group. The other income groups had greater odds of essential

use, with those in the third quintile (OR=1.71, 95% CI=1.44-2.04) having the highest odds of essential use. The same pattern was observed for long-term use (Figure 3-7) except for the statistically-significant and slightly elevated odds ratios found in all the comparison income quintiles groups.

3.3.2 Potentially inappropriate antipsychotic use in seniors with dementia

A total of 33,633 individuals, aged 65 years and older, who had a recorded diagnosis of possible dementia, but not schizophrenia or bipolar diagnosis in 2004 or 2005, met our criteria for inclusion in the cohort (Figure 3-2). Cohort members were predominantly women (60%), lived in urban areas (82%) and had seven chronic conditions on average. Those living in long-term care facilities comprised less than one quarter of seniors (23%), many of whom were concentrated in the lower income groups (Table 3-3).

Close to one out of four seniors (23%) in this cohort had potentially inappropriately received antipsychotic treatment and about one out of seven were given the drug for more than 90 days (long-term use). There were more seniors who received at least one atypical antipsychotic (20%) than seniors who were exclusively on typical antipsychotics (2.5%).

Bivariate analyses indicate the presence of an income gradient in the potentially inappropriate use of antipsychotics. The trend (Figure 3-5) suggests that seniors with lower income had higher levels and longer duration of potentially inappropriate antipsychotic use.

In long-term care facilities, almost three out of every five seniors (56%) had been given potentially inappropriate antipsychotic treatment. In comparison, only 13% of community-dwelling seniors received similar treatment (data not shown). Even when differences in age, sex, health status and residence in urban areas had been accounted for, long-term care seniors were

still more likely than their community-dwelling counterparts to receive potentially inappropriate antipsychotic treatment (OR=9.31, 95% CI=8.75-9.91) .

Because of the significant differences in the prevalence of use between long-term care and community-dwelling seniors, two separate logistic regression analyses were performed in each subgroup. Results of the stratified analysis (Table 3-4) indicate that among community-dwelling seniors, those from the lowest income quintile had higher odds of potentially inappropriate use compared to highest-income seniors (OR=1.24, 95% CI=1.10-1.39). Among long-term care seniors (who were more likely to receive antipsychotic treatment than community-dwelling seniors), no statistically significant differences in the odds of use were found. Similar trends were observed when long-term antipsychotic use was examined (Figure 3-8 and Figure 3-9).

3.3.3 Potentially inappropriate antipsychotic use in children and youth

A total of 789,617 children and youth (aged 19 years and younger) met our criteria for inclusion in the cohort (Figure 3-3). These were all individuals who had no recorded schizophrenia or bipolar diagnosis in either 2004 or 2005. Many of these individuals lived in urban areas (83%) and had two chronic conditions on average (Table 3-5).

About 40 per 10,000 (prevalence figures are presented in per 10,000 population due to rare prevalence) received potentially inappropriate antipsychotic treatment. Also, about 30 per 10,000 were on treatment for more than 90 days (long-term use). The use of atypical antipsychotics (37 per 10,000) was markedly greater than the use of typical antipsychotics (3 per 10,000).

Bivariate analyses suggest a reversed-J-shaped relationship between income and the potentially inappropriate use of antipsychotics in this cohort (Figure 3-6). The trend suggests that children and youth from lowest income households had higher prevalence and longer duration of potentially

inappropriate antipsychotic use compared to those from highest-income households. Children and youth from the middle-income quintiles had the lowest prevalence and the smallest proportion of long-term recipients of potentially inappropriate antipsychotic treatment.

Results of the logistic regression analysis that adjusted for a number of covariates (Table 3-6) confirm the presence of a reversed-J-shaped relationship (Figure 3-10) between income and potentially inappropriate antipsychotic use in this cohort. Children and youth from lowest income households had more than twice the odds of potentially inappropriate (OR=2.40, 95%CI=2.17-2.66) and long-term use (OR=2.63, 95%CI=2.34-2.96) of antipsychotics compared to those in the highest income quintile. Those from the third quintile group had the lowest odds of potentially inappropriate and long-term use. Older children (10 to 14 year olds OR=64.52, 95% CI=44.30-93.95; 15 to 18 year olds OR=58.83, 95% CI=40.39-85.69) and boys also had remarkably higher odds of use.

3.4 Discussion

The results of this study show that the prevalence of essential antipsychotic use among adults with a recorded schizophrenia diagnosis was high, though it varied across income groups. Study results also indicate that potentially inappropriate antipsychotic use differed across income levels, both for community-dwelling seniors and children and youth. Among seniors living in the community (who had a recorded dementia but not schizophrenia or bipolar disorder diagnosis), 13% received potentially inappropriate antipsychotic treatment with higher odds of use evident among lowest income quintile individuals. Among seniors in long-term care, potentially inappropriate use was consistently high across income levels. Finally, among children and youth, potentially inappropriate antipsychotic use was rare, although those with the lowest incomes had the highest odds of use.

The high prevalence of essential antipsychotic treatment and its long-term use observed among people with a recorded schizophrenia diagnosis in this study is encouraging. This is because consistent use of this medication among individuals with schizophrenia improves overall functioning and reduces risk of hospitalization.[94] The inverted-U-shaped relationship between income levels and antipsychotic use, however, points to the importance of factors, other than public drug coverage, in promoting essential antipsychotic use. Perhaps more aggressive forms of support are needed to assist individuals with schizophrenia fill their prescription and adhere to their treatment regimen. Among highest income group, the lower odds of use could be due to individuals' relatively better ability to pay for alternative and complementary therapies, which could result in better outcomes and less need for antipsychotic medication.

The continued use of antipsychotic treatment in seniors with dementia raises some concern given the increased risk of adverse events associated with antipsychotic use in this population.[18,73-75] It should be noted that that regulatory warnings and definitive studies regarding antipsychotics' limited efficacy and increased risk of adverse events for this population did not appear until the middle of 2005.[18,73,76] Nevertheless, there were guidelines already in place before that time that urge care providers to use this medication as last-line treatment for extreme cases of agitation or psychotic behaviour.[95]

Another disconcerting finding is the higher odds of potentially inappropriate use found among low-income compared to high-income seniors living in the community. It is likely that these higher odds of use are caused partly by a greater proportion of income assistance recipients in low-income groups who received the treatment at reduced or no cost. A similar low-barrier to antipsychotic medication access in long-term care facilities could account for

the consistently high prevalence of potentially inappropriate use found across income groups. These findings, altogether, highlight the need to implement changes in dementia care to discourage potentially inappropriate antipsychotic use. Available evidence suggests that care models that emphasize psychosocial and person-centred approaches may help decrease antipsychotic use in this population.[96]

Finally, our finding of greater odds of antipsychotic use among children and youth from low-income families is similar to what others have previously reported. A recent US study, for example, reported that children and youth receiving benefits from Medicaid in the US had significantly higher levels of atypical antipsychotic treatment compared to those with private health insurance.[97] This higher odds of use could simply be due to the higher concentration of prodromal severe mental disorders among children and youth from low-income families.[98] Alternatively, this could again be due to the higher concentration of children and youth from low-income families who were eligible to receive antipsychotic treatment at reduced or no cost. Physicians in public treatment settings at times feel compelled to avoid further use of resources by administering antipsychotic treatment to children with challenging behaviours.[99] In BC, nonpharmacological treatments such as behaviour therapies are not covered by the provincial health plan if administered by non-physicians.

3.5 Conclusions

Where evidence indicates the use of medicine results in benefits that far outweigh risk, higher levels of use that are consistent across income or other social categories are desirable and are indicative of good care quality. The results of our study on essential antipsychotic use suggest that the prevalence of this kind of use in BC is high, although, some income-related disparities persist and possibly impact the poorest segment of the population. Our study has also

provided some evidence for the potentially inappropriate use of this medication, which appeared to be more likely amongst the marginalized sectors of our society – seniors and children and youth from low income households and all seniors living in long-term care facilities.

Table 3-1 Descriptive characteristics of the cohort of adults (19 to 64 years) who had a recorded schizophrenia diagnosis in 2004 or 2005

		Income Quintiles					
	Total	Lowest	Second	Third	Fourth	Highest	Statistics
N	11,417	2,284	2,283	2,284	2,283	2,283	
Income (median $)	14,375	3,999	5,313	14,375	27,500	46,667	H(4)=10531.6, p=.0001
Age (%)							
19 to 24	10.5	8.8	9.7	7.6	10.6	16.0	$\chi^2(4)=102.9$, p<.001
25 to 29	10.5	9.9	10.8	9.9	11.9	10.3	$\chi^2(4)=6.9$, p=.143
30 to 34	9.8	10.1	9.1	10.5	11.0	8.3	$\chi^2(4)=11.6$, p=.020
35 to 39	12.0	11.5	12.8	11.9	13.2	10.8	$\chi^2(4)=8.0$, p=.092
40 to 44	14.7	16.9	14.7	15.1	14.5	12.3	$\chi^2(4)=19.3$, p=.001
45 to 49	14.2	14.5	15.8	14.1	12.5	14.2	$\chi^2(4)=10.3$, p=.036
50 to 54	10.2	10.6	9.9	12.2	9.5	9.1	$\chi^2(4)=14.5$, p=.006
55 to 59	10.2	10.6	9.9	12.2	9.5	9.1	$\chi^2(4)=14.5$, p=.006
60 to 64	5.8	5.6	5.3	7.0	4.7	6.5	$\chi^2(4)=14.8$, p=.005
Women (%)	40.2	36.8	38.3	40.5	41.9	43.6	$\chi^2(4)=28.1$, p<.001
Urban dwellers (%)	83.8	82.6	84.4	85.1	83.9	83.0	$\chi^2(4)=6.9$, p=.140
Health status							
ADG count (mean)*	5.2	5.2	5.1	5.3	5.1	5.1	F(4,11412)=2.94, p=.019
SD	3.2	3.3	3.2	3.3	3.1	3.1	
Hospitalization (%)†	26.79	27.93	28.43	27.10	28.25	22.25	$\chi^2(4)=31.2$, p<.001
Antipsychotic use (%)							
≥ one antipsychotic	85.09	84.02	84.28	89.58	85.55	82.04	$\chi^2(4)=56.7$, p<.001
> 180 days	71.26	69.48	72.89	78.42	71.05	64.48	$\chi^2(4)=114.9$, p<.001
any atypical‡	75.04	72.59	73.89	79.07	76.65	72.97	$\chi^2(4)=37.1$, p<.000
typical only‖	10.06	11.43	10.38	10.51	8.89	9.07	$\chi^2(4)=11.4$, p=.022

Source: Population Data BC and PharmaNet (2005). Although demographic and prescription use data were from 2005, schizophrenia case ascertainment were done for the years 2004 and 2005

Notes: *ADG – Aggregated Diagnostic Groups derived from physician and claims data using the ACG system.
†any hospitalization in 2004 or 2005 with schizophrenia as the most responsible diagnosis.
‡includes everyone who filled atypical and typical antipsychotics in 2005.
‖includes only those who filled typical antipsychotics in 2005.

Table 3-2 Essential antipsychotic use by income and other covariates among adults (19 to 64) who had a recorded schizophrenia diagnosis in 2004 or 2005

	≥ one antipsychotic			> 180 days		
	OR	95% CI	95% CI	OR	95% CI	95% CI
Income quintiles						
Lowest	1.05	0.90	1.23	**1.18**	**1.04**	**1.34**
Second	1.08	0.92	1.26	**1.40**	**1.23**	**1.59**
Third	**1.71**	**1.44**	**2.04**	**1.87**	**1.64**	**2.14**
Fourth	**1.22**	**1.04**	**1.44**	**1.31**	**1.15**	**1.48**
Highest (ref)	1.00	-	-	1.00	-	-
Age						
19 to 24 (ref)	1.00	-	-	1.00	-	-
25 to 29	**1.23**	**1.00**	**1.52**	**1.41**	**1.19**	**1.67**
30 to 34	**1.39**	**1.12**	**1.72**	**1.61**	**1.35**	**1.91**
35 to 39	**1.40**	**1.14**	**1.72**	**1.69**	**1.44**	**2.00**
40 to 44	**2.04**	**1.66**	**2.50**	**2.09**	**1.78**	**2.45**
45 to 49	**1.85**	**1.51**	**2.27**	**2.27**	**1.92**	**2.67**
50 to 54	**1.69**	**1.37**	**2.09**	**2.37**	**2.00**	**2.81**
55 to 59	**2.23**	**1.77**	**2.82**	**2.53**	**2.11**	**3.03**
60 to 64	**1.63**	**1.26**	**2.12**	**2.61**	**2.10**	**3.25**
Women*	0.96	0.86	1.07	1.02	0.94	1.12
Health status†	**1.03**	**1.02**	**1.05**	0.98	0.97	1.00
Urban‡	**1.52**	**1.33**	**1.73**	**1.37**	**1.23**	**1.53**
Hospitalized‖	**1.97**	**1.72**	**2.25**	**1.40**	**1.28**	**1.55**

Notes: Numbers in **bold** were statistically significant at p<0.05.
*compared to the reference group of men.
†ADG counts derived from physician and claims data using the ACG system.
‡compared to non-urban reference group.
‖any hospitalization in 2004 or 2005 with schizophrenia as the most responsible diagnosis.

Table 3-3 Descriptive characteristics of the cohort of seniors (≥65 years) who had a recorded dementia but not schizophrenia or bipolar disorder diagnosis

		Income Quintiles					
	Total	Lowest	Second	Third	Fourth	Highest	Statistics
N	33,633	6,727	6,727	6,726	6,727	6,726	
Income (median $)	31,500	16,000	24,000	31,500	45,000	70,000	H(4)=32267.2, p=.0001
Age (%)							
65 to 69	8.1	8.5	5.8	7.1	7.9	10.8	$\chi^2(4)=124.7$, p<.001
70 to 74	11.8	9.3	10.1	11.5	12.5	15.5	$\chi^2(4)=155.1$, p<.001
75 to 79	18.9	13.7	17.8	19.8	21.0	22.2	$\chi^2(4)=193.8$, p<.001
80 to 84	24.8	21.9	25.1	25.8	25.6	25.8	$\chi^2(4)=40.3$, p<.001
85 to 89	21.1	23.4	23.1	22.1	20.3	16.8	$\chi^2(4)=119.6$, p<.001
90+	15.3	23.2	18.1	13.7	12.7	8.9	$\chi^2(4)=626.9$, p<.001
Women (%)	60.3	76.5	64.4	58.6	54.4	47.8	$\chi^2(4)=1300$, p<.001
Urban dwellers (%)	81.7	81.8	81.0	77.2	81.6	86.9	$\chi^2(4)=216.0$, p<.001
In long-term care (%)	23.3	30.4	25.9	22.6	21.1	16.4	$\chi^2(4)=413.6$, p<.001
Health status							
ADG count (mean)*	7.2	7.0	7.3	7.2	7.2	7.3	F(4,33628)=9.40, p<.001
SD	3.6	3.8	3.7	3.7	3.6	3.5	
Antipsychotic use (%)							
≥ one antipsychotic	22.7	25.9	24.3	22.4	21.7	19.0	$\chi^2(4)=106.6$, p<.001
> 180 days	14.2	16.9	15.3	14.1	13.4	11.3	$\chi^2(4)=94.9$, p<.001
any atypical†	20.2	22.9	21.7	20.1	19.3	17.0	$\chi^2(4)=84.1$, p<.001
typical only‡	2.5	3.1	2.6	2.3	2.4	2.0	$\chi^2(4)=18.2$, p=.001

Source: Population Data BC and PharmaNet (2005)
Although demographic and prescription use data were from 2005, schizophrenia and bipolar disorder case ascertainment were done for the years 2004 and 2005

Notes: *ADG – Aggregated Diagnostic Groups
†includes everyone who filled atypical and typical antipsychotics in 2005.
‡includes only those who filled typical antipsychotics in 2005.

Table 3-4 Potentially inappropriate antipsychotic use by income and other covariates among seniors (≥65 years) who had a recorded dementia but not schizophrenia or bipolar disorder diagnosis

	≥ one antipsychotic			> 180 days		
	OR	95% CI	95% CI	OR	95% CI	95% CI
Seniors living in the community (N=25,804)						
Income quintiles						
Lowest	**1.24**	**1.10**	**1.39**	**1.19**	**1.03**	**1.36**
Second	**1.19**	**1.05**	**1.34**	1.10	0.96	1.27
Third	1.05	0.93	1.19	0.93	0.80	1.08
Fourth	1.05	0.93	1.19	0.97	0.84	1.12
Highest (ref)	1.00	-	-	1.00	-	-
Age						
65 to 69	1.00	-	-	1.00	-	-
70 to 74	1.12	0.95	1.32	**1.31**	**1.07**	**1.59**
75 to 79	**1.30**	**1.12**	**1.51**	**1.45**	**1.21**	**1.74**
80 to 84	**1.16**	**1.00**	**1.35**	**1.31**	**1.10**	**1.57**
85 to 89	1.16	0.99	1.35	**1.22**	**1.01**	**1.47**
90+	1.17	0.99	1.38	**1.26**	**1.02**	**1.54**
Women*	**1.19**	**1.10**	**1.29**	**1.28**	**1.17**	**1.41**
Health status†	**1.07**	**1.06**	**1.08**	**1.02**	**1.00**	**1.03**
Urban‡	0.92	0.84	1.01	0.94	0.84	1.05
Seniors in long-term care (N=7,829)						
Income quintiles						
Lowest	0.90	0.78	1.04	0.96	0.83	1.10
Second	0.88	0.76	1.02	0.95	0.82	1.09
Third	0.94	0.81	1.08	1.05	0.91	1.21
Fourth	1.02	0.89	1.18	1.05	0.91	1.21
Highest (ref)	1.00	-	-	1.00	-	-
Age						
65 to 69	0.87	0.61	1.26	0.95	0.67	1.35
70 to 74	0.99	0.71	1.39	1.04	0.75	1.44
75 to 79	0.75	0.54	1.04	0.75	0.54	1.02
80 to 84	**0.67**	**0.48**	**0.92**	**0.68**	**0.50**	**0.93**
85 to 89	**0.54**	**0.39**	**0.74**	**0.53**	**0.38**	**0.72**
90+	0.87	0.61	1.26	0.95	0.67	1.35
Women*	0.93	0.84	1.03	0.98	0.88	1.08
Health status†	1.00	0.99	1.02	**0.96**	**0.95**	**0.98**
Urban‡	0.93	0.82	1.05	0.93	0.82	1.06

Notes: Numbers in **bold** were statistically significant at p<0.05.
*compared to the reference group of men.
†ADG counts derived from physician and claims data using the ACG system.
‡compared to non-urban reference group.

Table 3-5 Descriptive characteristics of the cohort of children and youth (≤18 years) who had no recorded schizophrenia or bipolar disorder diagnosis

		Income Quintiles					
	Total	Lowest	Second	Third	Fourth	Highest	**Statistics**
N	789,617	157,924	157,923	157,924	157,923	157,923	
Income (median $)	40,800	10,000	29,375	40,800	60,000	102,083	H(4)=75800, p=.0001
Age (%)							
65 to 69	19.5	20.9	20.4	20.4	19.9	15.9	$\chi^2(4)$=1600, p<.001
70 to 74	25.5	26.8	26.1	25.8	25.9	23.1	$\chi^2(4)$=656.2, p<.001
75 to 79	29.7	29.1	29.6	29.6	29.4	30.8	$\chi^2(4)$=132.5, p<.001
80 to 84	25.3	23.3	24.0	24.2	24.8	30.1	$\chi^2(4)$=2500, p<.001
Girls (%)	48.69	48.49	48.6	48.6	48.8	49.0	$\chi^2(4)$=9.1, p=.059
Urban dwellers (%)	82.7	80.5	80.7	80.0	85.7	86.6	$\chi^2(4)$=4400, p<.001
Health status							
ADG count (mean)*	2.3	2.4	2.2	2.2	2.3	2.4	F(4,789612)=249.7,p<.001
SD	2.0	2.1	2.0	2.0	2.0	2.0	
Antipsychotic use (%)							
≥ one antipsychotic	.40	.78	.31	.26	.29	.35	$\chi^2(4)$=741.3, p<.001
> 180 days	.30	.62	.22	.18	.21	.25	$\chi^2(4)$=720.7, p<.001
any atypical†	.37	.74	.28	.24	.27	.33	$\chi^2(4)$=761, p<.001
typical only‡	.03	.04	.02	.02	.03	.02	$\chi^2(4)$=7.43, p=.115

Source: Population Data BC and PharmaNet (2005)
Although demographic and prescription use data were from 2005, schizophrenia and bipolar disorder case ascertainment were done for the years 2004 and 2005

Notes: *ADG – Aggregated Diagnostic Groups
†includes everyone who filled atypical and typical antipsychotics in 2005.
‡includes only those who filled typical antipsychotics in 2005.

Table 3-6 Potentially inappropriate antipsychotic use by income and other covariates among children and youth (≤18 years) who had no recorded schizophrenia or bipolar disorder diagnosis

	≥ one antipsychotic			> 180 days		
	OR	95% CI	95% CI	OR	95% CI	95% CI
Income quintiles						
Lowest	**2.40**	**2.17**	**2.66**	**2.63**	**2.34**	**2.96**
Second	1.02	0.90	1.15	1.01	0.87	1.16
Third	**0.87**	**0.77**	**0.99**	**0.81**	**0.70**	**0.95**
Fourth	0.95	0.82	1.05	0.90	0.78	1.04
Highest (ref)	1.00	-	-	1.00	-	-
Age						
0 to 4	1.00	-	-	1.00	-	-
5 to 9	**24.57**	**16.79**	**35.95**	**33.95**	**20.60**	**55.96**
10 to 14	**64.52**	**44.30**	**93.95**	**89.16**	**54.35**	**146.27**
15 to 18	**58.83**	**40.39**	**85.69**	**66.15**	**40.27**	**108.66**
Girls*	**0.38**	**0.35**	**0.41**	**0.30**	**0.28**	**0.33**
Health status†	**1.45**	**1.43**	**1.46**	**1.43**	**1.41**	**1.45**
Urban‡	0.92	0.84	1.01	0.92	0.82	1.02

Notes: Numbers in **bold** were statistically significant at p<0.05.
*compared to the reference group of men.
†ADG counts derived from physician and claims data using the ACG system.
‡compared to non-urban reference group.

Figure 3-1 Selection process for the cohort of adult individuals (19 to 64 years) who had a recorded schizophrenia diagnosis

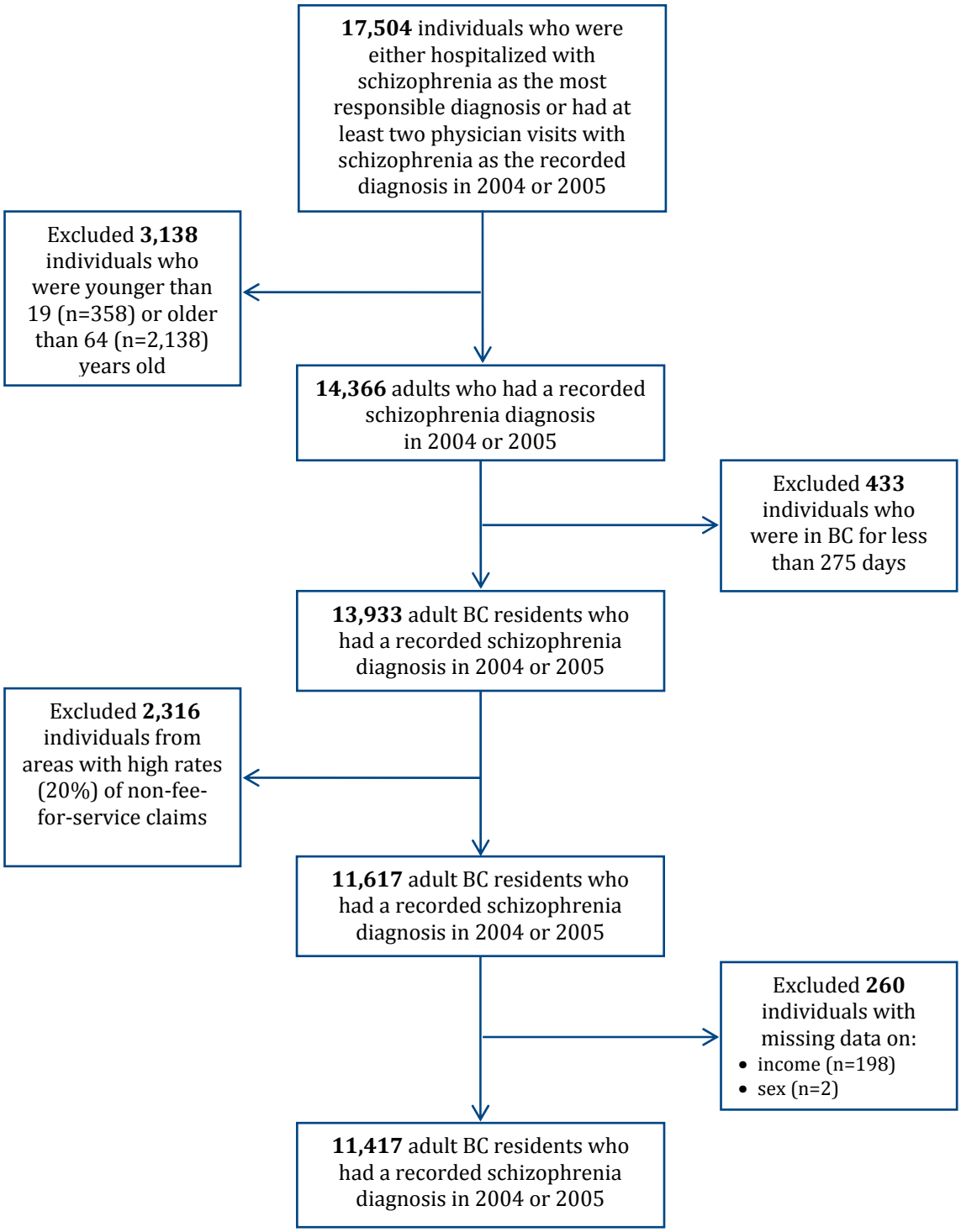


Figure 3-2 Selection process for the cohort of seniors (≥65 years) who had a recorded dementia but not schizophrenia or bipolar disorder diagnosis

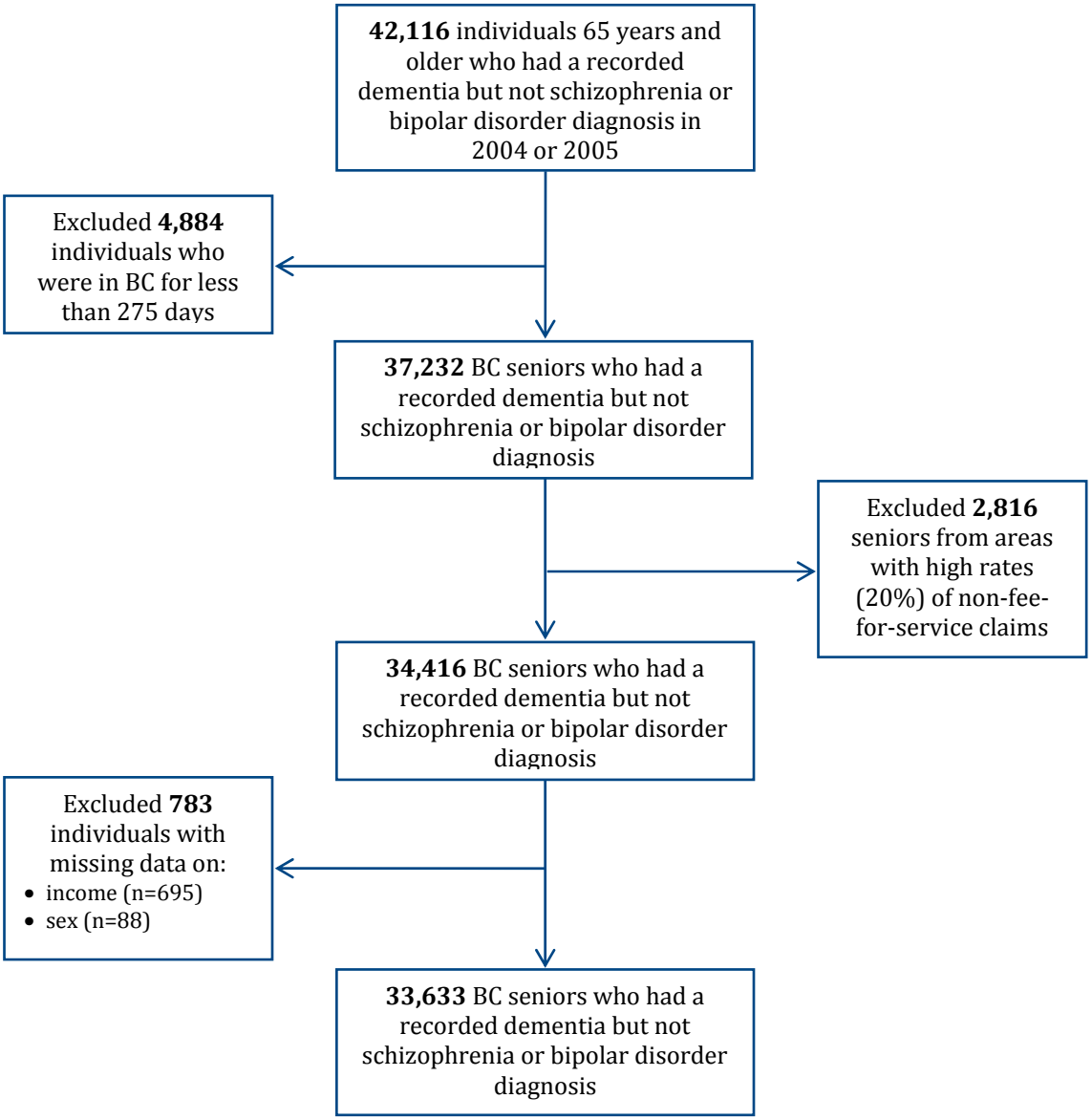


Figure 3-3 Selection process for the cohort of children and youth (≤18 years) who had no recorded schizophrenia or bipolar disorder diagnosis

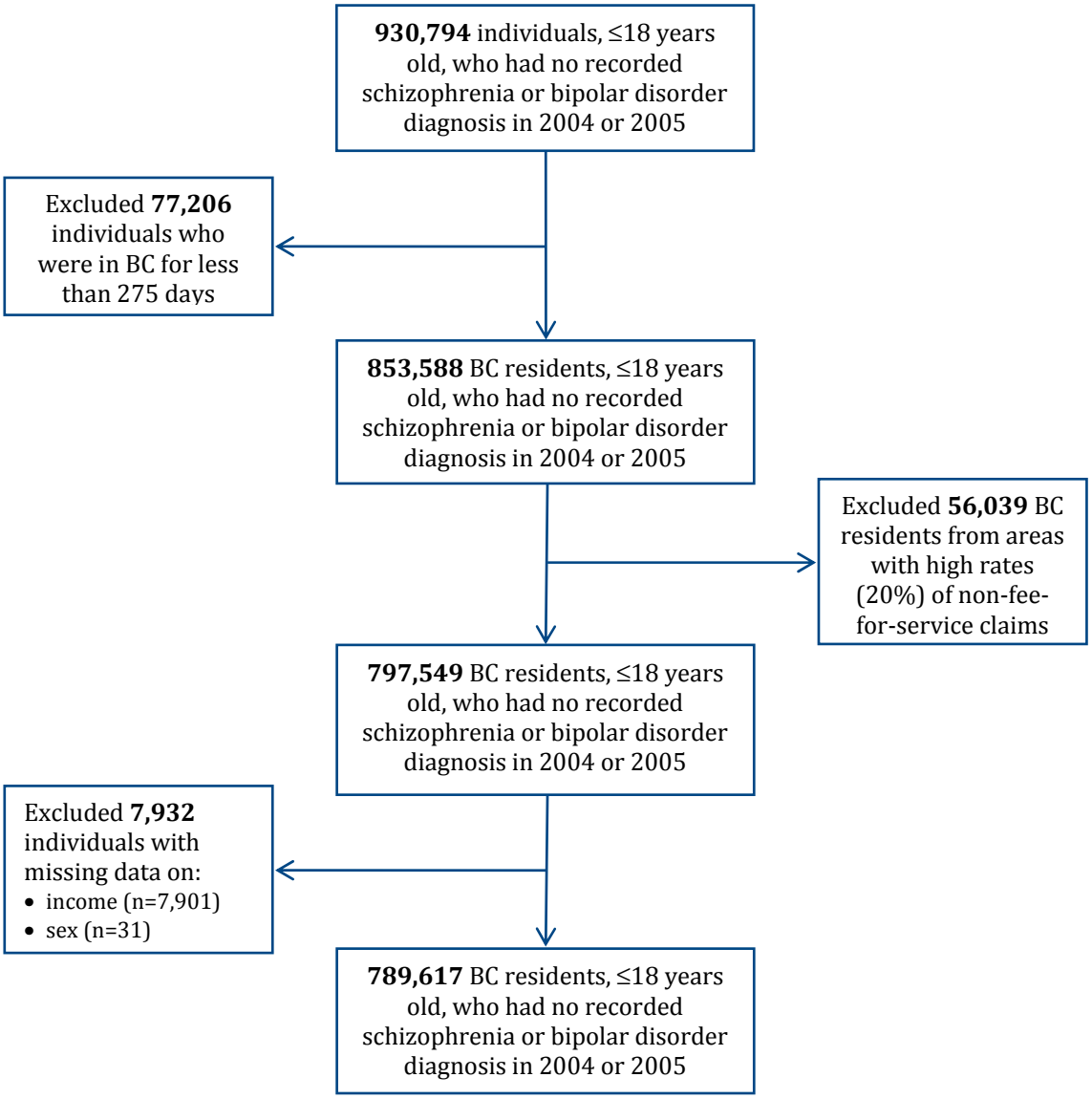
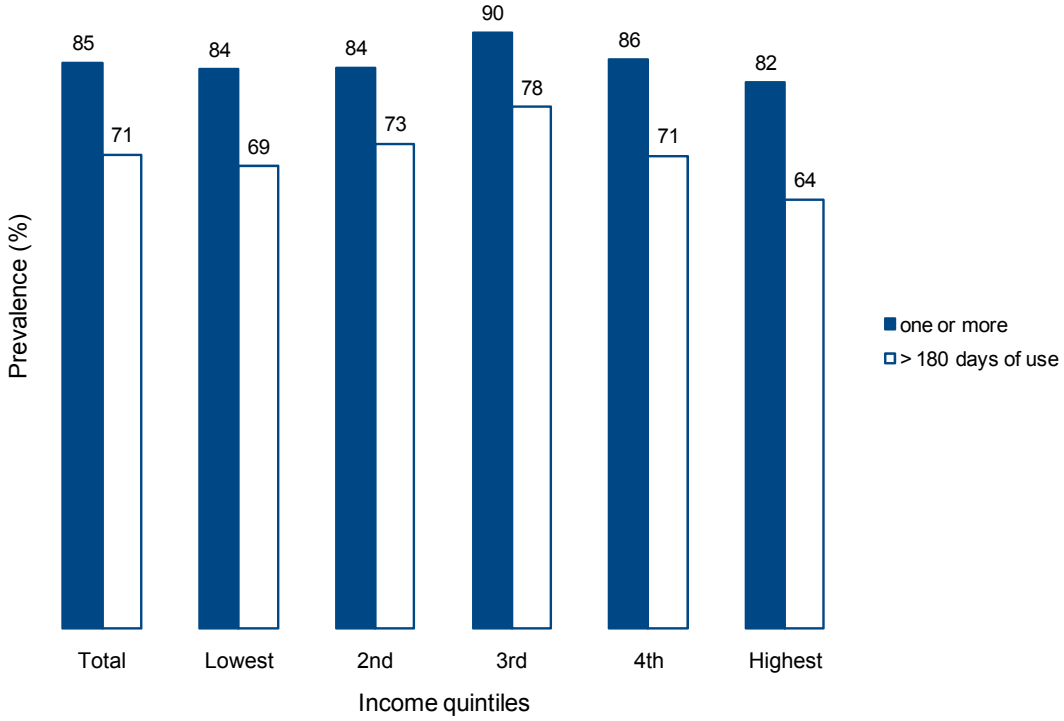
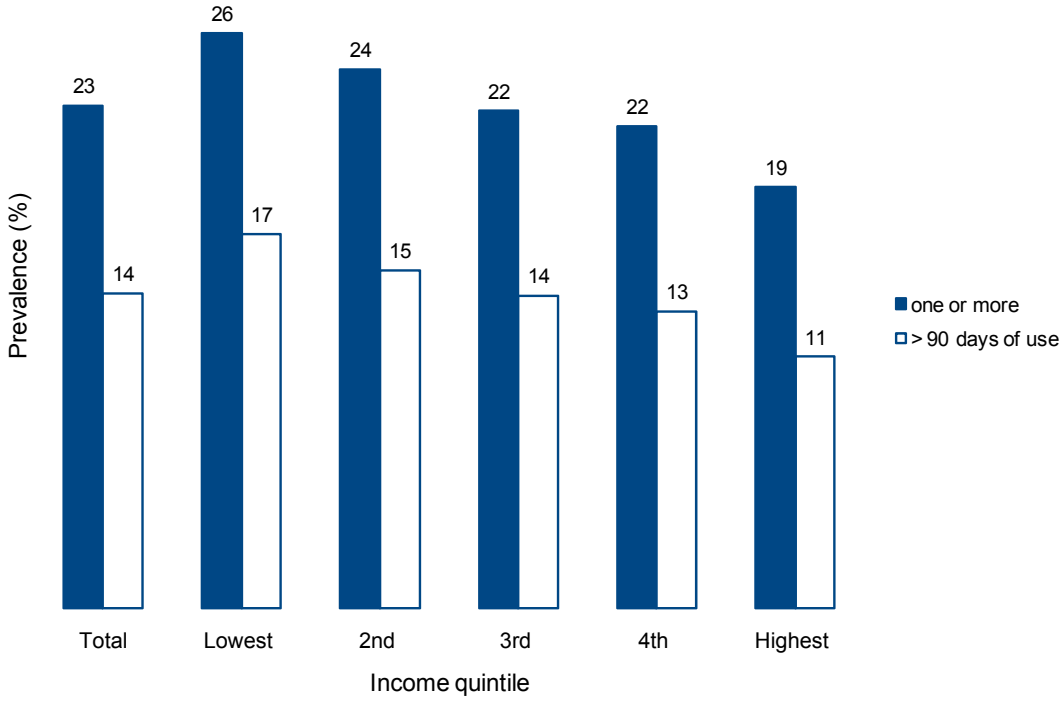


Figure 3-4 Crude prevalence of essential antipsychotic use among individuals (19 to 64 years) who had a recorded schizophrenia diagnosis



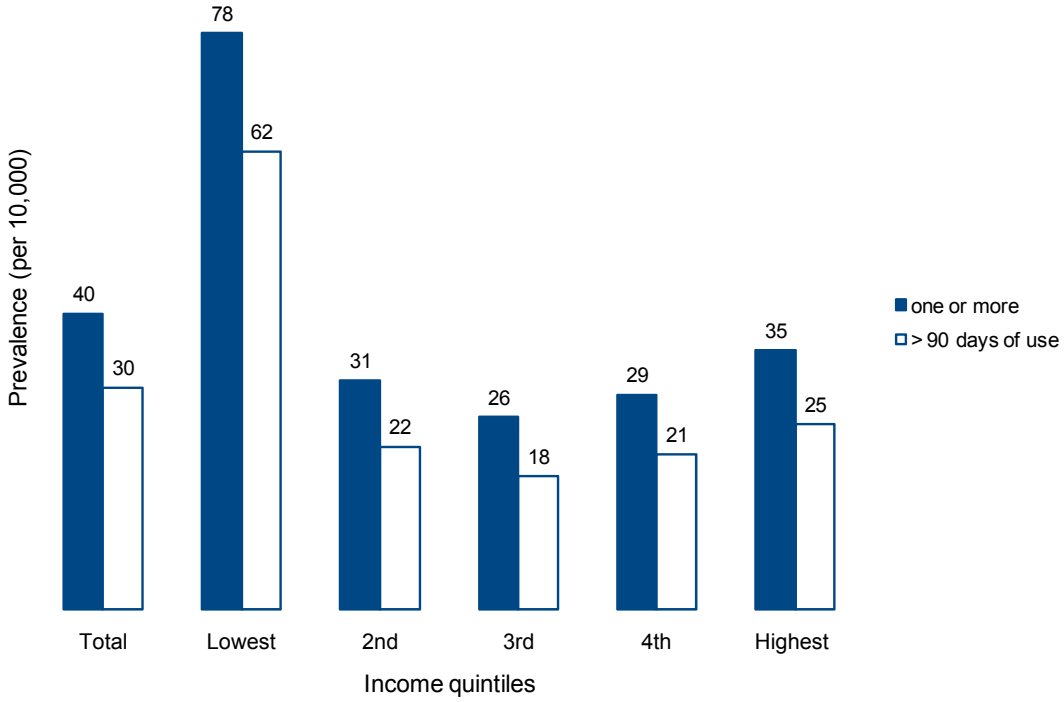
Source: Population Data BC and PharmaNet (2005)

Figure 3-5 Crude prevalence of potentially inappropriate antipsychotic use among seniors (≥65 years) who had a recorded dementia but not schizophrenia or bipolar disorder diagnosis



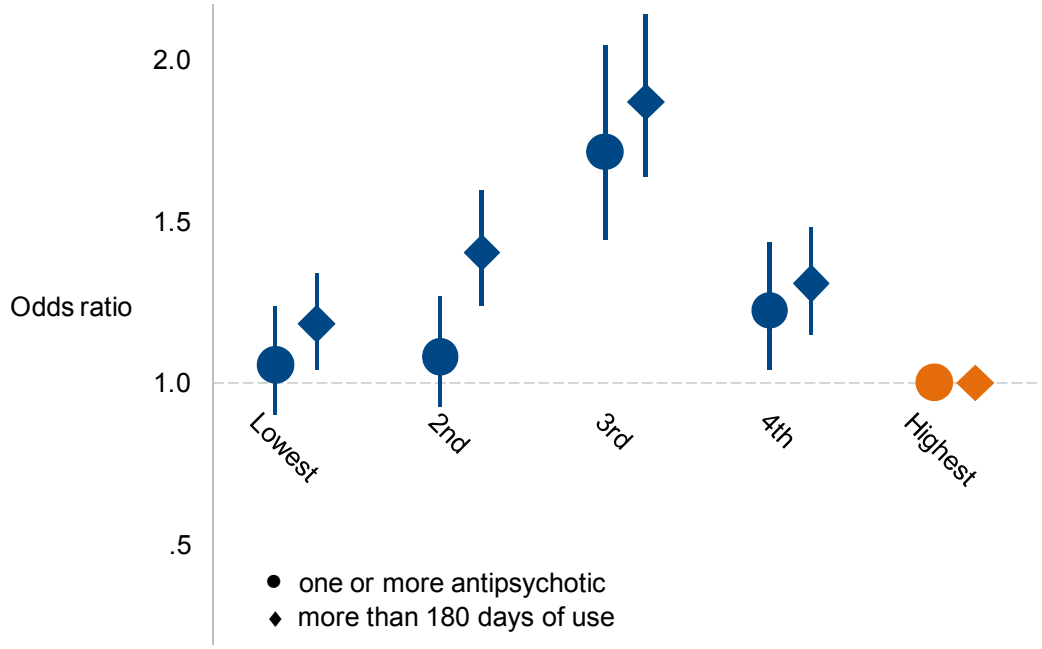
Source: Population Data BC and PharmaNet (2005)

Figure 3-6 Crude prevalence of potentially inappropriate antipsychotic use among children and youth (≤18 years) who had no recorded schizophrenia or bipolar disorder diagnosis



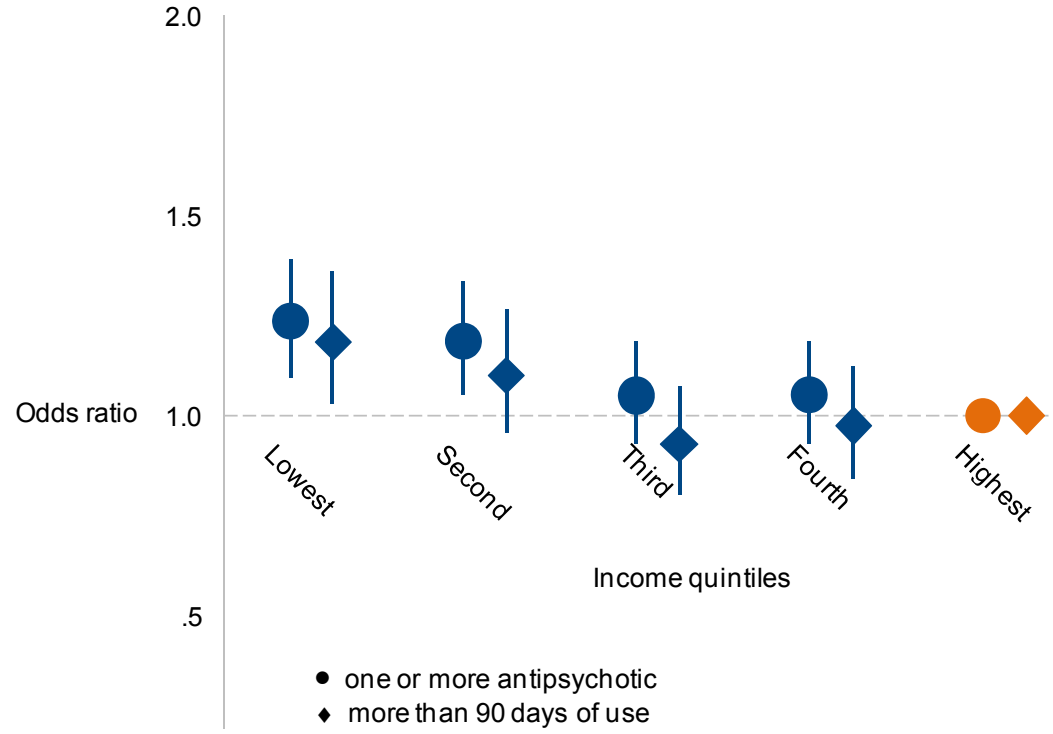
Source: Population Data BC and PharmaNet (2005)

Figure 3-7 Essential antipsychotic use by income among adults who had a recorded schizophrenia diagnosis



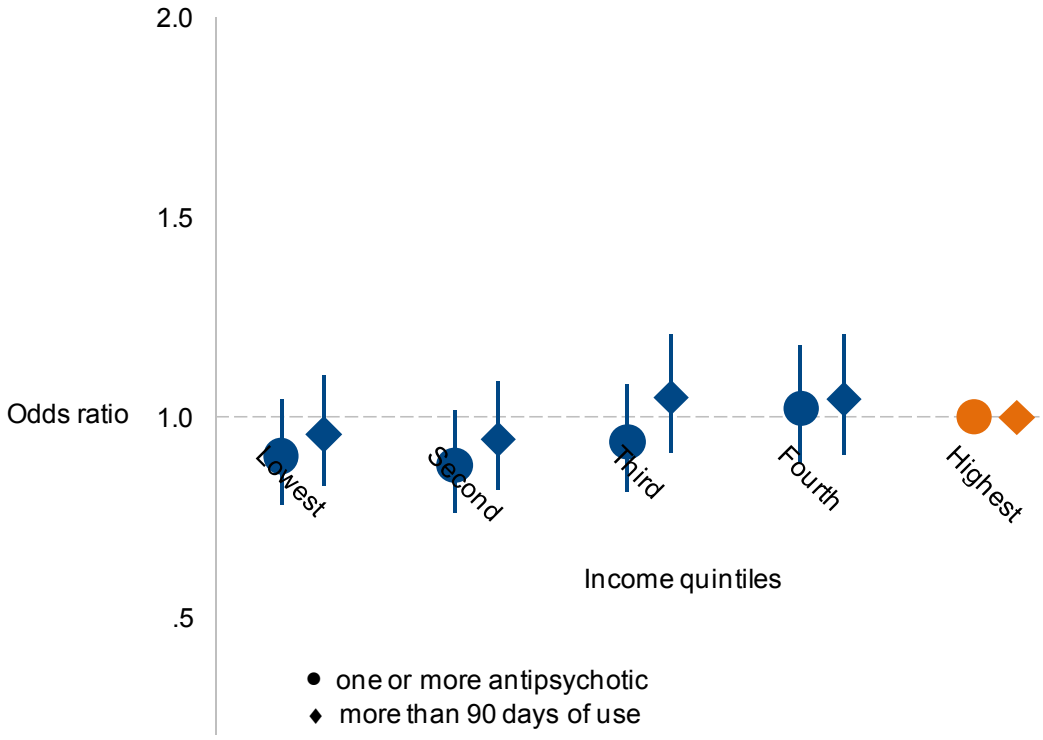
● ♦ The highest income quintile with an odds ratio of 1.0 was the reference group

Figure 3-8 Potentially inappropriate antipsychotic use by income among community-dwelling seniors who had a recorded dementia but not schizophrenia or bipolar disorder diagnosis



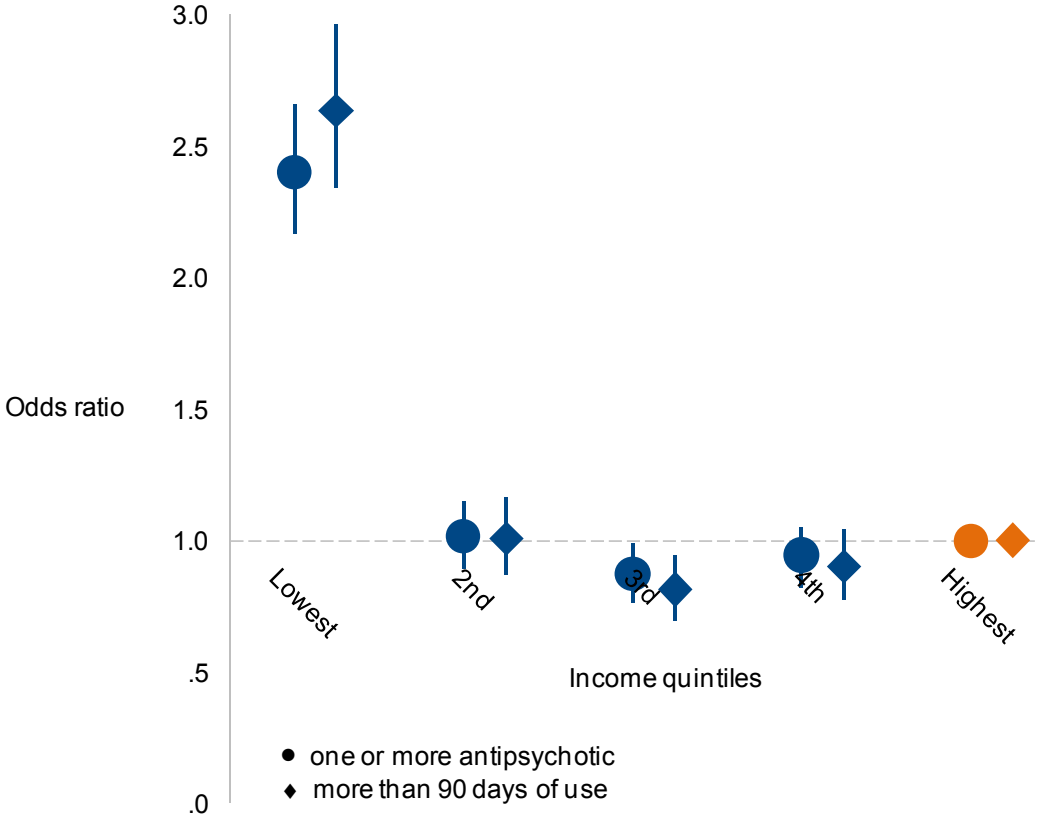
●♦ The highest income quintile with an odds ratio of 1.0 was the reference group

Figure 3-9 Potentially inappropriate antipsychotic use by income among long-term care seniors who had a recorded dementia but not schizophrenia or bipolar disorder diagnosis



●♦ The highest income quintile with an odds ratio of 1.0 was the reference group

Figure 3-10 Potentially inappropriate antipsychotic use by income among children and youth who had no recorded schizophrenia or bipolar disorder diagnosis



● ♦ The highest income quintile with an odds ratio of 1.0 was the reference group

4 Conclusion

4.1 Summary of findings

To examine disparities in the use of antipsychotic medication, we conducted two studies: 1) a systematic review of the peer-reviewed literature to synthesize current findings on race or ethnic-based disparities, and, 2) a secondary analysis of linked administrative to examine income-related disparities in the use of antipsychotic medication. The systematic review was carried out in recognition of the need to synthesize the literature that has accumulated over the past three decades on ethnic disparities in antipsychotic use. The second study was an effort to contribute to an understudied area in disparities research.

In our systematic review, we found 28 studies that examined racial or ethnic disparities in antipsychotic treatment after accounting for the effect of a wide range of factors (i.e., age, sex, comorbid mental, physical disorders, insurance) known to influence the use of antipsychotic medication. The majority of these studies were population-based studies using mostly samples of adults who were diagnosed with schizophrenia or other psychotic disorders. Many of the studies were conducted in the US (only three were from countries such as Netherlands, New Zealand, and the United Kingdom) with African Americans and Latinos as the most frequently studied ethnic groups.

Our review did not find consistent ethnic disparities in the receipt of antipsychotics in general. However, among those who received antipsychotic treatment, our findings suggest racial or ethnic minorities such as African Americans and Latinos who were being treated for severe mental disorder diagnosis were less likely than whites to receive atypical antipsychotic treatment and more likely to have received the older, typical antipsychotics. In

addition, the studies we reviewed indicate that African Americans and Asians were less likely than whites to receive the antipsychotic medication specifically prescribed for individuals with treatment-resistant schizophrenia.

These findings indicate that ethnic minorities have lower odds of using currently recommended antipsychotic treatment – atypical antipsychotics. Though it is not fully known what is driving this disparity, it has been suggested that this may have been caused by clinicians' concerns about specific adverse effects (i.e., weight gain and cardiovascular events), which are putatively greater among ethnic minorities who already have a disproportionate burden of certain health conditions (e.g., diabetes and heart disease).[48]

Our secondary analysis of administrative data examined income-related disparities in the essential and potentially inappropriate use of antipsychotics. In our analysis of essential antipsychotic use within a cohort of adults who received outpatient or inpatient schizophrenia diagnosis in 2005 or the previous year, we found that up to 85% of the individuals were treated with antipsychotics and that the most frequently used antipsychotic was the atypical antipsychotics. We also found that middle quintile individuals had the highest prevalence of essential antipsychotic use. This disparity remained even after accounting for variables that influence medicine use.

Our analyses of potentially inappropriate antipsychotic use were performed separately on a cohort of seniors and a cohort consisting of children and youth. The results of our analysis show that about one in every five seniors received potentially inappropriate antipsychotic treatment. Prevalence of use is higher among seniors in long-term care facilities than seniors living in the community. By type of antipsychotics, atypical antipsychotics appeared to be the most frequently used. By income, seniors in the lowest income quintile had higher odds of potentially inappropriate use compared to those in the highest

income quintile and the differences remained even after accounting for other factors that influence medicine use.

In the cohort composed of children and youth who had no recorded schizophrenia or bipolar disorder diagnosis in 2005 or the previous year, our analysis indicate that the prevalence of potentially inappropriate use was low. However, we found children and youth from lowest income quintile households to have more than twice the odds of potentially inappropriate antipsychotic use compared to those from the highest income quintile. This greater odds of use persisted even after adjusting for other factors that influence medicine use.

These findings regarding high prevalence of essential antipsychotic use and low prevalence of potentially inappropriate use are encouraging. Altogether, these imply that individuals who were most likely to benefit from antipsychotic therapy had received them while exposure was minimized for those who were likely to be affected mainly by its adverse effects. The observed income-related disparities in antipsychotic use have important implications regarding BC's public coverage for this medication. Among individuals with schizophrenia, the disparities highlight the importance of considering factors other than public coverage when promoting essential use. Among those without severe mental illness, the disparities suggest that public drug coverage may have inadvertently increased the risk of exposure of certain individuals (low-income individuals and seniors in long-term care) to potentially inappropriate antipsychotic treatment.

4.2 Strengths and limitations

4.2.1 Systematic review of ethnic disparities

To our knowledge, this systematic review is the first ever conducted to synthesize the extant literature on racial and ethnic disparities in the use of antipsychotic medication. We implemented the following to ensure that the

review was conducted in a rigorous manner: 1) a protocol for searching the literature, assessing studies for inclusion, data collection and synthesis was developed by the main investigator and revised after review and approval by co-investigators; 2) a Master's trained information specialist conducted the search across several bibliographic databases to ensure a reasonably comprehensive search; and, 3) two investigators assessed the studies in each stage of the review process to minimize subjectivity.

Like any systematic review, our study comes with some limitations. First, the search was limited to literature published in academic journals. Any findings of disparity or the lack thereof that were reported in the grey literature or other types of reports and publications would therefore have been excluded. Second, the review was limited to studies that have a primary focus on ethnic or racial disparities in antipsychotic use. As a result, some studies examining determinants of antipsychotic use that have included ethnicity or race as a control variable may have been missed, particularly if the ethnicity relevant findings were not reported or discussed anywhere in the abstract. Finally, we were not able to perform statistical analyses on the odds ratios to determine the overall significance of the differences reported in the literature. Such analysis was not conducted due to the heterogeneity in the characteristics of the population studied and in the wide variation in the covariates used for calculating the adjusted odds ratios.

4.2.2 Analysis of income-related disparities

Our analysis on income-related disparities in antipsychotic use is the only population-based study we know of that examined income disparities within the context of essential and potentially inappropriate medicine use. We have used income variables derived from previously validated data used in the actual implementation of the government's drug benefit program. We adopted a

procedure for identifying probable schizophrenia cases from a study that found the method to be valid and reliable. More importantly, our source of data for antipsychotic medication use in outpatient settings covers virtually the entire population of BC.

A number of limitations need to be mentioned when considering the results of this study. First, the outcome that was measured was based on prescriptions filled which is a variable that may overestimate the prevalence of medication use while at the same time underestimate the number of actual prescriptions issued by care providers. This is because not all individuals fill their prescriptions and those that do, may later not use them. Though the prevalence of use may have been biased by this, it is unlikely that the odds ratios were affected in a meaningful way as these biases do not seem to be systematically associated with income levels. Second, this study used administrative data to identify people with or without schizophrenia in 2004 and 2005. As a result, a small proportion of people who have schizophrenia may have been missed. Third, there is likely to be residual confounding in the analyses of essential antipsychotic use due to the over representation of severe schizophrenia cases in the lower income groups.[100] We attempted to reduce some of this bias by deriving a measure of severity based on hospitalization, but we acknowledge that our analyses may still have underestimated the odds of essential use for the highest income group. Last, it is possible that some individuals may have been misclassified as not having schizophrenic disorders and were therefore included in the cohorts of individuals without schizophrenia or bipolar diagnosis. We tried to minimize this misclassification error by excluding everyone that had any schizophrenia or bipolar diagnoses in 2005 or the previous year, and also by dropping cases residing in areas that have high non fee-for-service claims.

4.3 Recommendations

The use of antipsychotic medication as treatment for severe mental disorders needs periodic examination and monitoring to determine if the disparities are changing in magnitude and also to ensure that the medication is equally accessible to individuals who would benefit from its use. At the same time, policies and interventions should be introduced to reduce potential misuse particularly among low-income individuals who have limited access to behavioural treatments for non-psychotic conditions. The following recommendations are therefore offered to guide future efforts along these lines.

4.3.1 Recommendations for future research

4.3.1.1 Examine understudied and homogeneous ethnic groups

Due to differences in historical background and socio-demographic characteristics, findings of disparities from one ethnicity may not generalize to other ethnic groups. There is therefore a need to conduct studies that examine other ethnic groups. This is particularly true for countries, such as Canada and the US, that are experiencing a surge in ethnic diversity coming especially from the recent wave of Asian migration.[101,102] To our knowledge, there is only one study in Canada that has examined this issue.[103]

The contexts in which disparities are examined also vary from one country to another. It is not clear at present how much of the disparities reported in the literature could be accounted for by differences in the context within which health care is accessed. Replication studies in other countries would contribute to a better understanding of this issue. There is limited evidence that the disparity in antipsychotic use reported in the US between whites and non-whites does not exist in other countries with a different health care system. A recent study in the UK, for example, reported that no significant

differences were found in antipsychotic use between non-white and white inpatients.[104]

With the increase in the population of certain ethnic groups, it may also become possible to examine and compare single-ethnicity groups and avoid the common practice of aggregation. Aggregation (e.g., using Asians as the category for all non-African Americans, non-Latinos, non-whites and non-Arabs) limits the inference that can be made from disparity research to interpretations about ethnic relations (minority versus majority status) and socio-economic positions.[105] Comparing single-ethnicity groups (e.g. white Europeans versus Chinese versus African Americans) will provide for a richer interpretation of disparity findings that encompasses differences in beliefs and cultural practices relevant to the use of medication.

4.3.1.2 Examine disparities in mental health outcomes

Three decades of research have consistently demonstrated the existence of disparities in the use of antipsychotic medication. The next logical step would be to determine the impact this disparity has had on mental health outcomes, particularly for members of ethnic minorities. Differences in outcomes that are causally linked to disparities in use will more strongly emphasize the importance of eliminating disparities in the use and access of medications.

4.3.2 Recommendations for initiatives that may reduce disparities

There have been many recommendations put forward to reduce disparities in health care. Many of these general recommendations[10,34,106] address various aspects of the issue (e.g., legal, regulatory, financing and policy) and can be applied to eliminate disparities in access to antipsychotic medications. Generally, interventions that have been found successful were the ones that are multi-faceted in addressing causes of disparities, culturally appropriate, and, patient-centered.[106]

Recommendations that apply specifically to disparities in the use of antipsychotic medication would include the systematic collection of ethnicity and income data from people who are on antipsychotic regimen and reporting these data in aggregate form as quality indicators. These would be useful for performance monitoring and also for evaluating the effectiveness of interventions and innovations implemented to reduce disparities.[34]

Another specific recommendation is to design programs that take into account differences in language and culture.[107,108] Variations in cultural beliefs about mental disorders influence individual behaviour towards seeking and receiving mental health care. Initiatives that are delivered in the patients' native language and that are respectful of their culture should result in better uptake of and promote adherence to antipsychotic medications.[109]

The inappropriate use of antipsychotics is best addressed by initiatives that are designed to minimize misuse and increase the capacity of the health system to manage behavioural disorders. A government inquiry in the UK that looked at antipsychotic medication use among people with dementia living in care homes has provided the following recommendations to curtail indiscriminate antipsychotic use: 1) provide specialist dementia training for all care home staff; 2) provide enhanced support from general practitioners and other psychiatric care providers; 3) ensure involvement of family members or caregivers in all decisions regarding medication use; 4) require patient-reviews every 3 months; and 5) institute compulsory regulation and audit of antipsychotic drugs for people with dementia.[110]

With regards to the higher odds of potentially inappropriate antipsychotic treatment in lowest income individuals, policies and initiatives that enhance access to a wider range of treatment options may be beneficial. At present, inadequate access to nonpharmacological treatments leave low-income

households and physicians little choice in the management of behavioural symptoms that sometimes accompany nonpsychotic conditions.

4.4 Conclusions

Disparities in the use of antipsychotic medication continue to exist. The patterns of disparities observed in this study point to the marginalized sectors of our society as the group most likely to be affected – ethnic minorities and low-income individuals. These findings have important implications about the quality of care provided to people with mental disorders and behavioural problems. Future studies should help unravel how disparities in use impact mental health outcomes and what actions can be done to reduce or eliminate them.

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Appendices

A. Systematic review search strategy

Source: CINAHL (EbscoHost CINAHL with full text)
Searched on: 29 November, 2010
Saved as: n/a
Results: 96
Search:
(MH "Ethnic Groups+") OR (MH "Race Factors") OR (MH "Minority Groups")
AND
(MH "Antipsychotic Agents+") OR (Acepromazine or Acetophenazine or Amisulpride or Aripiprazole or Benperidol or Bromperidol or Butaperazine or Chlorproethazine or Chlorpromazine or Chlorprothixene or Clopenthixol or Clotiapine or Clozapine or Cyamemazine or Dixyrazine or DOGMATIL or Droperidol or Fluanisone or Flupentixol or Fluphenazine or Fluspirilene or Haloperidol or Levomepromazine or Levosulpiride or Loxapine or Melperone or Mesoridazine or Molindone or Moperone or Mosapramine or Olanzapine or Oxypertine or Paliperidone or Penfluridol or Perazine or Periciazine or Perphenazine or Pimozide or Pipamperone or Pipotiazine or Prochlorperazine or Promazine or Prothipendyl or Quetiapine or Remoxipride or Risperidone or Sertindole or Sulpiride or Sultopride or Thiopropazate or Thioproperazine or Thioridazine or Tiapride or Tiotixene or Trifluoperazine or Trifluperidol or Triflupromazine or Ziprasidon or Zotepine or Zuclopenthixol or Methotrimeprazine)
Limit to: Scholarly (Peer Reviewed) Journals

Source: EMBASE (OvidSP; 1980 to 2010 Week 47)
Searched on: 1 December, 2010
Saved as: ethnicity antipsychotics Joseph SR EMBASE
Results: 1310
Search:
1. exp neuroleptic agent/bd, ct, ad, cm, do, it, dt, ih, ia, ce, cv, dl, ig, im, na, ip, tl, iv, po, pa, pr, pe, pd, rc, sc, sb, li, tp, td
2. (Acepromazine or Acetophenazine or Amisulpride or Aripiprazole or Benperidol or Bromperidol or Butaperazine or Chlorproethazine or Chlorpromazine or Chlorprothixene or Clopenthixol or Clotiapine or Clozapine or Cyamemazine or Dixyrazine or DOGMATIL or Droperidol or Fluanisone or Flupentixol or Fluphenazine or Fluspirilene or Haloperidol or Levomepromazine or Levosulpiride or Loxapine or Melperone or Mesoridazine or Molindone or Moperone or Mosapramine or Olanzapine or Oxypertine or Paliperidone or Penfluridol or Perazine or Periciazine or Perphenazine or Pimozide or Pipamperone or Pipotiazine or Prochlorperazine or Promazine or Prothipendyl or Quetiapine or Remoxipride or Risperidone or Sertindole or Sulpiride or Sultopride or Thiopropazate or Thioproperazine or Thioridazine or Tiapride or Tiotixene or Trifluoperazine or Trifluperidol or Triflupromazine or Ziprasidon or Zotepine or Zuclopenthixol or Methotrimeprazine).mp.
3. 1 or 2
4. exp ethnic difference/ or exp ethnic group/ or exp "ethnic or racial aspects"/ or exp race/ or exp "ethnic, racial and religious groups"/ or exp ethnicity/
5. 3 and 4
6. limit 5 to (human and english language and yr="1980 -Current")
7. limit 6 to (article or journal or letter or report or "review")

Source: International Pharmaceutical Abstracts (OvidSP; 1970 to November 2010)
Searched on: 29 November, 2010
Saved as: ethnicity antipsychotics Joseph SR IPA
Results: 84
Search:
1. ethnic.mp. [mp=title, subject heading word, registry word, abstract, trade name/generic name]
2. (ethnic or ethnicity).hw.
3. race.hw.
4. 1 or 2 or 3
5. Antipsychotic agents.hw.
6. (Acepromazine or Acetophenazine or Amisulpride or Aripiprazole or Benperidol or Bromperidol or Butaperazine or Chlorproethazine or Chlorpromazine or Chlorprothixene or Clopenthixol or Clotiapine or Clozapine or Cyamemazine or Dixyrazine or DOGMATIL or Droperidol or Fluanisone or Flupentixol or Fluphenazine or Fluspirilene or Haloperidol or Levomepromazine or Levosulpiride or Loxapine or Melperone or Mesoridazine or Molindone or Moperone or Mosapramine or Olanzapine or Oxypertine or Paliperidone or Penfluridol or Perazine or Periciazine or Perphenazine or Pimozide or Pipamperone or Pipotiazine or Prochlorperazine or Promazine or Prothipendyl or Quetiapine or Remoxipride or Risperidone or Sertindole or Sulpiride or Sultopride or Thiopropazate or Thioproperazine or Thioridazine or Tiapride or Tiotixene or Trifluoperazine or Trifluperidol or Triflupromazine or Ziprasidon or Zotepine or Zuclopenthixol or Methotrimeprazine).ti,ab,hw,tn,rw.
7. 5 or 6
8. 4 and 7
9. limit 8 to (english language and human and yr="1980 -Current")

Source: MEDLINE (1950 to Present with Daily Update) (OvidSP)
Searched on: 29 November 2010
Saved as: ethnicity antipsychotics Joseph SR
Results: 597
Search:
1. ethnicity.mp.
2. exp ethnic groups/ or exp african americans/ or exp arabs/ or exp asian americans/ or exp gypsies/ or exp hispanic americans/ or exp mexican americans/ or exp jews/
3. exp continental population groups/ or exp african continental ancestry group/ or exp african americans/ or exp indians, central american/ or exp indians, south american/ or exp asian continental ancestry group/ or exp asian americans/ or exp european continental ancestry group/ or exp oceanic ancestry group/
4. cross-cultural comparison/ or exp cultural characteristics/ or exp cultural diversity/ or exp ethnology/
5. 1 or 2 or 3 or 4
6. Antipsychotic Agents/
7. Psychotic Disorders/dt [Drug Therapy]
8. (Acepromazine or Acetophenazine or Amisulpride or Aripiprazole or Benperidol or Bromperidol or Butaperazine or Chlorproethazine or Chlorpromazine or Chlorprothixene or Clopenthixol or Clotiapine or Clozapine or Cyamemazine or Dixyrazine or DOGMATIL or Droperidol or Fluanisone or Flupentixol or Fluphenazine or Fluspirilene or Haloperidol or Levomepromazine or Levosulpiride or Loxapine or Melperone or Mesoridazine or Molindone or Moperone or Mosapramine or Olanzapine or Oxypertine or Paliperidone or Penfluridol or Perazine or Periciazine or Perphenazine or Pimozide or Pipamperone or Pipotiazine or Prochlorperazine or Promazine or Prothipendyl or Quetiapine or Remoxipride or Risperidone or Sertindole or Sulpiride or Sultopride or Thiopropazate or Thioproperazine or Thioridazine or Tiapride or Tiotixene or Trifluoperazine or Trifluperidol or Triflupromazine or Ziprasidon or Zotepine or Zuclopenthixol or Methotrimeprazine).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]
9. 6 or 7 or 8
10. 5 and 9
11. limit 10 to (english language and yr="1980 -Current")
12. limit 11 to (classical article or clinical trial, all or comparative study or controlled clinical trial or evaluation studies or journal article or letter or meta analysis or multicenter study or randomized controlled trial or "review" or technical report or validation studies)

Source: PsycINFO (Ebsco)
Searched on: 29 November, 2010
Saved as: n/a
Results: 76
Search:
S1 DE "Racial and Ethnic Groups" OR DE "African Cultural Groups" OR DE "Arabs" OR DE "Asians" OR DE "Blacks" OR DE "Indigenous Populations" OR DE "Latinos/Latinas" OR DE "Romanies" OR DE "Whites" OR DE "Cross Cultural Differences" OR DE "Racial and Ethnic Differences"
S2 DE "Neuroleptic Drugs" OR DE "Aripiprazole" OR DE "Clozapine" OR DE "Molindone" OR DE "Nialamide" OR DE "Olanzapine" OR DE "Quetiapine" OR DE "Reserpine" OR DE "Risperidone" OR DE "Spiroperidol" OR DE "Sulpiride" OR DE "Tetrabenazine"
S3 (Acepromazine or Acetophenazine or Amisulpride or Aripiprazole or Benperidol or Bromperidol or Butaperazine or Chlorproethazine or Chlorpromazine or Chlorprothixene or Clopenthixol or Clotiapine or Clozapine or Cyamemazine or Dixyrazine or DOGMATIL or Droperidol or Fluanisone or Flupentixol or Fluphenazine or Fluspirilene or Haloperidol or Levomepromazine or Levosulpiride or Loxapine or Melperone or Mesoridazine or Molindone or Moperone or Mosapramine or Olanzapine or Oxypertine or Paliperidone or Penfluridol or Perazine or Periciazine or Perphenazine or Pimozide or Pipamperone or Pipotiazine or Prochlorperazine or Promazine or Prothipendyl or Quetiapine or Remoxipride or Risperidone or Sertindole or Sulpiride or Sultopride or Thiopropazate or Thioproperazine or Thioridazine or Tiapride or Tiotixene or Trifluoperazine or Trifluperidol or Triflupromazine or Ziprasidon or Zotepine or Zuclopenthixol or Methotrimeprazine)
S4 S2 OR S3
S5 S1 AND S4
Limiters - Scholarly (Peer Reviewed) Journals, 1980-Current

Source: Web of Science (Thompson Reuters ISI Web of Knowledge)
Searched on: 29 November, 2010
Saved as: n/a
Results: 307
Search:
#1 Topic=(antipsychotic*)
#2 Topic=(ethnic* OR racial OR race)
#3 #2 AND #1
Refined by: Document Type=(ARTICLE OR LETTER OR REVIEW) AND Languages=(ENGLISH)
Timespan=All Years. Databases=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH.

B. Systematic review data collection form

Full-text #:	
Authors:	
Year:	

Location: ***(country only)***	

Year(s) of data collection:	

Sampling frame (X):		Geographic
		Institutional
		Insurance status
		Other
	Details	

Sampling method (X):		Random
		Convenience
		Population-based
		Other

Age range:	

Sex (X):		Male only
		Female only
		Both

Treatment Setting (X):		Inpatient only
		Outpatient only
		Both

Population group(s) studied (X):		Schizophrenia
e.g. Patients with schizophrenia only		Bipolar disorders
		Depression
		Dementia
		HIV
		Autism Spectrum Disorder
		Other *Specify here*

Prescription data source (X):		Administrative data
		Chart review
		Survey
		Other *Specify here*
		Not specified

Ethnic Groups	Ref	
Note: please write actual ethnic/racial categories used	EG1	
	EG2	
	EG3	
	EG4	
	EG5	
	EG6	

Type of antipsychotic studied		any antipsychotic
note: single AP studies (e.g. Risperidone) are excluded, except for Clozapine studies		any typical
		any atypical
		Clozapine

Measure of AP use		use versus non use
		atypical versus typical
		Other *Specify here*
		Not specified

Count(s) of AP use		at least one
		2 or more
		Other *Specify here*
		Not specified

AP form investigated		Oral
		Depot
		Both
		Not specified

Covariates used for adjustment		Age
		Sex
		Insurance
		SES
		Health status
		Psychiatric diagnoses
		Other

Distribution by Covariates Used

Sample Size (n)	

		%
Age	Agecat1	
Note: write the actual age categories used	Agecat2	
	Agecat3	
	Agecat4	
	Agecat5	

Sex	Men	
	Women	

Any Antipsychotic	**Crude**	**Adjusted Odds Ratio**			**Other Disparity Measure**		
	Prev	Pt est	-CI	+CI	Pt est	-CI	+CI
Ref							
EG1							
EG2							
EG3							
EG4							
EG5							
EG6							

Any Atypical	Crude	Adjusted Odds Ratio			Other Disparity Measure		
	Prev	Pt est	-CI	+CI	Pt est	-CI	+CI
Ref							
EG1							
EG2							
EG3							
EG4							
EG5							
EG6							

Any Typical	Crude	Adjusted Odds Ratio			Other Disparity Measure		
	Prev	Pt est	-CI	+CI	Pt est	-CI	+CI
Ref							
EG1							
EG2							
EG3							
EG4							
EG5							
EG6							

Clozapine	Crude	Adjusted Odds Ratio			Other Disparity Measure		
	Prev	Pt est	-CI	+CI	Pt est	-CI	+CI
Ref							
EG1							
EG2							
EG3							
EG4							
EG5							
EG6							

Other important sources of bias not related to sampling, data source or covariates included in the model:

1.
2.

C. List of typical and atypical antipsychotics found in PharmaNet in 2005

Typical agents	Atypical agents
Chlorpromazine	Clozapine
Flupentixol	Olanzapine†
Fluphenazine	Quetiapine
Fluspirilene	Risperidone
Haloperidol	
Levomepromazine	
Loxapine	
Mesoridazine	
Periciazine	
Perphenazine	
Pimozide	
Pipotiazine	
Thioproperazine	
Thioridazine	
Thiotixene	
Trifluoperazine	
Zuclopenthixol	

† requires special authorization from PharmaCare as of March 2011

D. Public drug coverage in BC

Plan B: Permanent residents of licensed residential care facilities

- Full coverage for eligible prescription.

Plan C: Recipients of BC income assistance

- Full coverage for eligible prescription.

Plan D: Cystic fibrosis

- Coverage contingent on the patient's primary plan (e.g., Plan C).
- Full coverage for digestive enzymes and other products listed in the Cystic Fibrosis Formulary.

Plan F: Children in the 'At Home' Program

- Full coverage of eligible prescription.
- The 'At Home' program of the Ministry of Children and Family Development provides community-based, family-style care for severely handicapped children who would otherwise become reliant on institutional care.

Plan G: No-charge psychiatric medication plan

- Full coverage of psychiatric medications included in the formulary. Certain drugs (e.g. Olanzapine) require prior authorization from PharmaCare.
- Registration in the plan is required and eligibility is determined by physicians and community mental health centers.

Plan I: Fair PharmaCare Plan

- Coverage is based on income.