Weather, Mood, and Use of Antidepressants: The Role of Projection Bias in Mental Health Care Decisions*

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Abstract

Evidence from psychology suggests that on a bad-weather day, individuals may feel more depressed than usual. If people are not fully able to account for the effect of transient weather, they may take systematically biased treatment decisions. I derive a model of a person considering treatment for depression and show that when projection bias is present, transient weather might influence choice. I use detailed administrative medical records from the MarketScan® database and daily county-level meteorological data from the National Climatic Data Center. My period of analysis is 01/01/2003 through 12/31/2004. My main analysis focuses on patient behavior during a small interval of time after they have been seen by a physician. I look at how weather influences antidepressant filling decision within patient and only include appointments that involved a major diagnosis of a mental disease or disorder. I find that a one standard deviation increase in the amount of cloud coverage (2.73 oktas) leads to a 0.063 percentage point increase in the probability that a patient fills an antidepressant prescription on appointment day. That is a 1.04% increase from the 6.07% baseline. I also find effects associated with snow, rain, and temperature. All effects fade with time and are not significant within seven days of the appointment. Most most of the impact of cloud coverage on antidepressant filling is due to an increase on the number of new prescriptions, not an increase in refills. Virtually all the effect happens at the pharmacy, not via mail order. Most regions have similar coefficients associated with cloud coverage, with stronger results in the Northeast and Upper Midwest. Finally, most of the impact happens during Winter.

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1 Introduction

Each year, 6.5% of adults in the United States suffer from major depression, 60% of which report having symptoms severe enough to keep them from performing daily tasks (Kressner et al., 2003). Yet little is known about the behavior of patients under treatment for major depression. This paper focuses on a specific behavioral bias likely to play a role in the choice of antidepressant treatment: the extent to which individuals separately identify the part of their current psychological well-being that is due to structural factors and those due to temporary conditions. Do individuals react to temporary conditions as if they were permanent? The standard model typically assumes that individuals are able to ignore temporary factors at the time a decision with future payoffs is taken. However, a growing body of literature on Projection Bias (Loewenstein, O'Donoghue, and Rabin [2003], Busse, Pope, Pope, and Silva-Risso [2014]) have formalized and found evidence that people are in fact influenced by transient states when making inter-temporal decisions.

I focus on transient weather fluctuations. Evidence from psychology suggests that days with high cloud cover induce worse moods. Hence, on a bad-weather day, individuals may feel more depressed than usual. If people are not fully able to account for the effect of weather, they may ask for (changes in) medications. I derive a model of a person considering treatment decisions and show that when projection bias is present, transient states might play a role. To test this prediction, I use detailed administrative medical records and daily county-level meteorological data in the United States from 01/01/2003 through 12/31/2004. Medical data come from the Truven Health MarketScan® database. Of the 12,094,219 enrollees, 13.60% filled at least one antidepressant prescription, and 7.86% had a diagnosis of a mental disease or disorder. Meteorological data are from the National Climatic Data Center (NCDC).

As a preliminary check, I test the effect of daily transient weather fluctuations on the percentage of appointments that involve a diagnosis of a mental disease or disorder. I find that the occurrence of snow is associated with a 0.13 percentage point decrease in the percentage of mental disease and disorder diagnosis, from a 1.93% baseline. Weather fluctuations in other dimensions do not seem to systematically lead to a change in the percentage of patients that are diagnosed with a mental disease or disorder. My specification includes county-year, day of the week, week of the year, year, and climatic region fixed effects. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984).

As a second preliminary analysis, I study the effect of transient weather on the daily total filling of antidepressants at the county level. The average number of antidepressants filled per county-day is 16.37. I find that snow (rain) leads a 1.08% (0.56%) decrease in the number of antidepressants filled. It is plausible, however, that the occurrence of rain and snow increase the costs associated with filling a prescription. Further, a one standard deviation (19.24°F) increase in temperature is found to lead to a 0.81% increase in the number of antidepressants filled.

My main analysis focuses on patient behavior during a small interval of time after they have been seen by a physician. I look at how weather influences antidepressant filling decision within a patient; I only include appointments that involved a major diagnosis of a mental disease or disorder. I find that a one standard deviation increase in the amount of cloud coverage (2.73 oktas) leads to a 0.063 percentage point increase in the probability that a patient fills an antidepressant prescription on appointment day. That is a 1.04% increase from the 6.07% baseline. The impact of cloud coverage fades with time. The effect is borderline significant within a day of the appointment, and insignificant within seven days. I also find small effects associated with snow, rain, and temperature.

I perform several heterogeneity analysis that build on the main analysis. Most most of the impact of cloud coverage on antidepressant filling is due to an increase on the number of new prescriptions, and not an increase in refills. I also present results separately for prescriptions filled in a pharmacy or via mail order. Virtually all the impact of weather variables on antidepressant filling happens at the pharmacy; I do not find that weather impacts the probability of filling antidepressants via mail order. Further, I show results per climatic region in the contiguous United States. Most regions have similar coefficients associated with cloud coverage, but only in the only in the Northeast and Upper Midwest that coefficient is statistically significant. Perhaps not coincidentally, those are the two biggest regions in my data in terms of number of patients.

Additionally, I find that most of the impact of cloud coverage on the filling of antidepressants is led by patients who have had appointments during the Winter. A one (year-round) standard deviation increase in cloud coverage (2.73 oktas) lead to a 0.229 percentage point increase in the probability that a patient fills an antidepressant prescription in a pharmacy on the same day of the appointment, a 3.78% increase from the 5.54% (year-round) baseline. I also show results according to the dosing of a particular drug product. Most of the results seem to be led by filling of drugs of intermediate dosing. This is also the group of drus that is most frequently prescribed to patients in the data.

This paper relates to the literature that tests behavioral economics models using field data (see DellaVigna [2009] for a review). In specific, it contributes to the literature on Projection Bias as conceptualized by Loewenstein, O'Donoghue, and Rabin (2003). This paper closely relates to Busse, Pope, Pope, and Silva-Risso (2014), who investigate whether consumers are affected by weather when they purchase cars. They find that buying convertibles and four-wheel-drive cars is dependent on the weather at the time of purchase. Another related paper is Conlin, O'Donoghue, and Vogelsang (2007), find that purchases of cold-weather items are over-influenced by the weather at the time of purchase. Specifically, they find that purchases made in low temperatures are more likely to be returned.

The remaining of the paper is organized as follows. Section 3 introduces a theoretical framework and derives the main prediction of Projection Bias in this context. Section 3 describes the administrative data. Section 4 discusses the impact of weather on mental disease and disorder diagnosis. The impact of weather on antidepressant filling is discussed in section 5. Section 6 discusses the filling behavior of patients following an appointment. Finally, section 7 concludes.

2 Theoretical Framework

Consider a person deciding whether or not to initiate a treatment for depression.[1] Her time-varying mental health state s_t is formed by two components: structural well-being w, and transient mood m_t,

$$s_t = w + m_t. \tag{2.1}$$

The m_t component fluctuates on a daily basis, immediately affected by changes in mood-affecting variables, such as weather. The w component is not affected by transient shifts in mood.

In particular, I assume that m_t takes on two possible values, m^b and m^g, on bad and good weather days, respectively. Let $m_b < 0 < m_g$. I assume that a fixed proportion p_g of days have good weather, and $1 - p_g$ have bad weather. Let $w \in R$, with $w \geq 0$ corresponding to healthy structural well-being states and $w < 0$ corresponding to varying levels of depression.

At each day, the person has the choice of initiating a prescription drug treatment for depression. The treatment has an immediate cost of c and a per-period future net benefit of

$$b(d_t) = \begin{cases} -w, & \text{if } w < 0 \\ 0, & \text{if } w \geq 0 \end{cases}, \tag{2.2}$$

where d_t indicates ongoing treatment for depression. This means that a currently depressed person reverts to $w = 0$ one period after treatment starts, and that a non-depressed person derives no benefit from treatment.

A standard-model person is able to discern between the transient and structural components. When making predictions for any future period, the best estimate of future well-being, given a current mental health state, can be expressed as

$$u(s_{t+\tau}, d_{t+\tau}|s_t) = w + p_g m_g + (1 - p_g)m_b + b(d_{t+\tau}). \tag{2.3}$$

She will initiate treatment if

$$-c + \sum_{\tau=1}^{\infty} \delta^\tau u(s_{t+\tau}, 1|s_t) > \sum_{\tau=1}^{\infty} \delta^\tau u(s_{t+\tau}, 0|s_t), \tag{2.4}$$

which results in $c < -\frac{\delta}{1-\delta}w$. The standard-model person will initiate treatment if she is in depression, $w < 0$, and if benefits outweigh costs. That decision is not influenced by the transient mood component m_t.

Consider now an individual that suffers from projection bias. She is not able to fully disentangle the part of her current mental health state that is due to structural factors and transient factors. As a consequence, when making predictions for future well-being, she believes transient moods will be permanent, at least partially,

[1] In reality, that decision will hopefully be taken with the support of a medical professional. I abstract from that for now.

$$\hat{u}(s_{t+\tau}, d_{t+\tau}|s_t) = (1-\alpha)u(s_{t+\tau}, d_{t+\tau}|s_t) + \alpha u(s_t, d_{t+\tau}|s_t), \tag{2.5}$$

where $\alpha \in [0,1]$ is the projection bias parameter. This nests the standard model with $\alpha = 0$. In the extreme case, $\alpha = 1$, the person will act as if her current mental health is entirely due to permanent structural factors.

Given the linearity of the model, another way to think of projection bias here is that the person believes her permanent mental health state is given by $(1-\alpha)w + \alpha s_t(w+m_t) = w + \alpha m_t$ instead of w. As such, she estimates the benefits of the depression treatment by

$$\hat{b}(d_t) = \begin{cases} -w - \alpha m_t, & \text{if } w + \alpha m_t < 0 \\ 0, & \text{if } w + \alpha m_t \geq 0 \end{cases}. \tag{2.6}$$

For simplicity, I focus on the case $\alpha = 1$ in what follows.[2] Consider a person who is depressed, $w < 0$, on a bad weather day. She will initiate treatment if

$$-c + \sum_{\tau=1}^{\infty} \delta^{\tau} \left(w + m^b + \hat{b}\right) > \sum_{\tau=1}^{\infty} \delta^{\tau} \left(w + m^b\right), \tag{2.7}$$

which is equivalent to $c < -\frac{\delta}{1-\delta}(w + m_b)$. The projection bias leads her to take the transient mood m_b into account. She will be more likely to initiate a treatment for depression on a bad weather day.

Other cases follow an analogous logic. A depressed individual on a good weather day with $w + m^g < 0$ will choose treatment if $c < -\frac{\delta}{1-\delta}(w + m_g)$. A depressed individual on a good weather day with $w + m^g > 0$ will not believe she is in depression and not start treatment. In the two last cases, good weather decreases the likelihood of treatment. A non-depressed individual on a bad weather day with $w + m^b < 0$ will act as if she is depressed and choose treatment if $c < -\frac{\delta}{1-\delta}(w + m_b)$; bad weather here leads to unnecessary treatment. A non-depressed individual on a bad weather day with $w + m^b > 0$ will not not initiate treatment. Finally, a non-depressed individual on a good weather day will have $w + m^b > 0$ and will not treat herself.

Proposition. *To the extent that weather impact transient mood, an agent who displays projection bias will be more (less) likely to initiate treatment for depression on a bad (good) weather day. To the extent that weather does not immediately impact structural well-being, transient weather does not influence the standard-model agent depression treatment decisions.*

Well-Being Considerations

Projection bias unambiguously hurts the well-being of an individual if it is the only deviation from standard behavior influencing the antidepressant treatment decision. As seen in the previous paragraphs, projection bias may lead an individual to initiate treatment in cases where it is not cost-effective or even in cases when the person is not depressed. It may also lead a person not to treat herself when treatment is advisable.

[2] All cases $\alpha \in (0,1]$ share the same qualitative results.

On the other hand, projection bias may in fact improve the well-being of an individual who is also present-biased. Treatment for depression is an activity with immediate costs and delayed benefits. As such, it is not implausible to expect that several people for whom treatment is recommended are not in treatment due to procrastination. If that is the case, the increased likelihood to initiate treatment in a bad weather day might in fact help.

3 Data

I use administrative individual-level medical data from the *Truven Health MarketScan® Research Databases*. Weather data come from the National Climatic Data Center (NCDC). The period of analysis is 01/01/2003 through 12/31/2004. Summary statistics are presented on Table 1.

Medical

Medical data come from MarketScan's Commercial Claims and Encounters segment, which includes active employees, early retirees, COBRA continues, and their dependents insured by employer-sponsored plans from approximately 45 large employers in the United States.

Data on the use of prescription drugs come from the Outpatient Pharmaceutical Claims table. Each record represents a drug claim at the pharmacy or via mail order. Each drug is uniquely identified by its National Drug Code (NDC), which assigns a different code for each drug product of a specific dosing produced by a specific manufacturer. Drugs can be grouped according to their therapeutic class based on the pharmacological category of the drug product. I restrict attention to drugs classified as *antidepressants*. Out of the 12,094,219 patients in the data, 1,645,183 (13.0%) have filled at least one antidepressant prescription in the period of analysis. Figure **??** depicts the ten most frequently filled antidepressants in the data, as a percentage of total antidepressants filled.

Data from medical appointments come from the Outpatient Services table, that contains encounters and claims for services that were rendered in a doctor's office, hospital outpatient facility, emergency room or other outpatient facility. Of particular interest are appointments in which the patient was diagnosed with a mental disease or disorder. The major diagnostic category *mental diseases and disorders* (MDC 19) includes acute adjustment reaction and psycho-social dysfunction, depressive neuroses, non-depressive neuroses, disorders of personality and impulse control, organic disturbances and mental retardation, psychoses, behavioral and developmental problems, and other mental diagnoses. Out of the 12,094,219 patients in the data, 950,048 (7.86%) have had an appointment with a mental disease or disorder diagnosis in the period of analysis. There are a total of 4,839,861 such appointments recorded in the data.[3]

I construct indicator variables for the filling behavior of a patient following a medical appointment in which there was a mental disease or disorder diagnosis. As per Table 1, 6.46% (15.66%) of such medical appointments were followed by the filling of an antidepressant on the same day

[3]The last two statistics do not include appointments with medical professionals who are not able to prescribe drugs.

(within seven days). Enrollment records, demographic characteristics, and geographic locations come from the Enrollment table. All tables are linked via unique individual identifiers.

Weather

Weather data come from the National Climatic Data Center (NCDC); cloud coverage from the Integrated Surface Data (ISD) dataset, all other variables from the Global Summary of the Day (GSOD) dataset. I exclude data from stations with missing latitude, longitude, or elevation data, stations that started operating on or after 01/01/2002 or finished operating on or before 01/01/2005. I further excludes stations with an altitude exceeding that of the lowest laying station in the county in more than 500 meters and stations located in a body of water. Figure 2a depicts all 2,523 meteorological stations in the contiguous United States that are included in the analysis.

Weather data is linked to medical data using county identifiers. A county is included in the analysis if it contains at least one meteorological station in its territory. If two or more stations are located in the same county, I use the county-average of each weather variable weighting station-level data based on the number of daily observations recorded. That results in 972 counties. Summary statistics are presented on the Panel A of Table 1. The grouping of states into climatic regions follows the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6. I use weather at the county of residence of an enrollee, as opposed to that of the employer, pharmacy, or medical service provider.

4 Mental Disease and Disorder Diagnosis

I model the percentage of appointments in county c on day t that involve a diagnosis of a mental disease or disorder as

$$PctMentalDiagnosis_{ct} = \alpha_1 Weather_{ct} + \alpha_2 DoW_t + \alpha_3 Region_c Week_t + \xi_c Year_t + u_{ct} \tag{4.1}$$

where $Weather_{ct}$ includes temperature, cloud coverage, dew point, visibility, wind speed, as well as indicators for rain, snow, and fog. DoW_t, $Week_t$, $Year_t$, and $Region_c$ are day of the week, week of the year, year, and climatic region indicators. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6. I include an interaction of county fixed effects, ξ_c, and the year indicator. Standard errors are clustered at the climatic region level.

Table 2 presents the results of the specification in 4.1. The occurrence of snow is associated with a 0.13 percentage point decrease in the percentage of mental disease and disorder diagnosis, from a 1.93% baseline. Weather fluctuations in other dimensions do not seem to systematically lead to a change in the percentage of patients that are diagnosed with a mental disease or disorder.

5 Antidepressant Filling

Let $TotalFillings_{ct}$ denote the total number of antidepressants filled in county c at day t

$$TotalFillings_{ct} = \eta Weather_{ct} + \alpha_1 Dow_t + \alpha_2 Region_c \times Week_t + \xi_c \times Year_t + \beta \mathrm{X}_{it} + u_{ct} \quad (5.1)$$

where $Weather_{ct}$ includes temperature, cloud coverage, dew point, visibility, wind speed, as well as indicators for rain, snow, and fog. DoW_t, $Week_t$, $Year_t$, and $Region_c$ are day of the week, week of the year, year, and climatic region indicators. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6. I include an interaction of county fixed effects, ξ_c, and the year indicator. Standard errors are clustered at the climatic region level.

Table 2 presents the results of the specification in 4.1. The result on column four indicates that snow, rain, and changes in temperature lead to changes in the total number of antidepressants filled. It is plausible that the occurrence of rain and snow increase the costs associated with filling a prescription. In fact, I find that snow (rain) leads a 1.08% (0.56%) decrease in the number of antidepressants filled. The average number of antidepressants filled per county-day is 16.37. Summary statistics for rain and snow are displayed on Table 1. As per temperature, a change in one standard deviation (19.24°F) is found to lead to a 0.81% increase in the number of antidepressants filled.

Columns 5 and 6 of Table 2 show the results of specification 4.1 separately for refills and new prescriptions.

6 Antidepressant Filling After Appointment

I model the filling behavior of a patient following an appointment in which there was a mental disease or disorder diagnosis as

$$FillsAntidepressant_{it} = \eta Weather_{ct} + \alpha_1 Dow_t + \alpha_2 Region_c \times Week_t + \beta \mathrm{X}_{it} + \xi_i + u_{it} \quad (6.1)$$

where $FillsAntidepressant_{it}$ equals one if the patient fills an antidepressant prescription within a specific amount of time following the appointment. Different time windows will be used. $Weather_{ct}$ includes temperature, cloud coverage, dew point, visibility, wind speed, as well as indicators for rain, snow, and fog. DoW_t, $Week_t$, $Year_t$, and $Region_c$ are day of the week, week of the year, year, and climatic region indicators. Patient characteristics X_{it} includes age, gender, employee classification, employment status, and relation to the employee. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6. I include an interaction of county fixed effects, ξ_c, and the year indicator. Standard errors are clustered at the climatic region level. Patients who move across county lines in the period of study are not included in the analysis.

The results of specification 6.1 are presented on Table 4. I find that a one standard deviation increase in the amount of cloud coverage (2.73 oktas) lead to a 0.063 percentage point increase in the probability that a patient fills an antidepressant prescription on very same day they were seen by a doctor and diagnosed with a mental disease or disorder. That represents a 1.04% increase from the baseline 6.07% of patients who typically fill a prescription in such circumstances. Columns 5 and 7 of Table 4 show that the impact of cloud-coverage at the time of the appointment on filling behavior fades with time. The proportion of patients who fill an antidepressant prescription is borderline significant within a day of the appointment, and insignificant within seven days. No other weather variable is found to influence filling behavior.

Heterogeneity of the Results

The results on Table 5 show that most of the impact of cloud coverage on the filling of antidepressant prescriptions is mostly due to an increase in the number of new prescriptions, and not an increase in refills. In addition, I find that the estimates associated with rain and snow are related to the proportion of patients who fill a new antidepressant prescription on appointment day. By its turn, an increase in temperature is found to lead to a decrease in refills of antidepressants following an appointment. The magnitude of these three last results is small, however.

On Table 6 I presents results separately for prescriptions filled in a pharmacy or via mail order. I find that a one standard variation increase in the amount of cloud coverage (2.73 oktas) lead to a 0.052 percentage point increase in the probability that a patient fills an antidepressant prescription in a pharmacy on the same day of the appointment, a 0.94% increase from the 5.54% baseline. Still focusing on filling at the pharmacy, I find that the occurrence of snow leads to a 0.131 percentage point decrease in the filling of antidepressant. I do not find that weather impacts the probability of filling antidepressants via mail order. These results must be taken with a grain of salt, however, as the vast majority of prescriptions in the data are filled at a pharmacy.

Table 7 show results for each climatic region in the contiguous United States. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6. I exclude regions that do not represent at least 2% of the total patients in the data (Northern Rockies, Southwest, and West). While all regions, except the Southeast, have similar coefficients associated with cloud coverage, the only two regions with statistically significant results on that variable are the Northeast and Upper Midwest. Not coincidentally, perhaps, those are the two biggest regions in my data in terms of number of patients.

On Table 8 I present results for each one of the four seasons of the year. I find that most of the positive impact of cloud coverage on the filling of antidepressants is led by patients who have had appointments during Winter. A one (year-round) standard deviation increase in cloud coverage (2.73 oktas) lead to a 0.229 percentage point increase in the probability that a patient fills an antidepressant prescription in a pharmacy on the same day of the appointment, a 3.78% increase from the 5.54% (year-round) baseline.

Finally, Table 9 shows results according to the dosing of a particular drug product. Consider a drug product that is available in four different doses: 10mg, 20mg, 50mg, and 100mg. Each dosing is a different drug according to the NDC. I arbitrarily assign drugs to three mutually exclusive groups: minimum dose, intermediate, and maximum dose. In the case of the hypothetical drug product in question, the 10mg version is assigned to the minimum dose group, the 100mg version to the maximum dose group, and the 20mg and 50mg versions to the intermediate group. Not surprisingly, most of the results seem to be led by filling of drugs of intermediate dosing. This is also the group of drugs that is most frequently prescribed to patients in the data.

7 Discussion

There are several distinct antidepressant regimens currently available, and a usual treatment involves some experimentation with different prescription drugs. During an appointment, a patient is typically asked about the symptoms of her depression, and a decision is taken about whether or not to initiate or change a treatment with antidepressants. Temporary factors, such as weather, may influence the answer given by the patient to the doctor, consequently influencing medication choice. I derive a model of a person considering treatment decisions and show that when projection bias is present, weather might play a role in treatment choices. I use detailed administrative medical records and daily county-level meteorological data in the United States from 01/01/2003 through 12/31/2004. Medical data come from the Truven Health MarketScan® database. Meteorological data are from the National Climatic Data Center.

My main analysis focuses on patient behavior during a small interval of time after they have been seen by a physician. I look at how weather influences antidepressant filling decision within a patient; I only include appointments that involved a major diagnosis of a mental disease or disorder. My specification includes county-year, day of the week, week of the year, year, and climatic region fixed effects. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984). I find that a one standard deviation increase in the amount of cloud coverage (2.73 oktas) leads to a 0.063 percentage point increase in the probability that a patient fills an antidepressant prescription on appointment day. That is a 1.04% increase from the 6.07% baseline. The impact of cloud coverage fades with time. The effect is borderline significant within a day of the appointment, and insignificant within seven days. I also find small effects associated with snow, rain, and temperature.

I perform several heterogeneity analysis that build on the main analysis. Most most of the impact of cloud coverage on antidepressant filling is due to an increase on the number of new prescriptions, and not an increase in refills. I also present results separately for prescriptions filled in a pharmacy or via mail order. Virtually all the impact of weather variables on antidepressant filling happens at the pharmacy; I do not find that weather impacts the probability of filling antidepressants via mail order. Further, I show results per climatic region in the contiguous United States. Most regions have similar coefficients associated with cloud coverage, but only in the only in the Northeast and Upper Midwest that coefficient is statistically significant. Perhaps not coincidentally, those are the two biggest regions in my data in terms of number of patients. Additionally, I find that most of the impact of cloud coverage on the filling of antidepressants is led by patients who have had appointments during the Winter. A one (year-round) standard deviation increase in cloud coverage (2.73 oktas) lead to a 0.229 percentage point increase in the probability that a patient fills an antidepressant prescription in a pharmacy on the same day of the appointment, a 3.78% increase from the 5.54% (year-round) baseline. I also show results according to the dosing of a particular drug product. Most of the results seem to be led by filling of drugs of intermediate dosing. This is also the group of drugs that is most frequently prescribed to patients in the data.

Projection bias unambiguously hurts the well-being of an individual if it is the only deviation from the standard model influencing the antidepressant treatment decision. It may lead an individual to initiate treatment in cases where it is not cost-effective or even in cases when the person is not depressed. It may also lead a person not to treat herself when treatment would be advisable. On the other hand, projection bias may improve the well-being of an individual who is also present-biased. Treatment for depression is an activity with immediate costs and delayed benefits. It is not implausible to expect that several people for whom treatment for depression is advisable and cost-effective are not currently in treatment due to procrastination. If that is the case, the increased likelihood to initiate treatment in a bad weather day might in fact help.

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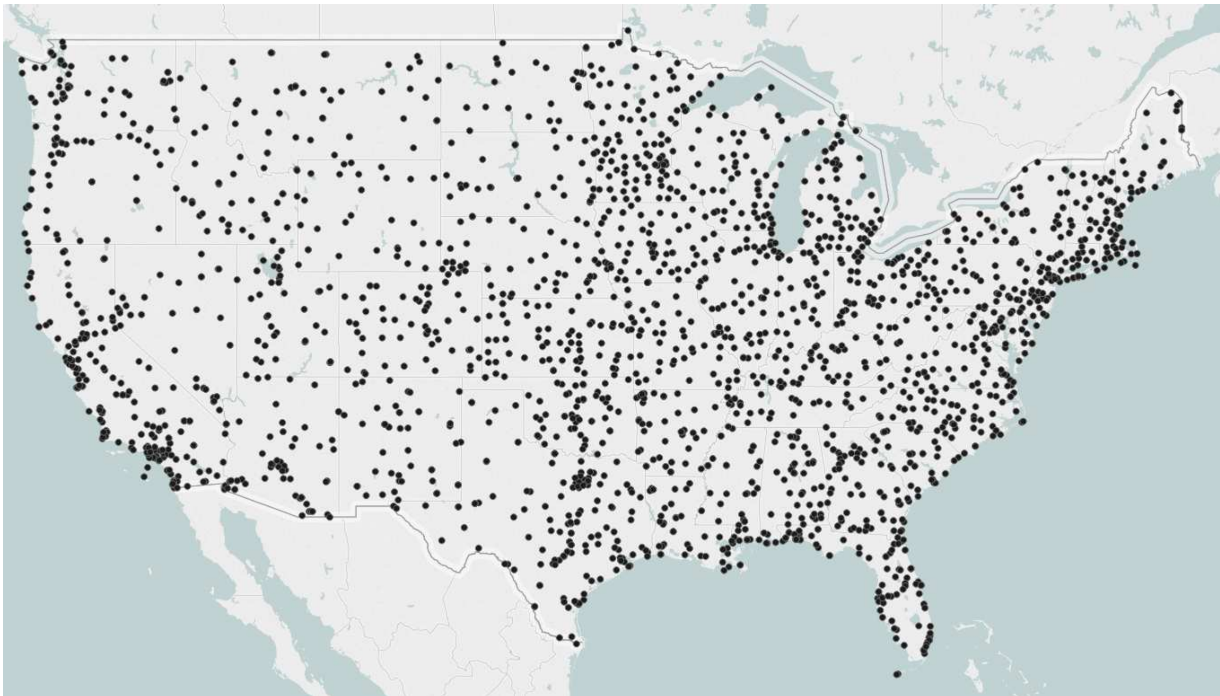
Figure 1: Meteorological Stations

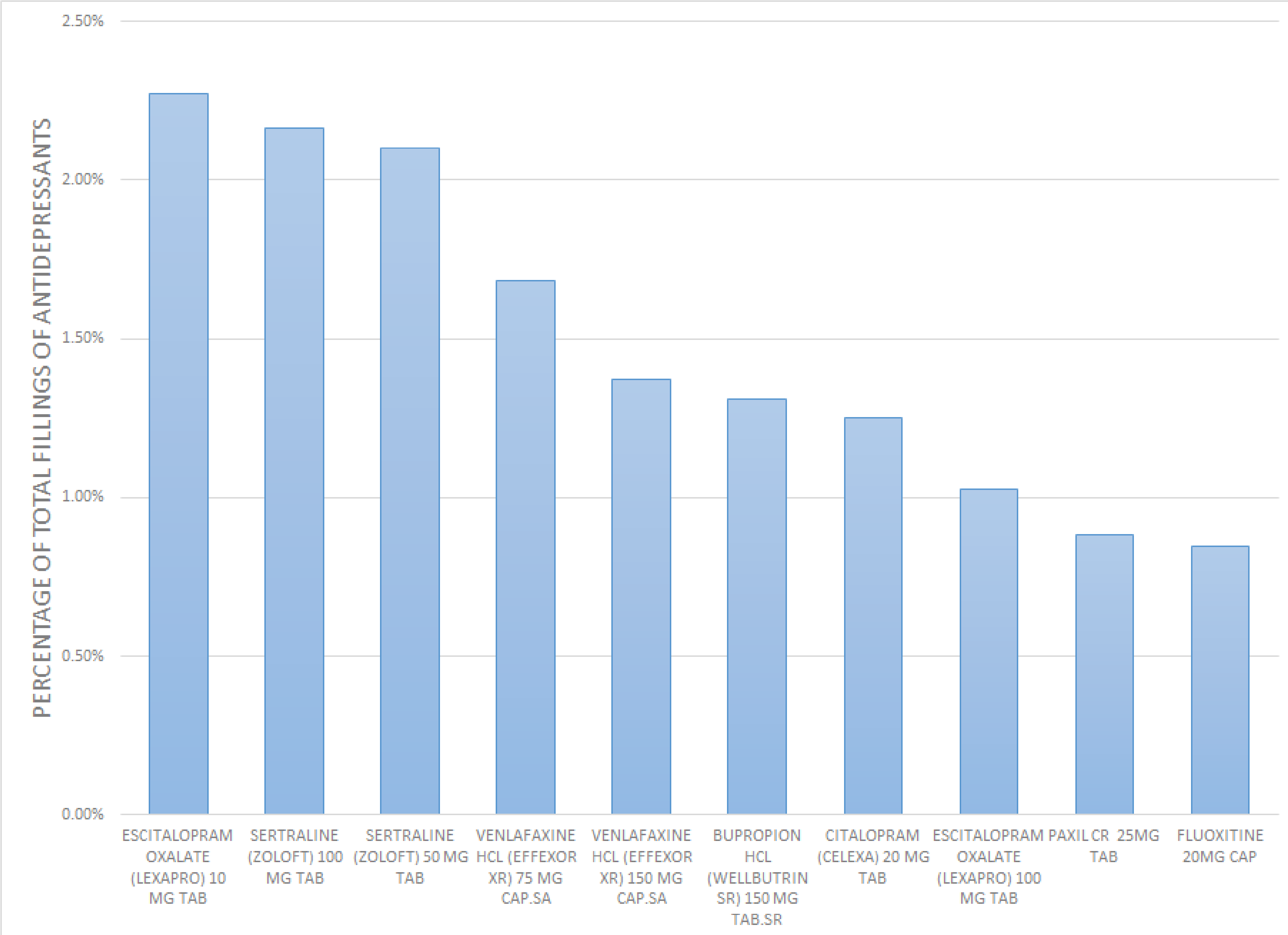


(a) Stations in the Contiguous United States

(b) Stations in Northeast Region Counties (detail, partial)

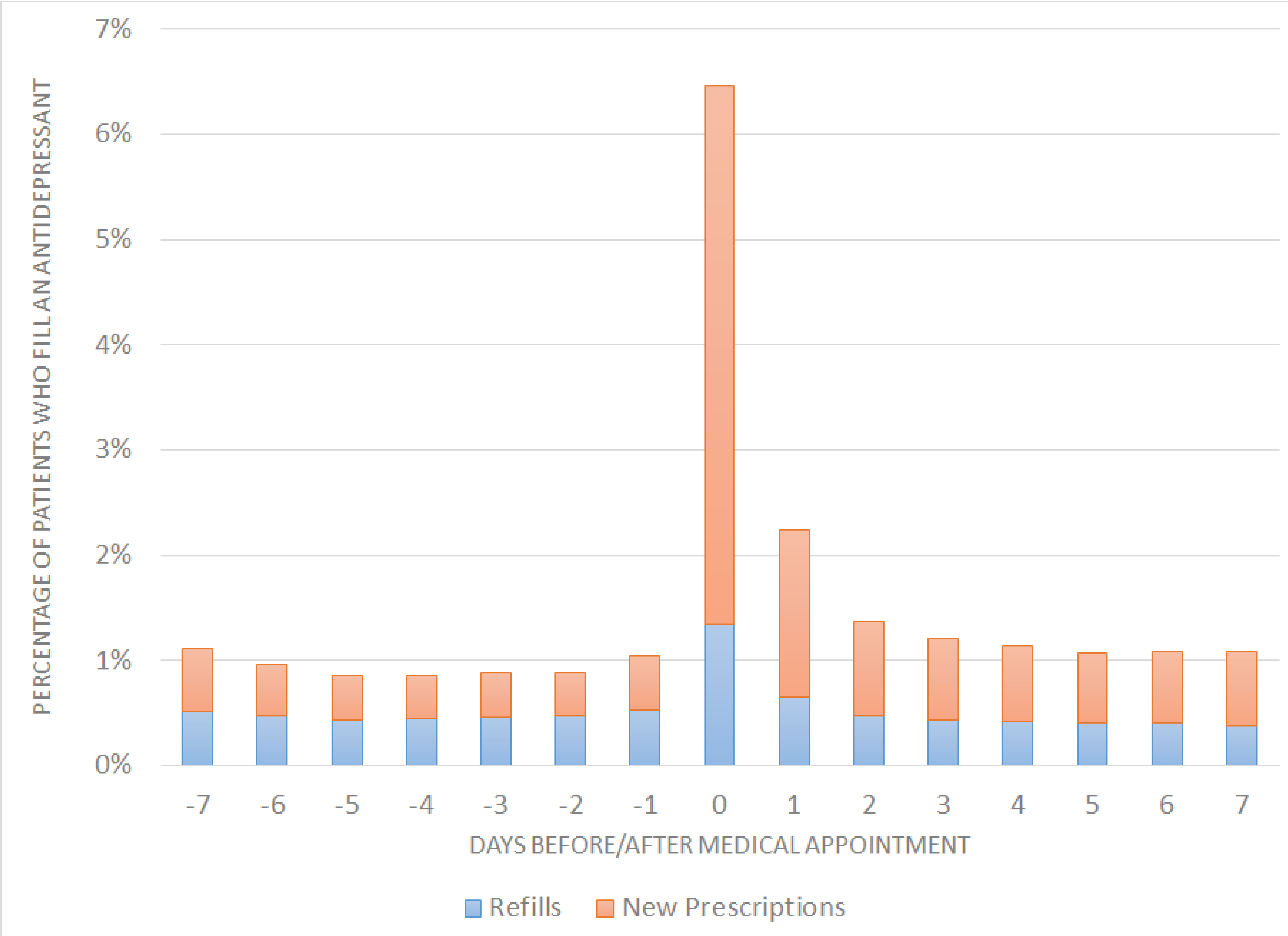
Notes: The figures depicts the location of a subset of the meterological stations available at the National Climatic Data Center (NCDC). Excludes stations with missing latitude, longitude, or elevation data. Excludes stations that started operating on or after 01/01/2002 or finished operating on or before 01/01/2005. Excludes stations with an altitude exceeding that of the lowest laying station in the county in more than 500 meters. Excludes stations located in a body of water.

Figure 2: Antidepressants Most Commonly Filled



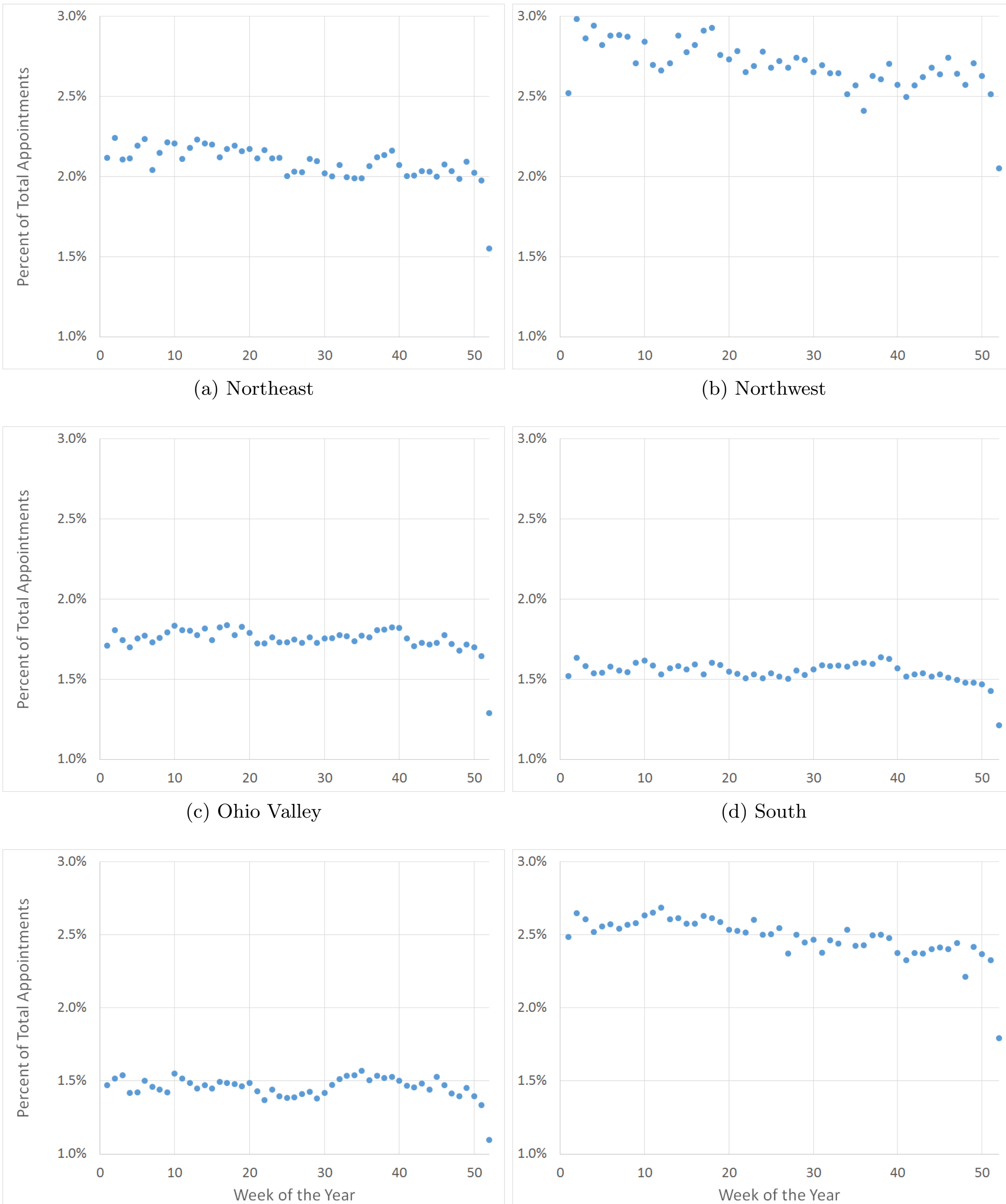
Notes: The figure depicts the ten most frequently filled antidepressants in the data, as a percentage of total antidepressants filled. Each drug is uniquely identified by its National Drug Code (NDC), which assigns a different code for each drug product of a specific dosing produced by a specific manunfacturer. The period is 01/01/2003-12/31/2004.

Figure 3: Antidepressant Fillings Around Appointment Day



Notes: The figure depicts the percentage of patients who fill an antidepressant prescription during a fifteen-day window period around appointment day. Only includes outpatient appointments with a medical professional who is able to prescribe drugs. Only includes appointments in which the major diagnosis is that of a mental disease or disorder. Outpatient prescription drug data from the MarketScan Commercial Claims & Encounters Research Databases. The period is 01/01/2003-12/31/2004.

Figure 4: Appointments with a Mental Disease or Disorder Diagnosis, by Week of the Year



(a) Northeast

(b) Northwest

(c) Ohio Valley

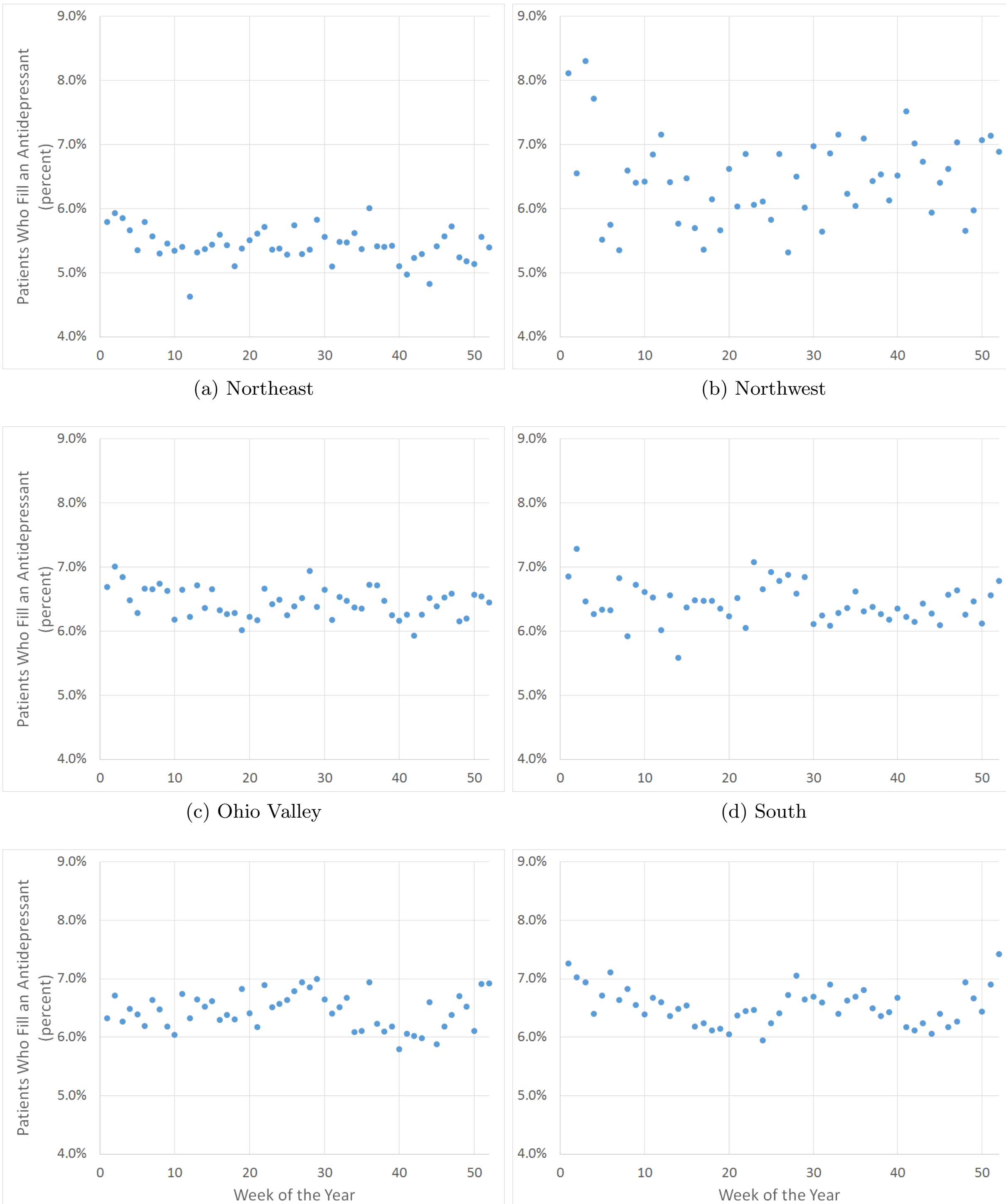
(d) South

(e) Southeast

(f) Upper Midwest

Notes: The figure depicts the percentage of total appointments in which the major diagnosis is a mental disease or disorder. Only includes outpatient appointments with a medical professional who is able to prescribe drugs. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984). The period is 01/01/2003-12/31/2004.

Figure 5: Enrollees Filling of Antidepressants on Appointment Day, by Week of the Year



(a) Northeast (b) Northwest

(c) Ohio Valley (d) South

(e) Southeast (f) Upper Midwest

Notes: The figure depicts the percentage of patients who fill an antidepressant prescription on appointment day. Only includes outpatient appointments with a medical professional who is able to prescribe drugs. Only includes appointments in which the major diagnosis is that of a mental disease or disorder. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984). The period is 01/01/2003-12/31/2004.

Table 1: Descriptive Statistics

A - Daily County-Level Weather Data

	Mean	*SD*
Temperature (Fahrenheit)	54.19	19.24
Cloud Coverage (oktas)	3.40	2.73
Dew Point (Fahrenheit)	43.15	19.42
Visibility (miles)	8.92	2.70
Wind Speed (knots)	6.55	3.25
Rain Indicator	0.29	
Snow Indicator	0.08	
Fog Indicator	0.21	

B - Patient Demographics

At least one psych. appointment	*Mean*	*SD*	*% of total*
Age	35.70	17.31	
Female Indicator	0.57		
Relation to Employer:			
Employee			46.09
Spouse			24.39
Child/Other			29.51
Climatic Regions			
Northeast (NE)			19.60
Northwest (NW)			4.98
Ohio Valley (OV)			19.98
South (S)			18.34
Southeast (SE)			15.34
Upper Midwest (UM)			19.30
Others			2.46
Type of Health Plan			
Comprehensive			19.22
Health Maintenance Organization			13.44
Point of Service Plan			19.17
Preferred Provider Organization			44.30
Others			3.86

C - Totals

	Total	*% of total*
Meterological Stations	2,523	
Counties	972	
Enrollees	12,094,219	
at least one antidepressant filled	1,645,183	13.60
at least one psych. appointment	950,048	7.86
Psych. appointments	4,839,861	
antidepressant filled same day	312,802	6.46
antidepressant filled in one day	420,927	8.69
antidepressant filled in seven days	757,941	15.66

Notes: The period is 01/01/2003-12/31/2004. Psych. appointment here refers to an outpatient appointment with any medical professional able to prescribe drugs in which the major diagnosis is a mental disease or disorder. Weather data from the National Climatic Data Center (NCDC); cloud coverage from the Integrated Surface Data (ISD) dataset, all other variables from the Global Summary of the Day (GSOD) dataset. Outpatient services and prescription drug data from the MarketScan Commercial Claims & Encounters Research Databases.

Table 2: Effect of Weather on Mental Disease and Disorder (MDD) Diagnosis

Percentage of Appointments with MDD Diagnosis	(1)	(2)	(3)	(4)
Temperature (Fahrenheit)	3.12e-05	2.90e-05	9.63e-06	1.19e-05
	(2.37e-05)	(2.35e-05)	(2.81e-05)	(3.22e-05)
Cloud Coverage (oktas)	6.49e-05**	6.91e-05**	4.79e-05	6.55e-05
	(2.80e-05)	(2.87e-05)	(3.51e-05)	(3.69e-05)
Rain Indicator	4.78e-05	-3.04e-05	-4.81e-05	-5.26e-05
	(0.000234)	(0.000260)	(0.000276)	(0.000315)
Snow Indicator	-0.00103**	-0.00102**	-0.00105***	-0.00134***
	(0.000361)	(0.000369)	(0.000273)	(0.000296)
Fog Indicator	4.26e-05	9.94e-06	-2.85e-05	-3.97e-05
	(0.000197)	(0.000186)	(0.000191)	(0.000196)
Dew Point (Fahrenheit)	-2.37e-05	-2.22e-05	1.23e-06	-1.63e-06
	(2.32e-05)	(2.37e-05)	(2.58e-05)	(2.87e-05)
Visibility (miles)	-2.55e-05	-1.80e-05	3.29e-06	9.40e-06
	(6.21e-05)	(6.58e-05)	(6.70e-05)	(7.31e-05)
Wind Speed (knots)	5.70e-05	5.57e-05	4.63e-05	4.56e-05
	(4.09e-05)	(3.81e-05)	(4.28e-05)	(4.49e-05)
County FE X Year FE	X	X	X	X
Day of the Week FE		X	X	X
Week of the Year FE			X	X
X Region FE				X
Mean dependent variable	0.019	0.019	0.019	0.019
Observations	489,511	489,511	489,511	489,511
R-squared	0.000	0.002	0.002	0.003
Number of County-Years	1,661	1,661	1,661	1,661

Notes: Each observation is measured at the county-day level. The period is 01/01/2003-12/31/2004. The dependent variable is the percentage of appointments with a mental disease or disorder diagnosis. Only includes outpatient appointments with a medical professional who is able to prescribe drugs. Standard errors clustered at the climatic region level. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6.

Table 3: Effect of Weather on Antidepressant Fillings

Log of Total Antidepressants Filled	All Prescriptions (1)	(2)	(3)	(4)	Refills (5)	New Presc. (6)
Temperature (Fahrenheit)	0.000261	-0.000270	0.000201	0.000426*	0.000138	0.000408
	(0.000450)	(0.000212)	(0.000135)	(0.000194)	(0.000272)	(0.000228)
Cloud Coverage (oktas)	0.00156	0.00124	0.000800	0.000709	0.00118*	0.000182
	(0.000860)	(0.000713)	(0.000695)	(0.000737)	(0.000600)	(0.000348)
Rain Indicator	-0.000926	-0.00609**	-0.00543*	-0.00563*	-0.00763***	-0.00242
	(0.00405)	(0.00258)	(0.00268)	(0.00248)	(0.00154)	(0.00392)
Snow Indicator	-0.00915	-0.0109***	-0.00564**	-0.0108***	-0.0101***	-0.0102***
	(0.00520)	(0.00216)	(0.00194)	(0.00279)	(0.00271)	(0.00201)
Fog Indicator	-0.00164	-0.00264	-0.00371	-0.00338	-0.000525	-0.00640***
	(0.00364)	(0.00244)	(0.00262)	(0.00292)	(0.00337)	(0.00120)
Dew Point (Fahrenheit)	-0.000742	-0.000256	-0.000195	-0.000201	-8.57e-05	-0.000173
	(0.000447)	(0.000242)	(0.000209)	(0.000224)	(0.000265)	(0.000257)
Visibility (miles)	-0.00136	0.000376	0.00108	0.00144	0.00160	0.00255**
	(0.00122)	(0.000923)	(0.000961)	(0.00106)	(0.000923)	(0.00109)
Wind Speed (knots)	-0.00101	-0.00114	-0.00101	-0.00105	-0.000933	-0.000759
	(0.00118)	(0.000983)	(0.000881)	(0.000895)	(0.000740)	(0.000717)
County FE X Year FE	X	X	X	X	X	X
Day of the Week FE		X	X	X	X	X
Week of the Year FE			X	X	X	X
X Region FE				X	X	X
Average Fillings per County-Day	16.317	16.317	16.317	16.317	10.653	8.583
Observations	391,097	391,097	391,097	391,097	356,837	300,577
R-squared	0.000	0.288	0.291	0.292	0.166	0.342
Number of County-Years	1,634	1,634	1,634	1,634	1,625	1,627

Notes: Each observation is measured at the county-day level. The dependent variable is the log of the total number of antidepressants filled. The period is 01/01/2003-12/31/2004. Standard errors clustered at the climatic region level. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6.

Table 4: Antidepressant Filling Following Appointment Day

Fills Antidepressant Indicator	On Appointment Day (1)	(2)	(3)	(4)	Within 1 Day (5)	Within 7 Days (6)
Temperature (Fahrenheit)	-9.69e-06	2.77e-06	-5.52e-06	-4.50e-05	-4.66e-05	2.27e-05
	(6.03e-05)	(5.98e-05)	(6.14e-05)	(6.45e-05)	(8.51e-05)	(0.000124)
Cloud Coverage (oktas)	0.000206*	0.000212**	0.000205*	0.000231***	0.000167*	0.000195
	(9.16e-05)	(8.45e-05)	(8.97e-05)	(3.96e-05)	(8.41e-05)	(0.000140)
Rain Indicator	-8.46e-05	9.41e-05	6.65e-05	8.93e-05	0.000189	0.00109
	(0.000308)	(0.000277)	(0.000288)	(0.000287)	(0.000410)	(0.000914)
Snow Indicator	-0.000195	-0.000586	-0.000685	-0.00136**	-0.00143	-0.00125
	(0.000904)	(0.000782)	(0.000794)	(0.000534)	(0.000937)	(0.00104)
Fog Indicator	0.000545	0.000512	0.000512	0.000206	-0.000160	-0.000629
	(0.000383)	(0.000398)	(0.000407)	(0.000471)	(0.000617)	(0.000581)
Dew Point (Fahrenheit)	-1.82e-05	-2.79e-05	-2.17e-05	-2.30e-05	-1.93e-05	-0.000108
	(4.53e-05)	(4.50e-05)	(4.68e-05)	(5.34e-05)	(8.23e-05)	(0.000111)
Visibility (miles)	9.39e-05	0.000136	0.000132	0.000158	9.07e-05	6.20e-05
	(0.000116)	(0.000115)	(0.000120)	(0.000103)	(0.000127)	(0.000231)
Wind Speed (knots)	-5.60e-05	-5.95e-05	-5.77e-05	1.39e-05	8.13e-05	0.000119
	(7.12e-05)	(7.36e-05)	(7.35e-05)	(6.74e-05)	(5.27e-05)	(6.54e-05)
County FE X Year FE	X	X	X			
Day of the Week FE	X	X	X	X	X	X
Week of the Year FE	X	X	X	X	X	X
X Region FE		X	X	X	X	X
Patient Characteristics			X			
Patient FE				X	X	X
Mean Dependent Variable	0.0607	0.0607	0.0607	0.0607	0.0869	0.155
Observations	2,500,891	2,500,891	2,500,891	2,500,891	2,500,891	2,500,891
R-squared	0.001	0.001	0.006	0.001	0.001	0.001
Number of County-Years	1,595	1,595	1,595	1,595	1,595	1,595
Number of Patients	483,333	483,333	483,333	483,333	483,333	483,333

Notes: Medical data at the patient-day level. Weather data at the county-day level. Period is 01/01/2003-12/31/2004. The dependent variable is an indicator for filling an antidepressant prescription following an appointment. Only includes outpatient appointments with a medical professional who is able to prescribe drugs. Only includes appointments in which the major diagnosis is that of a mental disease or disorder. Enrollee characteristics include age, gender, employee classification, employment status, and relation to the employee. Standard errors clustered at the climatic region level. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6.

Table 5: Antidepressant Filling on Appointment Day, by Type of Prescription

	Refills		New Prescription	
Fills Antidepressant Indicator	(1)	(2)	(3)	(4)
Temperature (Fahrenheit)	-2.16e-05	-3.42e-05**	2.62e-05	-1.20e-05
	(1.21e-05)	(1.04e-05)	(4.46e-05)	(6.12e-05)
Cloud Coverage (oktas)	5.49e-05	3.33e-05	0.000169*	0.000214***
	(2.98e-05)	(3.83e-05)	(8.80e-05)	(5.86e-05)
Rain Indicator	-0.000144	-0.000246	0.000384	0.000491***
	(0.000141)	(0.000187)	(0.000216)	(0.000124)
Snow Indicator	-8.30e-05	-0.000264	-0.000952	-0.00137**
	(0.000191)	(0.000270)	(0.000624)	(0.000435)
Fog Indicator	0.000440**	0.000251	-0.000284	-0.000332
	(0.000165)	(0.000261)	(0.000397)	(0.000567)
Dew Point (Fahrenheit)	8.07e-06	2.24e-05	-3.03e-05	-3.88e-05
	(1.30e-05)	(1.45e-05)	(3.95e-05)	(4.84e-05)
Visibility (miles)	9.82e-05**	0.000131**	7.65e-05	5.79e-05
	(3.70e-05)	(5.00e-05)	(0.000119)	(0.000133)
Wind Speed (knots)	-4.69e-06	2.28e-05**	-5.69e-07	4.41e-05
	(1.21e-05)	(9.00e-06)	(5.79e-05)	(5.25e-05)
County FE X Year FE	X		X	
Day of the Week FE	X	X	X	X
Week of the Year FE X Region FE	X	X	X	X
Patient Characteristics	X		X	
Patient FE		X		X
Mean dependent variable	0.006	0.006	0.050	0.050
Observations	2,500,891	2,500,891	2,500,891	2,500,891
R-squared	0.002	0.000	0.005	0.001
Number of County-Years	1,595	1,595	1,595	1,595
Number of Patients	483,333	483,333	483,333	483,333

Notes: Medical data at the patient-day level. Weather data at the county-day level. Period is 01/01/2003-12/31/2004. The dependent variable is an indicator for filling antidepressant prescription on the day of the appointment. Only includes outpatient appointments with a medical professional who is able to prescribe drugs. Only includes appointments in which the major diagnosis is that of a mental disease or disorder. Enrollee characteristics include age, gender, employee classification, employment status, and relation to the employee. Standard errors clustered at the climatic region level. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6.

Table 6: Antidepressant Filling on Appointment Day, by Fulfillment Method

Fills Antidepressant Indicator	In Pharmacy (1)	In Pharmacy (2)	By Mail (3)	By Mail (4)
Temperature (Fahrenheit)	-5.18e-06	-4.92e-05	-7.83e-06	-2.38e-06
	(5.84e-05)	(6.46e-05)	(8.04e-06)	(9.82e-06)
Cloud Coverage (oktas)	0.000201**	0.000191***	-8.75e-07	1.67e-05
	(7.84e-05)	(3.82e-05)	(1.65e-05)	(1.70e-05)
Rain Indicator	-2.27e-05	5.37e-05	6.63e-05*	6.24e-05
	(0.000294)	(0.000305)	(2.92e-05)	(3.41e-05)
Snow Indicator	-0.000601	-0.00131*	-6.99e-05	-0.000191
	(0.000844)	(0.000665)	(0.000113)	(0.000165)
Fog Indicator	0.000393	0.000191	3.83e-05	7.80e-05
	(0.000355)	(0.000387)	(6.56e-05)	(0.000119)
Dew Point (Fahrenheit)	-1.02e-05	-9.81e-06	-3.67e-06	-7.72e-06
	(4.55e-05)	(5.26e-05)	(9.89e-06)	(8.77e-06)
Visibility (miles)	0.000148	0.000108	-3.78e-06	2.25e-05
	(9.86e-05)	(9.28e-05)	(3.75e-05)	(3.08e-05)
Wind Speed (knots)	-5.92e-05	2.58e-05	5.75e-06	-9.08e-06
	(6.82e-05)	(7.47e-05)	(1.00e-05)	(1.45e-05)
County FE X Year FE	X		X	
Day of the Week FE	X	X	X	X
Week of the Year FE X Region FE	X	X	X	X
Patient Characteristics	X		X	
Patient FE		X		X
Mean dependent variable	0.0554	0.0554	0.0022	0.0022
Observations	2,500,891	2,500,891	2,500,891	2,500,891
R-squared	0.005	0.001	0.001	0.000
Number of County-Years	1,595	1,595	1,595	1,595
Number of Patients	483,333	483,333	483,333	483,333

Notes: Medical data at the patient-day level. Weather data at the county-day level. Period is 01/01/2003-12/31/2004. The dependent variable is an indicator for filling antidepressant prescription on the day of the appointment. Only includes outpatient appointments with a medical professional who is able to prescribe drugs. Only includes appointments in which the major diagnosis is that of a mental disease or disorder. Enrollee characteristics include age, gender, employee classification, employment status, and relation to the employee. Standard errors clustered at the climatic region level. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6.

Table 7: Antidepressant Filling on Appointment Day, by Climatic Region

	NE	NW	OV	S	SE	UM
Fills Antidepressant Indicator	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Fahrenheit)	0.000126	-0.000106	-0.000326**	-6.58e-05	-0.000215	7.68e-05
	(9.33e-05)	(0.000142)	(0.000102)	(4.19e-05)	(0.000236)	(3.56e-05)
Cloud Coverage (oktas)	0.000242*	0.000373	0.000219	0.000358	-0.000137	0.000234**
	(0.000123)	(0.000318)	(0.000372)	(0.000251)	(0.000472)	(4.39e-05)
Rain Indicator	0.000209	0.000726	-0.00103	-2.18e-05	-3.64e-05	0.000781**
	(0.000595)	(0.00113)	(0.00105)	(0.000158)	(0.000769)	(0.000192)
Snow Indicator	-0.00260	0.00632**	-0.000403	0.00228	0.00437	-0.00110
	(0.00180)	(0.000802)	(0.00267)	(0.00160)	(0.00775)	(0.000535)
Fog Indicator	-8.11e-05	0.00177	-1.76e-05	0.00186	-0.00277**	0.000834***
	(0.000533)	(0.00190)	(0.000541)	(0.00208)	(0.000794)	(0.000110)
Dew Point (Fahrenheit)	-9.78e-05	-8.17e-06	0.000207	-2.14e-05	0.000218	-0.000175***
	(6.54e-05)	(0.000114)	(0.000113)	(5.32e-05)	(0.000196)	(2.56e-05)
Visibility (miles)	-1.21e-05	0.000443	0.000258	0.000780*	-0.000387	0.000218
	(0.000221)	(0.000194)	(0.000373)	(0.000310)	(0.000435)	(9.77e-05)
Wind Speed (knots)	0.000127*	-0.000157	-6.58e-05	0.000141	0.000217	-0.000150**
	(6.58e-05)	(0.000371)	(0.000142)	(0.000163)	(0.000200)	(2.92e-05)
County FE X Year FE	X	X	X	X	X	X
Day of the Week FE	X	X	X	X	X	X
Week of the Year FE X Region FE	X	X	X	X	X	X
Patient FE	X	X	X	X	X	X
Observations	534,496	111,113	482,128	400,117	311,261	615,351
R-squared	0.001	0.001	0.001	0.001	0.001	0.001
Number of Patients	94,745	24,064	96,576	88,639	74,153	93,292

Notes: Medical data at the patient-day level. Weather data at the county-day level. Period is 01/01/2003-12/31/2004. The dependent variable is an indicator for filling antidepressant prescription on the day of the appointment. Only includes outpatient appointments with a medical professional who is able to prescribe drugs. Only includes appointments in which the major diagnosis is that of a mental disease or disorder. Enrollee characteristics include age, gender, employee classification, employment status, and relation to the employee. Standard errors clustered at the climatic region level. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6.

Table 8: Antidepressant Filling on Appointment Day, by Season

	Spring	Summer	Fall	Winter
Fills Antidepressant Indicator	(1)	(2)	(3)	(4)
Temperature (Fahrenheit)	-0.000178	-0.000161	-0.000187*	3.21e-05
	(0.000118)	(0.000166)	(8.66e-05)	(7.57e-05)
Cloud Coverage (oktas)	3.60e-06	0.000141	-0.000128	0.000838***
	(0.000243)	(0.000210)	(0.000117)	(0.000145)
Rain Indicator	0.000475	-0.000861	0.000332	0.00163
	(0.000992)	(0.00138)	(0.000837)	(0.00173)
Snow Indicator	-0.00352*	-0.00188	0.000551	-0.00197
	(0.00162)	(0.0145)	(0.00204)	(0.00162)
Fog Indicator	0.00260**	0.00110	-0.00217	7.05e-05
	(0.00111)	(0.00114)	(0.00119)	(0.00190)
Dew Point (Fahrenheit)	4.40e-06	9.64e-05	0.000177	-0.000177**
	(0.000108)	(0.000123)	(9.94e-05)	(7.14e-05)
Visibility (miles)	0.000133	3.48e-05	0.000262	0.000421
	(8.51e-05)	(0.000345)	(0.000226)	(0.000236)
Wind Speed (knots)	5.98e-05	8.69e-05	0.000170	-8.84e-05
	(9.28e-05)	(0.000291)	(0.000123)	(0.000152)
County FE X Year FE	X	X	X	X
Day of the Week FE	X	X	X	X
Week of the Year FE X Region FE	X	X	X	X
Patient FE	X	X	X	X
Observations	654,376	617,866	627,874	600,775
R-squared	0.001	0.001	0.001	0.001
Number of Patients	222,688	220,106	224,394	231,712

Notes: Medical data at the patient-day level. Weather data at the county-day level. Period is 01/01/2003-12/31/2004. The dependent variable is an indicator for filling antidepressant prescription on the day of the appointment. Only includes outpatient appointments with a medical professional who is able to prescribe drugs. Only includes appointments in which the major diagnosis is that of a mental disease or disorder. Enrollee characteristics include age, gender, employee classification, employment status, and relation to the employee. Standard errors clustered at the climatic region level. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6.

Table 9: Antidepressant Filling on Appointment Day, by Dosing

	Minimum Dose		Intermediate		Maximum Dose	
Fills Antidepressant Indicator	(1)	(2)	(3)	(4)	(5)	(6)
Temperature (Fahrenheit)	-2.33e-05	-3.85e-05	-1.09e-05	-4.71e-05	5.19e-06	9.56e-06
	(3.18e-05)	(4.41e-05)	(4.86e-05)	(3.39e-05)	(1.41e-05)	(1.46e-05)
Cloud Coverage (oktas)	-1.04e-05	-4.75e-06	0.000130**	0.000124*	6.21e-05	5.64e-05*
	(6.24e-05)	(5.30e-05)	(5.23e-05)	(6.20e-05)	(3.53e-05)	(2.95e-05)
Rain Indicator	2.46e-05	-6.30e-05	-3.77e-05	0.000193	2.78e-05	6.04e-05
	(0.000294)	(0.000317)	(0.000115)	(0.000346)	(0.000154)	(0.000207)
Snow Indicator	0.000129	-2.14e-05	-0.000399	-0.000941***	-0.000347	-0.000448
	(0.000220)	(0.000296)	(0.000520)	(0.000233)	(0.000347)	(0.000423)
Fog Indicator	0.000157	-0.000179	0.000210	-2.18e-05	0.000183	0.000434**
	(0.000364)	(0.000293)	(0.000131)	(0.000274)	(0.000127)	(0.000157)
Dew Point (Fahrenheit)	4.15e-05*	2.74e-05	-3.50e-05	-1.38e-05	-1.35e-05	-1.99e-05
	(2.16e-05)	(4.03e-05)	(3.53e-05)	(2.16e-05)	(1.66e-05)	(1.90e-05)
Visibility (miles)	1.96e-05	9.10e-06	3.02e-05	5.27e-05	4.77e-05	5.50e-05
	(8.02e-05)	(5.69e-05)	(8.00e-05)	(0.000105)	(5.52e-05)	(7.59e-05)
Wind Speed (knots)	1.16e-05	2.48e-05	-5.77e-05	-3.62e-06	2.59e-06	2.04e-05
	(1.61e-05)	(3.51e-05)	(7.86e-05)	(6.62e-05)	(1.80e-05)	(1.80e-05)
County FE X Year FE	X	X	X	X	X	X
Day of the Week FE	X	X	X	X	X	X
Week of the Year FE X Region FE	X	X	X	X	X	X
Patient Characteristics	X		X		X	
Patient FE		X		X		X
Mean of dependent variable	0.0189	0.0189	0.0342	0.0342	0.0130	0.0130
Observations	2,500,891	2,500,891	2,500,891	2,500,891	2,500,891	2,500,891
R-squared	0.002	0.000	0.001	0.004	0.000	0.002
Number of Patients	483,333	483,333	483,333	483,333	483,333	483,333

Notes: Medical data at the patient-day level. Weather data at the county-day level. Period is 01/01/2003-12/31/2004. Minimum/Maximum Dose only includes drugs with the minimum/maximum dosing within a drug product. The dependent variable is an indicator for filling antidepressant prescription on the day of the appointment. Only includes outpatient appointments with a medical professional who is able to prescribe drugs. Only includes appointments in which the major diagnosis is that of a mental disease or disorder. Enrollee characteristics include age, gender, employee classification, employment status, and relation to the employee. Standard errors clustered at the climatic region level. Climatic regions follow the classification of the National Centers for Environmental Information (Karl and Koss, 1984) as per Figure 6.

Figure 6: Climatic Regions of the Contiguous United States

Source: National Centers for Environmental Information (Karl and Koss, 1984)