Just What the Nurse Practitioner Ordered: Independent Prescriptive Authority and Population Mental Health *

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Abstract

While the costs of untreated mental illness are widely recognized, access to treatment is often limited. In this paper, we examine whether allowing nurse practitioners (NPs)—a class of registered nurses with advanced degrees—to prescribe medication without physician supervision or collaboration is associated with improved mental health outcomes. Exploiting time-series variation in independent prescriptive authority for NPs, we find that broadening prescriptive authority is associated both with improvements in self-reported mental health and decreases in mental-health-related mortality, including suicides. These improvements are strongest in areas that are underserved by psychiatrists, and among populations that are traditionally underserved by mental health providers. Furthermore, we find no evidence of crowd out; the number of prescriptions written by physicians is unchanged when NPs can independently prescribe. Together, our results provide strong evidence that extending prescriptive authority to NPs can both help mitigate the negative consequences of physician shortages and extend care to disadvantaged populations.

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1 Introduction

Limited access to mental health care services in the United States is a major public health concern. While one in five Americans suffers from a mental illness, nearly one third of the US currently lives in areas that are underserved by mental health care providers (Bureau of Health Workforce, 2016). As mental health problems tend to develop early in life and persist over the lifecycle, the costs of not receiving treatment can be devastating. In addition to direct medical costs, untreated mental illnesses are associated with lower human capital accumulation, worse labor market participation and performance, and greater criminal activity (Currie and Stabile, 2006; Ettner et al., 1997; Greenberg and Rosenheck, 2008). Recent evidence demonstrates that even increases in all-cause mortality for some groups are being driven by mental-health-related deaths, turning the policy focus to the challenging question of what can be done to improve population mental health (Case and Deaton, 2015).

In this paper, we examine whether allowing nurse practitioners (NPs)—registered nurses with an advanced degree in nursing—to prescribe medication without physician supervision or collaboration is associated with improved mental health outcomes. In doing so, we make two key contributions. First, we show that states that broaden prescriptive authority see both improvements in self-reported mental health and decreases in the number of mental-health-related deaths, including suicides. These benefits are most pronounced in low socioeconomic status populations, and in populations residing in areas with fewer psychiatrists per capita. Second, we show that independent prescriptive authority for NPs is not associated with a crowding out of the services provided by physicians. Together, our results suggest that granting independent prescriptive authority to NPs is an important policy tool which may be used to improve health outcomes for populations with limited access to care.

Broadly speaking, there are two types of treatment for mental illness: psychotherapy and psychotropic medication. A complementarity between the two has been well documented, and in most cases it is recommended that a patient receive a combination of both treatments (SAMHSA, 2015). Despite this ideal of psychotherapy in conjunction with psychotropic medication, it is often much easier to find consistent access to therapy than to medication. While all mental health professionals can offer some degree of counseling services, traditionally only psychiatrists and other medical doctors have the legislative authority to prescribe medications.

The observed imbalance between access to psychotherapy and access to psychotropic medications is greatest among already disadvantaged populations. Psychiatrists are more likely to locate in urban and suburban areas, leaving populations in rural areas with the most limited access to psychotropic treatment (Hartley et al., 2004). Even in areas where there are a sufficient

number of psychiatrists, access to psychotropic medications may still be limited for certain populations. Psychiatrists are less likely than all other physician specialties to accept insurance, with differences in acceptance rates being greatest among forms of public insurance (Bishop et al., 2014). Conversely, NPs are more likely than physicians to locate in rural and inner-city locations and to accept public insurance (Buerhaus et al., 2015). Granting independent prescriptive authority to NPs thus has the potential both to address physician shortages and to extend care to disadvantaged populations.

We find that extending prescriptive authority to NPs is associated with improvements in both self-reported mental health and mental-health-related mortality. Our identification strategy exploits state-level law changes that dictate the level of independence that NPs and other Advanced Practice Registered Nurses (APRNs) have to diagnose, treat, and prescribe medications from 1990 to 2014. We use within-state variation in this scope of practice legislation to examine how both population mental health and prescribing behaviors of physicians change when NPs are granted independent prescriptive authority. On average, granting NPs independent prescriptive authority is associated with a significant reduction in the number of days spent in poor mental health (0.14 days, or 4% of the mean).

Improvements in mental health outcomes are more pronounced and more precisely estimated both in areas that are underserved by psychiatrists and among already disadvantaged populations. In particular, areas that are underserved by psychiatrists see improvements in self-reported mental health that are at least twice as large as that of an average respondant, as well as significant reductions in mental-health-related mortality. For days in poor mental health, populations with low levels of education see improvements that are even greater: the average low-education resident in a state with fewer psychiatrists per capita sees improvements that are 135% greater than the average resident in the full sample.

Despite a burgeoning literature demonstrating that NPs can safely and efficiently provide a variety of services, including an endorsement of the skills of NPs by the Institute of Medicine, efforts to extend prescriptive authority beyond physicians are controversial. Opponents worry that allowing NPs to prescribe medication would put patients in danger since NPs receive fewer years of training, are held to different legal standards, and go through a different process of licensing than medical doctors. Critics further note that extending prescriptive authority beyond physicians need not expand overall use of pharmacological treatment, as the prescriptions written by non-physician providers may simply crowd out the prescriptions previously written by physicians. The American Medical Association (AMA), a national professional organization representing physicians and medical students in the US, has been particularly vocal in opposing

the expansion of state-level scope of practice legislation.

Using detailed prescription data on the number of prescriptions written by physicians for both antipsychotics and antidepressants, we examine whether extending prescriptive authority to NPs crowds out the services provided by physicians. Again exploiting time-series variation in scope of practice legislation, we find no evidence of crowd out. In fact, in all 18 states that granted NPs independent prescriptive authority between 1990 and 2014, there is no statistically significant difference between the number of prescriptions written by physicians before and after the change in legislation.

Our results indicate that liberalizing scope of practice legislation for non-physician providers can help mitigate the impacts of limited access to physician-provided health care. In particular, states which are underserved by psychiatrists can grant independent prescriptive authority to NPs to decrease the prevalence of negative mental health outcomes. The potential for such legislative action remains large: as of January, 2015, only 24 states and the District of Columbia had granted independent prescriptive authority to NPs. Noticeably, no state in the south has yet to allow NPs to independently prescribe. Given the limited access to psychiatrists in these states, as well as their record of poor mental health outcomes, our findings are of particular importance for the provision of mental health care services in the southern US.

This paper proceeds as follows. In Section 2, we introduce the data. In Section 3, we examine how self-reported mental health and mental-health-related mortality change when independent prescriptive authority is extended to NPs. Using detailed prescription data, in Section 4 we examine how the number of prescriptions for antidepressants and antipsychotics written by physicians change when NPs are granted independent prescriptive authority. Section 5 concludes.

2 Data

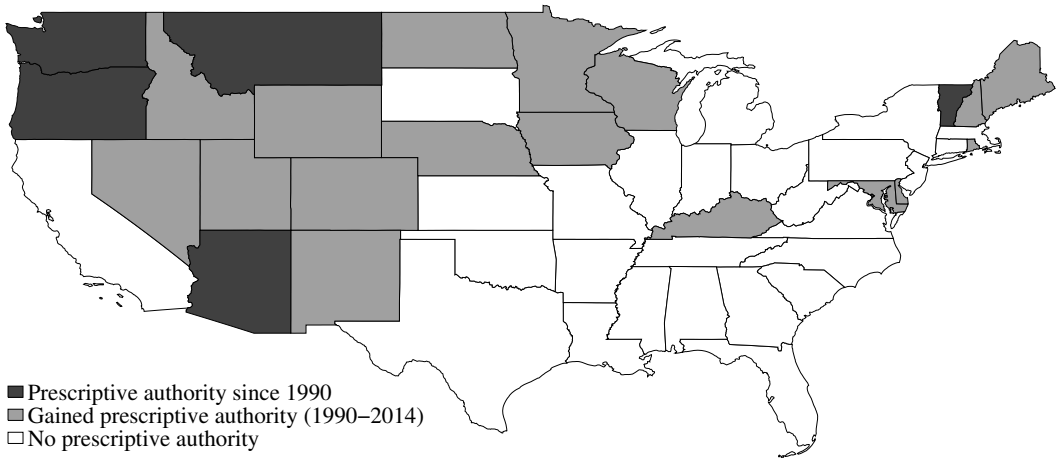
We use information from seven sources to document how extending prescriptive authority to NPs affects population mental health. In particular, we combine a new dataset detailing the prescriptive authority for NPs from 1990 to 2014 with both mental health outcomes from the US mortality files and the Behavioral Risk Factor Surveillance System survey and prescription data from IMS Health's Xponent database. These data are supplemented with information on the provision of local medical resources from the Area Resource Files, the American Community Survey, and the US Census. Each dataset is described in detail below.

2.1 Independent Prescriptive Authority

Our first dataset documents whether NPs had the legislative authority to independently prescribe medication in each month from 1990 to 2014 in each state and the District of Columbia. This dataset was constructed by the authors and combines information from the *The Nurse Practitioner's* yearly "Annual Legislative Update," correspondences with state nursing boards, and readings of primary source legislation. While the language of scope of practice legislation is particular to each state, we define independent prescriptive authority as the ability to prescribe medication without physician collaboration or supervision. More information on the construction of this dataset can be found in the Data Appendix.

As of the start of our dataset on January 1st, 1990, six states and the District of Columbia had already granted NPs statutory authority to independently prescribe medication. Between 1990 and 2014, 18 states changed their scope of practice legislation to allow NPs to prescribe without physician involvement. The geographic and temporal variation in scope of practice legislation is displayed in Figure 1.

Figure 1: Changes in Independent Prescriptive Authority for NPs: $1990 - 2014$



Notes: NPs in Alaska had independent prescriptive authority before 1990, while NPs in Hawaii gained prescriptive authority in 2010. We define a state as having independent prescriptive authority if NPs registered in the state have the statutory authority to prescribe medications without physician collaboration or supervision.

While it is difficult to say why states decide to grant NPs independent prescriptive authority, we believe that the timing of state-level changes in scope of practice legislation are exogenous to population mental health. Anecdotal evidence suggests that changes in scope of practice legislation are driven by idiosyncrasies of local politics. We find no evidence that the law changes are driven by measures of local economic conditions or the availability of mental health care (see Table A.17). Therefore, we believe that these law changes are exogenous to baseline

levels and trends of mental health.

2.2 Mental Health Outcomes

We identify the impact of independent prescriptive authority for NPs on population mental health using two complementary outcomes: self-reported days in "poor mental health" and mental-health-related mortality. For each outcome, we consider how extending prescriptive authority to NPs impacts both the local population as a whole and disadvantaged subpopulations. As psychiatrists are unlikely to accept public insurance, populations with low levels of income and education may not be able to make use of psychiatrist-provided care (Bishop et al., 2014). NPs, on the other hand, are more likely than physicians to treat Medicaid recipients and other vulnerable populations, and thus these populations may benefit more than others from changes in scope of practice legislation (Buerhaus et al., 2015). We therefore look separately at low socioeconomic (SES) populations to account for the fact that even when there are sufficient psychiatrists within an area, low SES residents may find it more difficult to access existing care.

2.2.1 Mental-Health-Related Mortality

Our first measure of mental health is mental-health-related mortality at the county level from the US Mortality Files. Here, we consider both suicides and a broader measure of "mental-health-related deaths," which combines suicides, deaths of unknown intent, and accidental death categories that are closely related to mental health: those involving firearms, trains, drownings, and poisonings (Björkenstam et al., 2014; Hilkevitch, 2005; Rockett et al., 2006).

Our preferred outcome is the broad measure of mental-health-related mortality for two reasons. First, geographic variation in reported suicides may reflect both systematic differences in true suicides as well as systematic differences in cause-of-death reporting. When someone dies from an overdose of oxycodone, for example, the local coroner decides whether to label the death as a suicide or as an accidental poisoning. Our broad measure of mental-health-related deaths captures both causes of death, whereas "suicides" only captures the former. Second, drug and alcohol addiction is an increasingly important category of mental health illness, and one which would not be fully captured in suicides (Case and Deaton, 2015). Therefore, we believe that our broad measure of mental-health-related mortality is more indicative of true differences in mortality caused by poor mental health than suicides alone.

The mortality files contain some demographic information for the deceased individual. In particular, the deceased's county of residence, sex, race, age, and level of education are recorded in the files. We use this information to determine both the total number of deaths at the county

level as well as the number of deaths among subpopulations of interest. As the mortality files contain no information on the deceased's income, we use education as a proxy for socioeconomic status.

While the mortality files tell us the number of people who died, they provide us with no information on the size of the population base. When one area reports having more deaths than another, for example, we cannot determine from the mortality files alone whether this is because the population is larger and the death rates are the same, or whether the location experienced a disproportionate number of deaths. To take into account the size of the relevant population, we combine the number of deaths at the county level with linearly interpolated county-month-level population estimates from the 1990, 2000, and 2010 Decennial Censuses.

Table 1: Summary Statistics: County-Level Mortality and Controls, 1990 - 2014

	All	Never Indep. Rx Authority	Ever Indep. Rx Authority
Deaths per 100,000:			
Suicides	0.99	0.93	1.17
All Mental-Health-Related Causes	1.85	1.77	2.11
Independent Prescriptive Authority	0.13	0	0.61
Low Psychiatrist-to-Pop. Ratio	0.21	0.20	0.21
Total Population	1,039,476	1,173,171	550,514
Population Density (Per Sq. Mile)	2,209	2,247	729
Percent Male	0.49	0.49	0.49
Percent White	0.75	0.73	0.81
Percent Black	0.12	0.14	0.06
Percent Hispanic	0.13	0.14	0.10
Percent Unemployed	0.06	0.06	0.06
Percent Poverty	0.25	0.25	0.25
Percent 18 and Under	0.13	0.13	0.12
Percent 65 and Over	0.47	0.48	0.43
Percent HS or Less	0.28	0.29	0.27
Median Income: 1st Quintile	0.05	0.06	0.03
Median Income: 2nd Quintile	0.08	0.08	0.06
Median Income: 3rd Quintile	0.12	0.13	0.11
Median Income: 4th Quintile	0.21	0.21	0.24
Median Income: 5th Quintile	0.54	0.53	0.56
Percent College or More	0.25	0.25	0.26
Median Year Structure Built	1970	1969	1973
Medicaid Eligible per 100,000	18,724	19,347	16,447
Psychiatrists per 100,000	12	12	11
Primary Care MDs per 100,000	77	77	78
Rural County	0.13	0.13	0.15
Observations	925,174	640,882	284,292

Notes: Data is at the county-year level, weighted by population. "Mental-Health-Related Deaths" includes suicide, deaths of unknown intent, and accidental deaths involving firearms, trains, and poisonings. "Ever (Never) Independent Rx Authority" includes respondents living in states which had independent prescriptive authority for NPs at some point (at no point) during our sample. "Independent Prescriptive Authority" and "Low Psychiatrist-to-Pop. Ratio" reflect whether counties allowed NPs independent prescriptive authority or were underserved for mental health services in a given year. Mortality statistics are taken from the US Mortality Files, provider counts from the the HRSA's Area Resource Files, and all other variables from the 1990, 2000, and 2010 decennial censuses and the 5-year pooled (2008-2012) American Community Survey (ACS). Census and ACS variables are linearly interpolated at the county-year level.

In addition to population estimates, we also use county-level demographics from both the census and the American Community Survey (ACS) to control for underlying differences across counties and to identify disadvantaged subpopulations. In particular, we consider compositional differences in gender, race, ethnicity, age, education, income, unemployment, rural/urban designation (we define rural counties as those in which over half the population was designated rural from 1990-2010), and poverty across counties when analyzing county-level mortality. As with

total population, we linearly interpolate these subpopulation estimates at the county-month-level between the 1990 and 2000 censuses, and either the 2010 census or the 5-year pooled estimates from the ACS (2008-2012). As shown in Table 1, counties in states which allow NPs to prescribe independently at some point during the sample period tend to be less densely populated and less racially diverse. However, both the groups of states have nearly identical employment and poverty statistics.

2.2.2 Self-Reported Mental Health

Our second outcome is the number of days in the past month that a person reports being in poor mental health. This measure comes from the Behavioral Risk Factor Surveillance System survey (BRFSS)—a large, annual phone survey that collects information on health-related risk behaviors, chronic health conditions, and use of preventive services in the US. The BRFSS is representative at the state-year level. Starting in 1993 and in most state-years during our sample frame, respondents were asked the following question:

> "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?"

This question is not designed to draw a particular mental health diagnosis, but rather to indicate whether a respondent experiences any symptoms associated with a wide range of mental health conditions. Importantly, responses are elicited from both those with diagnosed and undiagnosed mental illness, as respondents are not asked whether they have ever been diagnosed with a mental illness by a doctor.

We consider as outcome variables both the number of days reported in poor mental health and an indicator for whether the respondent reported having spent at least 21 of the past 30 days in poor mental health. According to the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5), to be diagnosed with a major depressive episode a patient must have either "a depressed mood most of the day, nearly every day" or "a markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day" for two consecutive weeks. In addition to major depressive disorder, the diagnostic criteria for many mental health conditions include a specified timeframe over which symptoms must be experienced in order for the diagnosis to apply. Thus, we believe creating a binary variable focusing on those experiencing prolonged symptoms will help identify people suffering from severe forms of mental illness.

On average, BRFSS respondents report spending 3.33 days in the past month in poor mental health, with 67% of respondents reporting no days in poor mental health and 6% of respondents reporting at least 21 days in poor mental health (see Table 2). Noticeably, respondents in states which ever had independent prescriptive authority during our sample report fewer days in poor mental health. The BRFSS also includes information on each respondent's sex, race, ethnicity, age, education, income, and employment and health insurance status. These variables allow us both to separately consider disadvantaged populations and to control for underlying differences across respondents in our analysis. As shown in Table 2, there are limited differences in the demographics of treatment and control states.

Table 2: Summary Statistics: Self-Reported Mental Health and Controls, 1993 - 2013

	All	Never Indep. Rx Authority	Ever Indep. Rx Authority
Days in Poor Mental Health:			
Average	3.33	3.36	3.16
Percent 0	0.67	0.67	0.66
Percent >= 21	0.06	0.06	0.05
Independent Prescriptive Authority	0.14	0	0.75
Low Psychiatrist-to-Population Ratio	0.37	0.39	0.26
Male	0.48	0.48	0.49
White	0.71	0.70	0.78
Black	0.10	0.11	0.05
Hispanic	0.12	0.13	0.09
Employed	0.52	0.52	0.54
Health Insurance	0.84	0.84	0.86
Age: 18 to 34	0.31	0.31	0.32
Age: 35 to 44	0.20	0.20	0.20
Age: 45 to 54	0.18	0.18	0.18
Age: 55 to 64	0.13	0.13	0.13
Age: 65 and Over	0.17	0.17	0.17
Education: HS or Less	0.43	0.44	0.39
Education: Some College or More	0.57	0.56	0.60
Income: 1st Quintile	0.20	0.20	0.17
Income: 2nd Quintile	0.17	0.17	0.18
Income: 3rd Quintile	0.17	0.17	0.18
Income: 4th Quintile	0.18	0.18	0.19
Income: 5th Quintile	0.14	0.14	0.15
Observations	5,670,468	3,399,048	2,271,420

Notes:Data is at the individual level, weighted using BRFSS sample weights. "Days in Poor Mental Health" was not asked in WY in 1993, RI in 1994, DC in 1995, 29 states in 2002, and HI in 2004. "Ever (Never) Independent Rx Authority" includes respondents living in states which had independent prescriptive authority for NPs at some point (at no point) during our sample. "Independent Prescriptive Authority" and "Low Psychiatrist-to-Pop. Ratio" reflect the fraction of respondents living in a state with independent prescriptive authority or that was underserved for mental health services in the year that he/she responded. Some categorical variables do not sum to one; the difference reflects the percentage of missings.

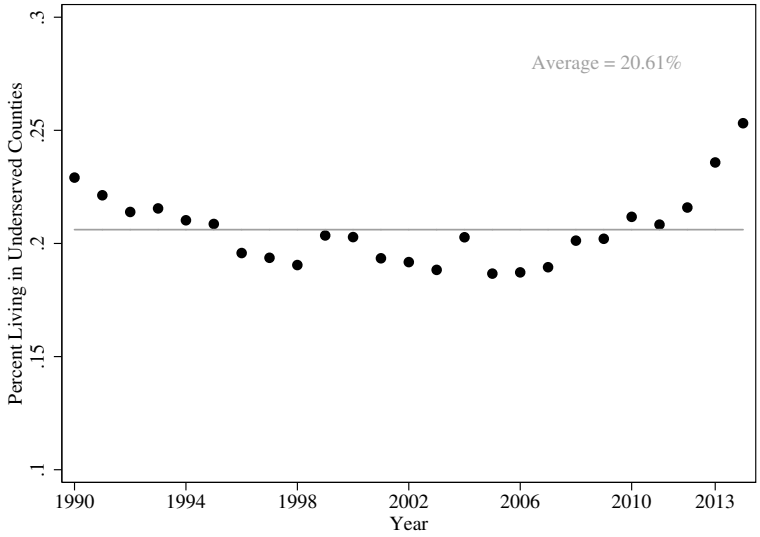
The question on days in poor mental health was not asked in some state-years during our sample frame. These missing state-years correspond to 3.08% of state-year observations and 2.26% of the population. The missing state-years do not correspond with the year before, the year of, or the year after a law change for any state, and thus our identification is not directly affected (see Table A.1 for missing state-years).

2.3 Health Resources

Increasing the supply of providers who can prescribe medication should impact mental health more for populations living in areas with an insufficient supply of such providers. According to the Health Resources and Services Administration (HRSA), an area is underserved for mental health care services if there is fewer than one psychiatrist for every $30,000$ people. Using this definition, we identify underserved counties by combining county-year psychiatrist counts from the HRSA's Area Resource Files with county-year population estimates from the census. As before, we linearly interpolate county-level populations between the 1990, 2000, and 2010 Decennial Censuses.

As the survey data outlined in Section 2.2 is at the state level, we also need a measure of how well-equipped each state is for mental health care services. To take into account the geographic distribution of resources within a state, we define a state as being "underserved" for mental health services in a given year if the population-weighted average of binary, underserved categorizations across all counties in that state is less than the median across all states in that year.

Figure 2: Percent of US Population Living in Underserved Counties: 1990 – 2014



Notes: A county is "underserved" for mental health care services if the county has fewer than one psychiatrist per 30,000 residents. We identify underserved counties by combining county-year information on the number of psychiatrists from the HRSA's Area Resource Files with county-year population estimates linearly interpolated between the 1990, 2000, and 2010 decennial censuses.

As shown in Figure 2, over our sample period, approximately 20% of the US population lived in counties that were underserved for mental health care. Despite yearly fluctuations, this fraction remains fairly stable over our sample period. As shown in Tables A.2 and A.3, underserved counties are on average less densely populated, less educated, and are more white than counties with adequate mental health resources Refer to Figures A.1 and A.2 for maps of underserved counties and states in 2002, respectively.

2.4 Prescription Data

Finally, to examine how prescribing practices of physicians change when NPs gain independent prescriptive authority, we use the Xponent database from IMS Health—a public company specializing in pharmaceutical market intelligence. This dataset contains the number of prescriptions filled for antipsychotics and antidepressants at the physician-month level from 2006 to 2014. Importantly, the data contain both the county and the month of each prescription. These variables allow us to identify whether NPs had independent prescriptive authority when and where the prescription was filled. IMS Health constructs the database by collecting prescription scripts directly from 86% of US retail pharmacies, and estimating the remaining 14% using their patented projection methodology. Unfortunately, we only have prescription data from 2006 onwards. However, eight states granted independent prescriptive authority to NPs

during this time frame: Colorado, Hawaii, Maryland, Nevada, North Dakota, Rhode Island, Kentucky, and Minnesota.

3 Prescriptive Authority and Mental Health Outcomes

In order to identify whether extending independent prescriptive authority to NPs improves mental health outcomes, we exploit time-series variation in state-level scope of practice legislation and mental health outcomes using a standard difference-in-difference framework. As described in Section 2.2, we consider two categories of mental health outcomes: self-reported days in poor mental health and mental-health-related mortality. The impact of prescriptive authority on each category of outcomes is considered in turn below.

3.1 Mental-Health-Related Mortality

When NPs are allowed to independently prescribe, do we see reductions in the prevalence of suicides and other mental-health-related deaths? As described in Section 2.2, we consider both the number of suicides as well as a broader measure of mental-health-related mortality. Letting $Deaths_{cm}$ denote either of these outcomes in county c in month m, we estimate the following equation:

$$Deaths_{cm} = \beta_0 + \beta_1 Indep.\ Rx_{sm} + \beta_2 Pop_{cy} + \beta_3 X_{cy} + \gamma_s + \gamma_m + \gamma_y + \epsilon_{cm} \qquad (1)$$

where $Indep.\ Rx_{sm}$ is defined a dummy which equals one if NPs had independent prescriptive authority in state s in month m and zero otherwise, $Population_{cy}$ is the population of county c in month m, X_{cy} is a vector of other county-year controls, and λ_s, λ_m, and λ_y are state, month of year, and year fixed effects.[1]

To avoid introducing measurement error into the outcome, our preferred specification uses the number of deaths in a county-month as the outcome variable and includes a control for the corresponding population estimate on the right-hand side. While one could use county-level death rates as the outcome variable, death rates are very sensitive to population counts, and pre-

[1]County-year-level demographics include population, population density, percent male, percent black, percent white, percent hispanic, percent unemployed, percent under 18, percent over 65, percent homeless, percent in poverty, percent with a high school diploma or less, percent with a college degree or more, percent in poverty, median income quintiles, median year structure built, number of people eligible for Medicaid, and the number of practicing psychiatrists and general practitioners,.

cise county-level population estimates are only available every ten years. Whereas measurement error from population estimates on the right-hand side will attenuate our estimated coefficient, it will not affect the precision of our estimated coefficients of interest, as would measurement error in the outcome.

Increasing the supply of providers should impact mental health outcomes most for populations living in areas with an insufficient supply of providers and for populations who find it more difficult to access psychiatrist-provided care. Therefore, we allow the impact of changing scope of practice legislation to differentially influence mental health in counties with an under-provision of mental health care services and for populations who are traditionally disadvantaged. Letting $Underserved_{cy}$ be a dummy which equals one if county c in year y is underserved for mental health care services and zero otherwise, we separately consider counties that are underserved for mental health care services by estimating the following equation:

$$\begin{aligned} Deaths_{cm} \quad = \quad & \beta_0 + \beta_1 Indep.\ Rx_{sy} + \beta_2 Underserved_{cy} + \\ & \beta_3 Indep.\ Rx_{sy} \cdot Underserved_{cy} + \beta_4 Pop_{cy} + \beta_5 X_{cy} + \gamma_s + \gamma_m + \epsilon_{cm} \end{aligned} \tag{2}$$

where all other variables are defined as in Equation (1). To look specifically at disadvantaged populations, we again run Equation (2) separately for different demographic groups. Results for low education and rural populations are provided in Table 3; refer to Tables A.4 and A.5 for results for additional subpopulations.

Table 3 demonstrates that independent prescriptive authority for NPs is associated with reductions in both suicides and mental-health-related deaths. Interestingly, we see in Columns (2) - (4) and Columns (6) - (8) that suicides and mental-health-related deaths are actually less prevalent in areas that are underserved by psychiatrists. Despite the lower baselines for these counties, however, they still experience greater percentage reductions than the population as a whole when prescriptive authority is granted to NPs. Comparing Columns (1) and (2), we see that while the average county does not see any reduction in suicides when prescriptive authority is extended to NPs, counties underserved by psychiatrists experience a reduction of 17%. Columns (5) - (6) paint a similar picture: while on average counties experience no significant reduction in mental-health-related deaths on average when NPs can prescribe, counties that are underserved by psychiatrists experience significant reductions.

Table 3: Independent Prescriptive Authority and Mental-Health-Related Mortality

	Suicides				Mental-Health-Related Deaths			
	(1) Full Sample	(2) Full Sample	(3) Low Educ.	(4) Rural Counties	(5) Full Sample	(6) Full Sample	(7) Low Educ.	(8) Rural Counties
Indep. Prescriptive Authority	0.143	0.624	0.444	0.033	-0.825	-0.037	0.209	0.028
	(0.338)	(0.393)	(0.362)	(0.022)	(0.564)	(0.592)	(0.515)	(0.051)
Low Psychiatrist-to-Pop. Ratio		-0.598**	-0.519**	-0.020**		-0.843*	-0.826**	-0.031
		(0.266)	(0.218)	(0.008)		(0.473)	(0.409)	(0.020)
Interaction		-2.209*	-1.329*	-0.065**		-3.611*	-2.131*	-0.130**
		(1.284)	(0.740)	(0.027)		(2.102)	(1.206)	(0.050)
Observations	925,174	925,174	925,174	526,294	925,174	925,174	925,174	526,294
R^2	0.920	0.921	0.863	0.205	0.936	0.936	0.902	0.313
Mean Dependent Variable	9.51	9.51	5.23	0.50	17.12	17.12	10.23	0.80

Notes: Observations are at the county-month level, and are population weighted. Standard errors are clustered by state. All regressions include state, month, and year fixed effects. Additional controls include total population, population density, percent male, percent white, percent black, percent hispanic, percent unemployed, percent 18 and under, percent 65 and over, percent with a high school degree or less, percent poverty, and median income quintiles. "Low Educ" is defined as having a high school degree or less. Columns (3) and (6) further control for the size of this low education population. Refer to Table A.6 for full regression results.

In addition, as shown in Columns (3) - (4) and Columns (7) - (8), individuals with low levels of education or residing in rural counties see significant reductions in both the prevalence of suicides and mental-health-related deaths when NPs are granted independent prescriptive authority. For those with low levels of education, suicides and mental-health-related deaths are reduced by 17% and 19%, respectively, when independent prescriptive authority is extended to NPs. The point estimates are smaller but more precisely estimated in rural counties. In particular, suicides and mental-health-related deaths are reduced by 6.4% and 13%, respectively, in rural counties when independent prescriptive authority is extended to NPs. Given that suicides and mental-health-related deaths are quite rare, there is likely more measurement error when we focus on these outcomes in smaller populations than in the population as a whole. As these measurement issues will serve to attenuate our estimates, it is notable that we still identify an effect of comparable magnitude.

Finally, the main results in Table 3 are robust to several alternative specifications. In Table 3, all regressions are weighted by population size. Table A.7 reports the analogous results of unweighted specifications. If anything, the effects of extending prescriptive authority to NPs tend to be more precisely estimated in the unweighted regressions, which makes since if the law changes have the biggest impact in less densely populated counties. In addition, the main results are not being driven by any one particular state. Tables A.8 and A.9 show that the point

estimates are very stable when separately dropping each state which takes up treatment during our sample period. Finally, Table A.10 shows that the results remain when state-level linear time trends are included.

3.2 Self-Reported Mental Health

When prescriptive authority is extended to NPs, do we see improvements in the mental health of individuals on a day-to-day basis in conjunction with the decreases in mental-health-related deaths? As described in Section 2.2.2, we consider both the number of days in the past month respondents report being in poor mental health as well as a binary variable which equals one if the respondent reports having spent at least three weeks in poor mental health and zero otherwise. Letting $Poor\ Mental\ Health_{isy}$ denote either of these outcomes for individual i in state s in year y, we estimate the following equation:

$$Poor\ Mental\ Health_{isy} = \beta_0 + \beta_1 Indep.\ Rx_{sy} + \beta_2 X_{isy} + \gamma_s + \gamma_y + \epsilon_{isy} \tag{3}$$

where $Indep.\ Rx_{sy}$ is defined as in Equation (1), X_{isy} is a vector of individual-level controls, and γ_s and γ_y are state and year fixed effects.[2] We define a state as having independent prescriptive authority in a given year if NPs had the legislative authority to prescribe medications independently at any point within the year, although all results are robust to alternative timing assumptions,

As before, we consider that extending prescriptive authority to NPs may impact mental health outcomes more for populations living in states with an under-provision of mental health care services and for populations who are traditionally disadvantaged. Letting $Underserved_{sy}$ be a dummy which equals one if state s in year y is less equipped for mental health care services and zero otherwise (as defined in Section 2.3), we separately consider states with an under-provision of mental health care services by estimating the following equation:

$$\begin{aligned} Poor\ Mental\ Health_{isy} \;=\; & \beta_0 + \beta_1 Indep.\ Rx_{sy} + \beta_2 Underserved_{sy} + \\ & + \beta_3 Indep.\ Rx_{sy} \cdot Underserved_{sy} + \beta_4 X_{isy} + \gamma_s + \gamma_y + \epsilon_{isy} \end{aligned} \tag{4}$$

where all other variables are defined as in Equation (3). To look specifically at disadvantaged

[2]Individual level controls include sex, age, education, and income quintile dummies, and indicators for race (white, black, and missing), hispanic, employment status, and insurance status.

populations, we estimate the coefficients in Equation (4) separately for different subpopulations of interest. Results for individuals with low levels of education are provided in Table 4; refer to Tables A.11 and A.12 for results for other subpopulations.

As shown in Table 4, independent prescriptive authority for NPs is associated with a significant reduction in the number of poor mental health days reported by survey respondents. Looking first to Column (1), we see that respondents report on average having spent 0.134 fewer days in poor mental health when NPs are allowed to prescribe—a reduction of 4% of the mean. Adhering to the expectation that areas with an insufficient supply of providers before NPs were granted prescriptive authority should experience greater improvements, Column (2) demonstrates that the benefits are concentrated among respondents in states that are less equipped for mental health care. For respondents in underserved states, allowing NPs to prescribe independently is associated with spending 8.4% fewer days in poor mental health—over twice the improvement observed for the population on average.

Furthermore, already disadvantaged populations, see the greatest reductions in poor mental health on a day-to-day basis—here represented by individuals with low levels of education. Column (3) of Table 4 shows that individuals who both live in a less equipped state and have low levels of education see even greater improvements. Independent prescriptive authority is associated with a 9.4% reduction in poor mental health days for low education respondents—an additional 12% reduction over the average respondent in a state with an under-provision of psychiatrists, and a 135% reduction over the average respondent in the population as a whole.

Table 4: Independent Prescriptive Authority and Self-Reported Mental Health

	Days in Poor Mental Health			21+ Days in Poor Mental Health		
	(1) Full sample	(2) Full sample	(3) Low Educ.	(4) Full sample	(5) Full sample	(6) Low Educ.
Indep. Prescriptive Authority	-0.134*	-0.093	-0.095	-0.003	-0.002	-0.002
	(0.072)	(0.083)	(0.136)	(0.002)	(0.002)	(0.004)
Low Psychiatrist-to-Pop. Ratio		0.113	0.157		0.002**	0.004*
		(0.075)	(0.124)		(0.001)	(0.002)
Interaction		-0.186*	-0.267*		-0.003	-0.005**
		(0.109)	(0.140)		(0.002)	(0.002)
Observations	5,670,468	5,670,468	2,296,282	5,670,468	5,670,468	2,296,282
R^2	0.044	0.044	0.044	0.024	0.024	0.025
Mean Dependent Variable	3.33	3.33	3.86	0.06	0.06	0.07

Notes: Observations are at the individual level with sample weights. Standard errors are clustered by state. All regressions include state and year fixed effects. Additional controls include dummies for whether the respondent is male, white, black, hispanic, employed, and has health insurance. Dummies for age groups, education groups, and income quintiles are also included. "Low Educ" is defined as having a high school degree, less than a high school degree, or missing education information. Refer to Table A.13 for the full regression results.

In addition, allowing NPs to prescribe medication without physician supervision is associated with a decrease in the likelihood of spending at least three weeks in poor mental health for disadvantaged groups, which is likely indicative of a more severe mental illness. While Columns (4) and (5) of Table 4 show that independent prescriptive authority has no impact on this measure of mental health for the population as a whole, individuals who are both living in an underserved state and who have low levels of education experience a 10% reduction in the probability of reporting 21+ days in poor mental health when NPs can prescribe. It is possible that in the absence of independent prescriptive authority for NPs, available psychiatrists focus their efforts on those who have more severe mental illnesses. If this were the case, the patterns we observe are to be expected: individuals with minor mental illnesses and individuals with more severe mental illnesses who have difficulty accessing psychiatrist-provided care will benefit the most from the expansion of prescriptive authority. Contrary to what we saw with mental-health-related mortality, the reductions are much larger for disadvantaged groups than those observed across the entire population of individuals living in underserved counties.

Finally, the main results in Table 4 are robust to several alternative specifications. Tables A.14 and A.15 show that our results are not being driven by any one state—as before, the point estimates are very stable when separately dropping each state that takes up treatment during our sample period. Unlike the mortality results, however, Table A.16 shows that the self-reported mental health results are not robust to adding state-level linear time trends. As all

of the variation we are exploiting here is at the state-year level, adding state-level linear time trends in conjunction with state and year fixed effects is asking a lot of the data, so the null result is unsurprising.[3]

4 Prescriptive Authority and Prescribing Patterns

While both the number of NPs seen prescribing and the number of prescriptions written by NPs should increase when they are granted prescriptive authority, the effects of expanded scope of practice on the prescribing behavior of physicians is less clear. Critics note that the prescriptions written by NPs may crowd out the prescriptions previously written by physicians, in which case granting independent prescriptive authority to NPs will have no impact on the overall use of psychotropic treatment. In this case, we should observe a reduction in the number of prescriptions written by physicians when prescription authority is extended to NPs. It is also possible, however, that NPs simply meet unmet demand and prescribe for patients who were previously unable to access care. In this case, we should see no impact on the prescribing behavior of physicians when NPs are allowed to independently prescribe. Finally, it could be the case that physicians actually prescribe more medications when NPs are granted independent prescriptive authority. If, for example, NPs bring previously disenfranchised populations into the medical system and refer them to physicians for more specialized care, then we should see the number of prescriptions written by physicians actually increase.

To examine how independent prescriptive authority for NPs influences the prescribing practices of physicians, we exploit within-state variation in both scope of practice laws and the number of prescriptions written by physicians for antipsychotics and antidepressants. We consider the total number of prescriptions written by MDs, the average number of prescriptions written per MD who is observed prescribing, as well as the number of MDs observed prescribing. Letting $Prescriptions_{cm}^{MDs}$ denote one of these outcomes for county c in month m, we estimate the following equation:

$$Prescriptions_{cm}^{MDs} = \beta_0 + Indep.\, Rx_{sy} + \beta_2 X_{cm} + \gamma_s + \gamma_m + \epsilon_{cm} \tag{5}$$

where $Indep.Rx_{sy}$ is a dummy which equals one if NPs have independent prescriptive authority in state s in month m and zero otherwise, X_{cm} is a vector of county-month controls, and γ_s and

[3]This is less of a concern when we add state-level linear time trends to the mortality regressions. In Section 2.2.1, the outcome varies at the county-month level. Additionally, there is within-year variation in law changes and within-state variation in health resources.

γ_m are state and month fixed effects. In order to allow the effect to vary with the provision of local resources, as well as to allow for differential time trends in prescribing habits across areas with a different number of prescribers, we estimate Equation (1) separately for counties that are underserved and for counties that are not underserved by psychiatrists.

Table 5: Independent Prescriptive Authority and Prescriptions by MDs

	Not Underserved Counties			Underserved Counties		
	(1) Total	(2) Average	(3) N Prescribers	(4) Total	(5) Average	(6) N Prescribers
Indep. Prescriptive Authority	-2.648	-0.157	1.297	-0.504	-4.072	-1.764
	(2.996)	(2.101)	(8.875)	(0.454)	(2.974)	(1.239)
Observations	114,288	114,288	114,288	224,184	224,184	224,184
R^2	0.910	0.299	0.933	0.843	0.199	0.882
Mean Dependent Variable	143.52	65.31	462.35	13.63	63.43	33.94

Notes: Observations are at the county-month level, and are population weighted. Standard errors are clustered by state. All regressions include state, month, and year fixed effects. Additional controls include total population, population density, percent male, percent white, percent black, percent hispanic, percent unemployed, percent 18 and under, percent 65 and over, percent with a high school degree or less, percent poverty, and median income quintiles. "Total" refers to the total number of prescriptions written by MDs for antidepressants and antipsychotics in hundreds. "Average" refers to the average number of scripts written for these medications across doctors observed prescribing drugs in these classes. "N Prescribers" refers to the number of unique prescribers observed prescribing drugs in these classes.

As shown in Table 5, extending prescriptive authority to NPs appears to have no impact on the prescribing behavior of physicians. Neither the total number of prescriptions written for antidepressants and antipsychotics, the average number of prescriptions per prescribing physician, nor the number of physicians observed prescribing are affected. This holds both in areas that are underserved and in areas that are not underserved by psychiatrists.

5 Conclusion

Taken together, our results indicate that granting independent prescriptive authority to NPs is an important policy tool which can be used to improve population mental health. In particular, areas with an under-provision of psychiatrists or with populations who find it difficult to access psychiatrist-provided care can grant independent prescriptive authority to NPs to help mitigate the negative consequences of physician shortages and extend care to disadvantaged populations.

Policies that increase the number of providers who can prescribe medication may be particularly important in the US, where the supply of physicians has not kept pace with rising demand

for health care services. Although states often extend prescriptive authority to NPs to address shortages of primary care practitioners with prescribing abilities, we show that these laws also have important implications for mental health. In particular, states that grant independent prescriptive authority to NPs see both improvements in the quality of self-reported mental health as well as reductions in the prevalence of mental-health-related deaths, including suicides. Improvements are greatest for individuals who live in areas that are underserved by psychiatrists and among populations who have been shown to have more difficultly accessing psychiatrist-provided care.

It is noteworthy that we observe a consistent pattern of effects despite using two very different measures of mental health. Self-reported "days in poor mental health" allow us to examine whether the population suffering from mental illnesses of varying severities, including minor mental illnesses, notice improvements when NPs are allowed to prescribe. On the other hand, mental-health-related mortality allows us to examine whether the population suffering from very severe mental illnesses—that is, mental illnesses that may result in death—see improvements when independent prescriptive authority is extended beyond physicians. Even if extending prescriptive authority to NPs impacts one of these outcomes, it is not clear ex ante that prescriptive authority should also impact the other. In particular, since suicides and other deaths caused by poor mental health are relatively rare, it is possible that population mental health could improve without measurable effects on such extreme outcomes. The consistency of our results across the two categories of outcome measures indicates that prescriptive authority for NPs is associated with improved mental health across a spectrum of severity.

When independent prescriptive authority is extended to NPs, all NPs, not just those who specialize in mental health, have the statutory authority to prescribe. Just like physicians, however, some NPs specialize in psychiatric medicine. Psychiatric NPs with prescriptive authority traditionally provide psychotherapy in addition to psychotropic treatment, unlike the current movement among psychiatrists to only prescribe medications. It is therefore possible that the improvements in mental health that we observe are driven entirely by an increase in "full-service" mental health providers—that is, specialists that provide both psychotherapy and psychotropic treatment. However, it is also possible that our results are driven entirely by an increase in the overall supply of general practitioners who can prescribe. It remains an open question whether extending independent prescriptive authority to NPs results in improved mental health because such laws increase the number of general health care providers who can prescribe psychotropic treatment or because they increase the number of providers who provide psychotherapy in conjunction with psychotropic treatment. Answering this question is a promising area for future

research.

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Appendix

Data Appendix

Compiling the prescriptive authority database

The Nurse Practitioner is a journal addressing clinical issues relevant to NPs and other primary care providers. Every January since 1989, the journal has published the "Annual Legislative Update" which summarizes both the practice environment and the level of prescriptive authority for NPs in each state. While informative, these overviews do not consistently include dates of legislative action nor comprehensive coverage of the precise changes made to a state's legislation. Therefore, the information provided by the journal alone is not sufficient for a quantitative analysis of independent prescriptive authority.

In many states, NPs have the statutory authority to prescribe only under the direct supervision of a physician or with a collaborative practice agreement. While such laws should also increase access to medication over a regime in which NPs have no ability to prescribe, we expect their impacts to be more limited than granting NPs full independent prescriptive authority. Anecdotal evidence suggests that NPs have difficulty finding physicians who are willing to supervise or work in collaboration, especially in areas with few physicians. Therefore, collaborate practice agreements and mandatory supervision likely limit the expansion of access to medication that could be achieved by allowing NPs to prescribe independently, particularly in places where more prescribers may be needed the most.

Missing state-years in the BRFSS data

The BRFSS did not ask the mental health question in Wyoming in 1993, Rhode Island in 1994, D.C. in 1995, 29 states in 2002, and Hawaii in 2004 (see Table A.1).

Table A.1: Missing BRFSS State-Years

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014 mi
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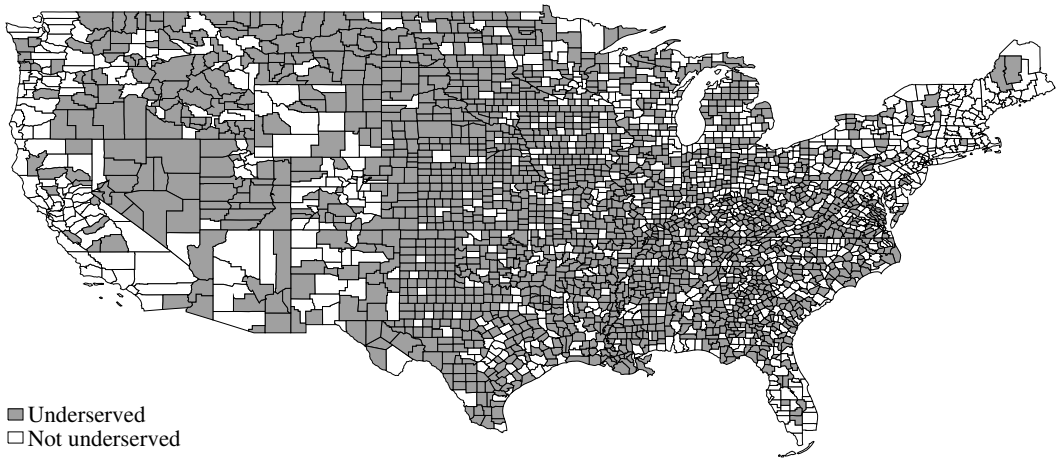
Total Missings	1	1	1	0	0	0	0	0	0	29	0	1	0	0	0	0	0	0	0	0	0	

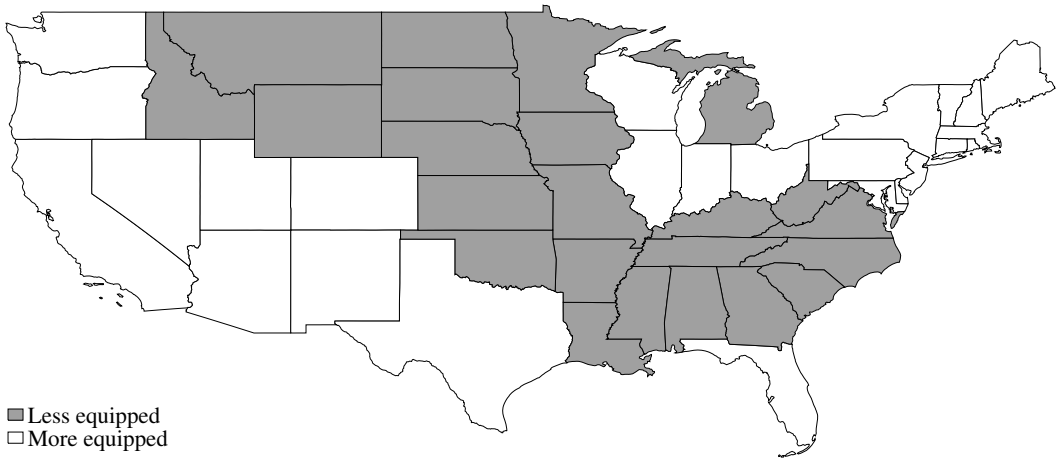
Supplementary Tables and Figures

Figure A.1: Mental Health Services by County: 2002



Notes: Following the definition provided by the HRSA, a county is "underserved" for mental health care services in a given year if the county has fewer than one psychiatrist per 30,000 residents. We identify underserved counties by combining county-year information on the number of psychiatrists from the HRSA's Area Resource Files with county-year population estimates linearly interpolated between the 1990, 2000, and 2010 decennial censuses.

Figure A.2: Mental Health Services by State: 2002



Notes: A state is "less equipped" for mental health services in a given year if the population-weighted average of binary, underserved categorizations across all counties in that state is less than the median across all states in that year. To construct the binary, underserved categorizations at the county-level, we use the definition provided by the HRSA: a county is "underserved" for mental health care services if the county has fewer than one psychiatrist per 30,000 residents. We identify underserved counties by combining county-year information on the number of psychiatrists from the HRSA's Area Resource Files with county-year population estimates linearly interpolated between the 1990, 2000, and 2010 decennial censuses.

Table A.2: Summary Statistics: Self-Reported Mental Health and Controls, 1993 - 2013

		Never Indep. Prescriptive Authority			Ever Indep. Prescriptive Authority		
	All	All	Never underserved	Ever underserved	All	Never underserved	Ever underserved
Days in Poor Mental Health:							
Average	3.33	3.36	3.39	3.34	3.16	3.16	3.17
Percent 0	0.67	0.67	0.65	0.68	0.66	0.67	0.65
Percent >= 21	0.06	0.06	0.06	0.06	0.05	0.05	0.05
Independent Prescriptive Authority	0.14	0	0	0	0.75	0.53	0.94
Low Psychiatrist-to-Population Ratio	0.37	0.39	0	0.69	0.26	0	0.47
Male	0.48	0.48	0.48	0.48	0.49	0.49	0.49
White	0.71	0.70	0.64	0.74	0.78	0.70	0.85
Black	0.10	0.11	0.08	0.13	0.05	0.09	0.02
Hispanic	0.12	0.13	0.19	0.08	0.09	0.12	0.07
Employed	0.52	0.52	0.51	0.53	0.54	0.54	0.53
Health Insurance	0.84	0.84	0.85	0.84	0.86	0.86	0.86
Age: 18 to 34	0.31	0.31	0.31	0.32	0.32	0.31	0.32
Age: 35 to 44	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Age: 45 to 54	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Age: 55 to 64	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Age: 65 and Over	0.17	0.17	0.18	0.17	0.17	0.16	0.17
Education: HS or Less	0.43	0.44	0.42	0.45	0.39	0.39	0.40
Education: Some College or More	0.57	0.56	0.58	0.54	0.60	0.61	0.60
Income: 1st Quintile	0.20	0.20	0.21	0.20	0.17	0.16	0.18
Income: 2nd Quintile	0.17	0.17	0.16	0.18	0.18	0.17	0.20
Income: 3rd Quintile	0.17	0.17	0.16	0.17	0.18	0.17	0.19
Income: 4th Quintile	0.18	0.18	0.19	0.18	0.19	0.19	0.19
Income: 5th Quintile	0.14	0.14	0.15	0.13	0.15	0.18	0.13
Observations	5,670,468	3,399,048	1,104,585	2,294,463	2,271,420	973,174	1,298,246

Notes: Raw data is at the individual level, weighted using sample weights. "Days in Poor Mental Health" reflects responses to the question "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" This question was asked on the BRFSS in all states in 1997 – 2001, 2003 and 2005 – 2013. It was not asked in Wyoming in 1993, Rhode Island in 1994, D.C. in 1995, 29 states in 2002, and Hawaii in 2004. "Ever Independent Prescriptive Authority" reflects whether the respondent was living in a state which had independent prescriptive authority for NPs at some point during our sample. Similarly, "Ever Underserved" reflects whether the respondent was living in a state which was less equipped for mental health care services at some point during our sample. "Independent Prescriptive Authority" reflects whether the respondent was living in a state with independent prescriptive authority in the year that he/she responded. Similarly, "Low Psychiatrist-to-Pop. Ratio" reflects whether the respondent was living in a state that was less equipped for mental health services in the year that he/she responded. Construction of both "Independent Prescriptive Authority" and "Low Psychiatrist-to-Pop. Ratio" requires information not provided in the BRFSS; their construction is outlined in Sections 2.1 and 2.3, respectively. All other variables come from the BRFSS and were asked in conjunction with the question on days in poor mental health. Some categorical variables do not sum to one; the difference reflects the percentage of missings.

Table A.3: Summary Statistics: County-Level Mortality and Controls, 1990 - 2014

		Never Independent Prescriptive Authority			Ever Independent Prescriptive Authority		
	All	All	Never underserved	Ever Underserved	All	Never underserved	Ever Underserved
Deaths per 100,000:							
Suicides	0.99	0.93	0.87	1.07	1.17	1.14	1.22
All Mental-Health-Related Causes	1.85	1.77	1.69	1.93	2.11	2.10	2.14
Independent Prescriptive Authority	0.13	0	0	0	0.61	0.62	0.61
Low Psychiatrist-to-Pop. Ratio	0.21	0.20	0	0.59	0.21	0	0.51
Total Population	1,039,476	1,173,171	1,699,192	169,328	550,514	838,276	142,774
Population Density (Per Sq. Mile)	2,209	2,247	3,359	332	729	982	369
Percent Male	0.49	0.49	0.49	0.49	0.49	0.49	0.50
Percent White	0.75	0.73	0.69	0.82	0.81	0.78	0.86
Percent Black	0.12	0.14	0.15	0.11	0.06	0.08	0.04
Percent Hispanic	0.13	0.14	0.17	0.08	0.10	0.11	0.08
Percent Unemployed	0.06	0.06	0.06	0.06	0.06	0.06	0.05
Percent Poverty	0.25	0.25	0.25	0.25	0.25	0.24	0.26
Percent 18 and Under	0.13	0.13	0.12	0.14	0.12	0.12	0.13
Percent 65 and Over	0.47	0.48	0.44	0.55	0.43	0.40	0.48
Percent HS or Less	0.28	0.29	0.29	0.29	0.27	0.27	0.27
Median Income: 1st Quintile	0.05	0.06	0.01	0.14	0.03	0	0.07
Median Income: 2nd Quintile	0.08	0.08	0.04	0.16	0.06	0.02	0.13
Median Income: 3rd Quintile	0.12	0.13	0.10	0.19	0.11	0.06	0.17
Median Income: 4th Quintile	0.21	0.21	0.20	0.22	0.24	0.25	0.22
Median Income: 5th Quintile	0.54	0.53	0.65	0.30	0.56	0.66	0.42
Percent College or More	0.25	0.25	0.29	0.18	0.26	0.30	0.21
Median Year Structure Built	1970	1969	1967	1973	1973	1973	1973
Medicaid Eligible per 100,000	18,724	19,347	19,942	18,210	16,447	15,821	17,334
Psychiatrists per 100,000	12	12	17	4	11	15	5
Primary Care MDs per 100,000	77	77	92	48	78	93	56
Rural County	0.13	0.13	0.01	0.36	0.15	0.04	0.31
Observations	925,174	640,882	105,300	535,582	284,292	44,984	239,308

Notes: Data is at the county-year level, weighted by population. "Suicides" and "Mental-Health-Related Deaths" are taken from the US Mortality Files. "Mental-Health-Related Deaths" includes suicides, deaths of unknown intent, and accidental deaths (accidental deaths involving firearms, trains, and poisonings). "Ever Independent Prescriptive Authority" reflects whether NPs ever had independent prescriptive authority in the state. Similarly, "Ever Underserved" reflects whether the county was ever underserved for mental health services. "Independent Prescriptive Authority" reflects whether NPs had independent prescriptive authority in a given county-year. The construction of this variable is described in Section 2.1. Similarly, "Low Psychiatrist-to-Pop. Ratio" reflects whether the county was underserved for mental health services in that year. The construction of this variable is described in Section 2.3. "Number of Practicing Psychiatrists" is provided by the AMA to the HRSA and is accessed by the authors from the HRSA's Area Resource Files. All other variables are from the 1990, 2000, and 2010 decennial censuses and the 5-year polled (2008-2012) American Community Survey (ACS). For census and ACS variables, years other than 1990, 2000, and 2010 are linearly interpolated at the county-year level.

Table A.4: Prescriptive Authority and Suicides

	(1) Full sample	(2) Black	(3) Middle Age	(4) Under 18	(5) Low Educ.	(6) Male	(7) Female	(8) Rural
Indep. Prescriptive Authority	0.624	-0.069	0.060	0.036	0.444	0.516*	0.160*	0.033
	(0.393)	(0.152)	(0.093)	(0.024)	(0.362)	(0.303)	(0.094)	(0.022)
Low Psychiatrist-to-Pop. Ratio	-0.598**	-0.046	-0.104**	-0.026	-0.519**	-0.471**	-0.102*	-0.020**
	(0.266)	(0.045)	(0.045)	(0.016)	(0.218)	(0.205)	(0.054)	(0.008)
Interaction	-2.209*	-0.085*	-0.696**	-0.067	-1.329*	-1.521	-0.559*	-0.065**
	(1.284)	(0.045)	(0.340)	(0.049)	(0.740)	(0.914)	(0.317)	(0.027)
Observations	925,174	925,174	925,174	925,174	925,174	925,174	925,174	526,294
R^2	0.921	0.686	0.824	0.422	0.863	0.914	0.796	0.205
Mean Dependent Variable	9.51	0.95	2.53	0.32	5.23	7.29	2.22	0.50

Notes: Observations are at the county-month level, and are population weighted. Standard errors are clustered by state. All regressions include state, month, and year fixed effects. Additional controls include total population, population density, percent male, percent white, percent black, percent hispanic, percent unemployed, percent 18 and under, percent 65 and over, percent with a high school degree or less, percent poverty, and median income quintiles. Each column further controls for the size of the population for which suicides are being measured (e.g. Column (2) additionally controls for the size of the black population). "Low Educ" is defined as having a high school degree or less.

Table A.5: Prescriptive Authority and Mental-Health-Related Mortality

	(1) Full sample	(2) Black	(3) Middle Age	(4) Under 18	(5) Low Educ.	(6) Male	(7) Female	(8) Rural
Indep. Prescriptive Authority	-0.037	0.044	-0.029	0.116*	0.209	0.164	-0.136	0.028
	(0.592)	(0.168)	(0.213)	(0.061)	(0.515)	(0.438)	(0.178)	(0.051)
Low Psychiatrist-to-Pop. Ratio	-0.843*	-0.050	-0.173*	-0.081*	-0.826**	-0.625*	-0.185*	-0.031
	(0.473)	(0.078)	(0.102)	(0.048)	(0.409)	(0.355)	(0.106)	(0.020)
Interaction	-3.611*	-0.394**	-1.230*	-0.090	-2.131*	-2.448	-0.999*	-0.130**
	(2.102)	(0.174)	(0.618)	(0.127)	(1.206)	(1.513)	(0.527)	(0.050)
Observations	925,174	925,174	925,174	925,174	925,174	925,174	925,174	526,294
R^2	0.936	0.858	0.885	0.581	0.902	0.932	0.865	0.313
Mean Dependent Variable	17.12	2.41	4.96	0.69	10.23	12.78	4.34	0.80

Notes: Observations are at the county-month level, and are population weighted. Standard errors are clustered by state. All regressions include state, month, and year fixed effects. Additional controls include total population, population density, percent male, percent white, percent black, percent hispanic, percent unemployed, percent 18 and under, percent 65 and over, percent with a high school degree or less, percent poverty, and median income quintiles. Each column further controls for the size of the population for which mental-health-related mortality is being measured (e.g. Column (2) additionally controls for the size of the black population). "Low Educ" is defined as having a high school degree or less.

Table A.6: Mental-Health-Related Mortality: Full Regression Results

	Suicides				Mental-Health-Related Deaths			
	(1) Full Sample	(2) Full Sample	(3) Low Educ.	(4) Rural Counties	(5) Full Sample	(6) Full Sample	(7) Low Educ.	(8) Rural Counties
Indep. Prescribe	0.143	0.624	0.444	0.033	-0.825	-0.037	0.209	0.028
	(0.338)	(0.393)	(0.362)	(0.022)	(0.564)	(0.592)	(0.515)	(0.051)
Low Psych./Pop.		-0.598**	-0.519**	-0.020**		-0.843*	-0.826**	-0.031
		(0.266)	(0.218)	(0.008)		(0.473)	(0.409)	(0.020)
Interaction		-2.209*	-1.329*	-0.065**		-3.611*	-2.131*	-0.130**
		(1.284)	(0.740)	(0.027)		(2.102)	(1.206)	(0.050)
Total Population	0.000***	0.000***	0.000	0.000***	0.000***	0.000***	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Pop. Density	-0.000	-0.000	-0.000	-0.000	0.000	0.000	-0.000	0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percent Male	-22.45***	-16.430**	-8.143	-0.510**	-38.41***	-29.118**	-15.121	-0.683
	(8.089)	(8.152)	(6.111)	(0.232)	(14.079)	(14.119)	(11.809)	(0.483)
Percent White	4.248	3.987	1.834	-0.019	10.850	10.373*	4.836	0.150
	(3.995)	(3.560)	(2.371)	(0.119)	(6.551)	(5.861)	(3.601)	(0.157)
Percent Black	11.659***	11.017***	7.198**	-0.258**	22.499***	21.485***	14.508***	-0.378**
	(4.285)	(3.989)	(3.052)	(0.109)	(7.229)	(6.754)	(5.150)	(0.153)
Percent Hispanic	0.198	-0.287	-0.837	-0.218***	0.963	0.246	-0.653	-0.314**
	(1.519)	(1.430)	(1.001)	(0.066)	(2.719)	(2.571)	(1.606)	(0.125)
Percent Unempl.	35.226**	35.458**	16.120**	-0.278	80.868**	81.188**	43.575**	-0.531
	(13.196)	(13.338)	(6.025)	(0.437)	(30.234)	(30.540)	(16.817)	(1.176)
Percent Under 18	-18.55***	-15.081**	-2.697	-0.687***	-22.702*	-17.303	0.303	-1.344**
	(6.861)	(7.025)	(3.990)	(0.224)	(12.179)	(12.663)	(6.763)	(0.566)
Percent Over 65	-8.024	-5.866	-2.934	0.343	-22.131**	-18.660**	-9.945	0.350
	(4.850)	(4.033)	(3.470)	(0.216)	(10.386)	(9.206)	(7.747)	(0.471)
Percent HS or Less	-0.910	0.070	-3.407	-0.231	4.372	5.673	-4.984	-0.562**
	(4.967)	(4.544)	(3.285)	(0.142)	(7.735)	(7.291)	(4.495)	(0.264)
Percent Poverty	-5.059**	-5.021**	-0.833	-0.014	-8.084**	-7.986**	0.320	0.216
	(1.978)	(2.105)	(2.200)	(0.084)	(3.518)	(3.704)	(3.446)	(0.210)
Median Inc.: Q2	0.490	0.484*	0.261	0.009	1.068***	1.070***	0.542*	-0.012
	(0.317)	(0.288)	(0.249)	(0.011)	(0.380)	(0.319)	(0.281)	(0.023)
Median Inc.: Q3	0.409	0.341	0.033	0.014	0.764	0.675	0.135	-0.004
	(0.312)	(0.269)	(0.238)	(0.013)	(0.647)	(0.575)	(0.503)	(0.027)
Median Inc.: Q4	1.483***	1.371***	0.599**	0.007	2.264**	2.106**	0.843	-0.020
	(0.326)	(0.272)	(0.269)	(0.018)	(0.981)	(0.898)	(0.797)	(0.039)
Median Inc.: Q5	1.380**	1.284**	0.714	-0.018	1.410	1.272	0.602	-0.058
	(0.538)	(0.482)	(0.445)	(0.023)	(1.286)	(1.208)	(1.063)	(0.049)
Percent College +	-0.201	-0.424	-4.299	-0.759***	2.038	1.619	-9.699**	-1.668***
	(5.893)	(5.558)	(3.458)	(0.234)	(10.176)	(9.679)	(4.483)	(0.433)
Median Year Built	-0.015	-0.014	-0.008	0.003***	-0.035	-0.034	-0.018	0.004***
	(0.033)	(0.032)	(0.027)	(0.001)	(0.048)	(0.047)	(0.041)	(0.001)
Medicaid Eligible	-0.000	-0.000	0.000	0.000*	-0.000	-0.000	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Psychiatrists	0.007***	0.007***	0.005***	-0.006***	0.000	0.001	0.001	-0.011***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.006)	(0.006)	(0.003)	(0.004)
Primary Care MDs	-0.004***	-0.004***	-0.002*	0.001**	-0.001	-0.001	0.001	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.002)	(0.001)
Observations	925,174	925,174	925,174	526,294	925,174	925,174	925,174	526,294
R^2	0.920	0.921	0.863	0.205	0.936	0.936	0.902	0.313
Mean Dep. Var.	9.51	9.51	5.23	0.50	17.12	17.12	10.23	0.80

Notes: Observations are at the county-month level, and are population weighted. Standard errors are clustered by state. All regressions include state, month, and year fixed effects. "Low Educ" is defined as having a high school degree or less. Columns (3) and (6) further control for the size of this low education population.

Table A.7: Prescriptive Authority and Mortality: Unweighted

	Suicides				Mental-Health-Related Deaths			
	(1) Full Sample	(2) Full Sample	(3) Low Educ.	(4) Rural Counties	(5) Full Sample	(6) Full Sample	(7) Low Educ.	(8) Rural Counties
Indep. Prescribe	-0.021	0.252**	0.125	0.020	-0.203*	0.204	0.065	0.006
	(0.047)	(0.125)	(0.078)	(0.017)	(0.110)	(0.201)	(0.123)	(0.031)
Low Psych.-to-Pop. Ratio		-	-	-0.013**		-0.152**	-0.129**	-0.023*
		0.127***	0.095***					
		(0.040)	(0.030)	(0.007)		(0.069)	(0.058)	(0.012)
Interaction		-0.402**	-0.244**	-0.043**		-0.599**	-0.351**	-0.068**
		(0.173)	(0.099)	(0.018)		(0.261)	(0.146)	(0.031)
Observations	925,174	925,174	925,174	526,294	925,174	925,174	925,174	526,294
R^2	0.808	0.809	0.693	0.178	0.854	0.855	0.787	0.273
Mean Dependent Variable	1.02	1.02	0.61	0.28	1.70	1.70	1.08	0.45

Notes: Observations are at the county-month level, and are not population weighted. Standard errors are clustered by state. All regressions include state, month, and year fixed effects. "Low Educ" is defined as having a high school degree or less. Columns (3) and (6) further control for the size of this low education population.

Table A.10: Mental-Health-Related Mortality: Including State-Specific Linear Time Trends

	Suicides				Mental-Health-Related Deaths			
	(1) Full Sample	(2) Full Sample	(3) Low Educ.	(4) Rural Counties	(5) Full Sample	(6) Full Sample	(7) Low Educ.	(8) Rural Counties
Indep. Prescriptive Authority	-0.478	-0.029	-0.285	-0.003	-0.666	0.074	-0.378	0.029
	(0.527)	(0.598)	(0.427)	(0.036)	(0.584)	(0.736)	(0.459)	(0.047)
Low Psychiatrist-to-Pop. Ratio		-0.630**	-0.548**	-0.020**		-0.925*	-0.879*	-0.032*
		(0.283)	(0.245)	(0.009)		(0.487)	(0.444)	(0.019)
Interaction		-2.251*	-1.264*	-0.057**		-3.699	-2.065*	-0.106**
		(1.333)	(0.712)	(0.028)		(2.214)	(1.211)	(0.045)
Observations	925,174	925,174	925,174	526,294	925,174	925,174	925,174	526,294
R^2	0.923	0.924	0.870	0.207	0.938	0.939	0.906	0.320
Mean Dependent Variable	9.51	9.51	5.23	0.50	17.12	17.12	10.23	0.80

Notes: Observations are at the county-month level, and are population weighted. Standard errors are clustered by state. All regressions include state, month, and year fixed effects. Additional controls include total population, population density, percent male, percent white, percent black, percent hispanic, percent unemployed, percent 18 and under, percent 65 and over, percent with a high school degree or less, percent poverty, and median income quintiles. Each column further controls for the size of the population for which suicide mortality is being measured (e.g. Column (2) additionally controls for the size of the black population). "Low Educ" is defined as having a high school degree or less.

Table A.8: Suicides Robustness (Leave Out)

	(1) ID	(2) NV	(3) UT	(4) CO	(5) WY	(6) NE	(7) NM	(8) ND	(9) MI
Indep. Prescriptive Authority	0.568	0.685*	0.487	0.648	0.634	0.656	0.571	0.625	0.664*
	(0.390)	(0.407)	(0.356)	(0.468)	(0.396)	(0.410)	(0.388)	(0.396)	(0.393)
Low Psychiatrist-to-Pop. Ratio	-0.602**	-0.549**	-0.593**	-0.602**	-0.598**	-0.598**	-0.604**	-0.604**	-0.612**
	(0.268)	(0.261)	(0.264)	(0.270)	(0.267)	(0.267)	(0.266)	(0.267)	(0.275)
Interaction	-2.301*	-2.257*	-1.948	-2.234*	-2.266*	-2.345*	-2.272*	-2.206*	-2.221*
	(1.324)	(1.294)	(1.365)	(1.315)	(1.306)	(1.349)	(1.353)	(1.287)	(1.293)
Observations	912,505	920,399	916,948	907,607	918,317	899,838	915,511	910,280	900,308
R^2	0.921	0.922	0.922	0.921	0.921	0.921	0.921	0.921	0.922

	(1) IA	(2) WI	(3) KY	(4) MD	(5) DE	(6) RI	(7) CT	(8) ME	(9) HI
Indep. Prescriptive Authority	0.683	0.683	0.624	0.945**	0.633	0.652	0.626	0.610	0.604
	(0.411)	(0.437)	(0.400)	(0.373)	(0.400)	(0.402)	(0.395)	(0.398)	(0.404)
Low Psychiatrist-to-Pop. Ratio	-0.602**	-0.615**	-0.598**	-0.505**	-0.599**	-0.595**	-0.597**	-0.598**	-0.601**
	(0.264)	(0.268)	(0.271)	(0.246)	(0.267)	(0.266)	(0.268)	(0.266)	(0.267)
Interaction	-2.608*	-2.592*	-2.217*	-2.272*	-2.210*	-2.210*	-2.207*	-2.252*	-2.205*
	(1.384)	(1.432)	(1.295)	(1.311)	(1.285)	(1.284)	(1.284)	(1.302)	(1.287)
Observations	895,478	903,589	889,211	917,974	924,274	923,674	922,774	920,374	923,943
R^2	0.921	0.921	0.921	0.924	0.921	0.921	0.921	0.921	0.921

Notes: Observations are at the county-month level, and are population weighted. Standard errors are clustered by state. All regressions include state, month, and year fixed effects. Additional controls include total population, population density, percent male, percent white, percent black, percent hispanic, percent unemployed, percent 18 and under, percent 65 and over, percent with a high school degree or less, percent poverty, and median income quintiles. Each column further controls for the size of the population for which suicide mortality is being measured (e.g. Column (2) additionally controls for the size of the black population). "Low Educ" is defined as having a high school degree or less.

Table A.9: Mental-Health-Related Mortality Robustness (Leave Out)

	(1) ID	(2) NV	(3) UT	(4) CO	(5) WY	(6) NE	(7) NM	(8) ND	(9) MI
Indep. Prescriptive Authority	-0.032	-0.068	-0.137	-0.010	-0.025	0.079	-0.181	-0.030	0.000
	(0.618)	(0.600)	(0.589)	(0.715)	(0.597)	(0.625)	(0.575)	(0.600)	(0.598)
Low Psychiatrist-to-Pop. Ratio	-0.851*	-0.779	-0.841*	-0.858*	-0.844*	-0.849*	-0.868*	-0.854*	-0.957**
	(0.477)	(0.468)	(0.472)	(0.479)	(0.474)	(0.474)	(0.470)	(0.475)	(0.471)
Interaction	-3.725*	-3.633*	-3.474	-3.638*	-3.694*	-3.876*	-3.593	-3.602*	-3.481
	(2.169)	(2.121)	(2.262)	(2.152)	(2.137)	(2.202)	(2.221)	(2.107)	(2.107)
Observations	912,505	920,399	916,948	907,607	918,317	899,838	915,511	910,280	900,308
R^2	0.936	0.937	0.936	0.936	0.936	0.936	0.936	0.936	0.937

	(1) IA	(2) WI	(3) KY	(4) MD	(5) DE	(6) RI	(7) CT	(8) ME	(9) HI
Indep. Prescriptive Authority	0.062	-0.063	-0.074	0.542	-0.033	-0.051	-0.034	-0.067	-0.094
	(0.619)	(0.676)	(0.597)	(0.470)	(0.606)	(0.598)	(0.596)	(0.611)	(0.609)
Low Psychiatrist-to-Pop. Ratio	-0.851*	-0.883*	-0.843*	-0.707	-0.844*	-0.843*	-0.837*	-0.846*	-0.847*
	(0.470)	(0.478)	(0.480)	(0.452)	(0.475)	(0.473)	(0.477)	(0.473)	(0.474)
Interaction	-4.224*	-4.115*	-3.611*	-3.810*	-3.612*	-3.606*	-3.610*	-3.662*	-3.596*
	(2.271)	(2.382)	(2.121)	(2.145)	(2.105)	(2.104)	(2.101)	(2.132)	(2.107)
Observations	895,478	903,589	889,211	917,974	924,274	923,674	922,774	920,374	923,943
R^2	0.936	0.936	0.936	0.937	0.936	0.936	0.936	0.936	0.936

Notes: Observations are at the county-month level, and are population weighted. Standard errors are clustered by state. All regressions include state, month, and year fixed effects. Additional controls include total population, population density, percent male, percent white, percent black, percent hispanic, percent unemployed, percent 18 and under, percent 65 and over, percent with a high school degree or less, percent poverty, and median income quintiles. Each column further controls for the size of the population for which mental-health-related mortality is being measured (e.g. Column (2) additionally controls for the size of the black population). "Low Educ" is defined as having a high school degree or less.

Table A.11: Prescriptive Authority and Days in Poor Mental Health

	(1) Full sample	(2) Black	(3) Middle Age	(4) Low Educ.	(5) Low Inc.	(6) Male	(7) Female
Indep. Prescriptive Authority	-0.093	-0.007	-0.244**	-0.095	-0.109	-0.116	-0.068
	(0.083)	(0.105)	(0.101)	(0.136)	(0.202)	(0.078)	(0.111)
Low Psychiatrist-to-Pop. Ratio	0.113	0.158	-0.047	0.157	0.201**	0.096	0.130
	(0.075)	(0.180)	(0.055)	(0.124)	(0.097)	(0.074)	(0.080)
Interaction	-0.186*	-0.705***	-0.032	-0.267*	-0.240	-0.147	-0.219*
	(0.109)	(0.203)	(0.100)	(0.140)	(0.147)	(0.105)	(0.125)
Observations	5,670,468	448,457	1,080,687	2,296,282	1,971,688	2,233,330	3,437,138
R^2	0.044	0.043	0.075	0.044	0.054	0.041	0.040
Mean Dependent Variable	3.33	3.77	3.66	3.86	4.34	2.77	3.85

Notes: Observations are at the individual level with sample weights. Standard errors are clustered by state. All regressions include state and year fixed effects. Additional controls include dummies for whether the respondent is male, white, black, hispanic, employed, and has health insurance. Dummies for age groups, education groups, and income quintiles are also included. "Low Educ" is defined as having a high school degree, less than a high school degree, or missing education information. "Low Inc" is defined as being in the bottom two quintiles of income.

Table A.12: Prescriptive Authority and 21+ Days in Poor Mental Health

	(1) Full sample	(2) Black	(3) Middle Age	(4) Low Educ.	(5) Low Inc.	(6) Male	(7) Female
Indep. Prescriptive Authority	-0.002	0.002	-0.008***	-0.002	-0.003	-0.002	-0.002
	(0.002)	(0.003)	(0.003)	(0.004)	(0.005)	(0.002)	(0.003)
Low Psychiatrist-to-Pop. Ratio	0.002**	0.007*	-0.003***	0.004*	0.005**	0.003**	0.002
	(0.001)	(0.004)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Interaction	-0.003	-0.020***	0.006***	-0.005**	-0.004	-0.003	-0.003
	(0.002)	(0.005)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Observations	5,670,468	448,457	1,080,687	2,296,282	1,971,688	2,233,330	3,437,138
R^2	0.024	0.022	0.049	0.025	0.031	0.024	0.023
Mean Dependent Variable	0.06	0.07	0.07	0.07	0.08	0.05	0.06

Notes: Observations are at the individual level with sample weights. Standard errors are clustered by state. All regressions include state and year fixed effects. Additional controls include dummies for whether the respondent is male, white, black, hispanic, employed, and has health insurance. Dummies for age groups, education groups, and income quintiles are also included. "Low Educ" is defined as having a high school degree, less than a high school degree, or missing education information. "Low Inc" is defined as being in the bottom two quintiles of income.

Table A.13: Self-Reported Mental Health: Full Regression Results

	Days in Poor Mental Health			21+ Days in Poor Mental Health		
	(1) Full sample	(2) Full sample	(3) Low Educ.	(4) Full sample	(5) Full sample	(6) Low Educ.
Indep. Prescriptive Authority	-0.134*	-0.093	-0.095	-0.003	-0.002	-0.002
	(0.072)	(0.083)	(0.136)	(0.002)	(0.002)	(0.004)
Low Psychiatrist-to-Pop. Ratio		0.113	0.157		0.002**	0.004*
		(0.075)	(0.124)		(0.001)	(0.002)
Interaction		-0.186*	-0.267*		-0.003	-0.005**
		(0.109)	(0.140)		(0.002)	(0.002)
Male	-0.940***	-0.940***	-0.917***	-0.012***	-0.012***	-0.013***
	(0.028)	(0.028)	(0.060)	(0.001)	(0.001)	(0.002)
White	0.123	0.122	-0.101	-0.002	-0.002	-0.007*
	(0.104)	(0.104)	(0.172)	(0.003)	(0.003)	(0.004)
Black	-0.087	-0.087	-0.513*	-0.005	-0.005	-0.017***
	(0.175)	(0.175)	(0.257)	(0.005)	(0.005)	(0.006)
Hispanic	-0.664***	-0.663***	-1.287***	-0.019***	-0.019***	-0.035***
	(0.139)	(0.139)	(0.200)	(0.004)	(0.004)	(0.005)
Employed	-1.246***	-1.246***	-1.669***	-0.033***	-0.033***	-0.045***
	(0.040)	(0.040)	(0.062)	(0.001)	(0.001)	(0.002)
Health Insurance	-0.355***	-0.355***	-0.103*	-0.009***	-0.009***	-0.004***
	(0.047)	(0.047)	(0.055)	(0.001)	(0.001)	(0.001)
Age: 18 to 34	1.444***	1.445***	1.877***	0.010***	0.010***	0.023***
	(0.064)	(0.064)	(0.114)	(0.001)	(0.001)	(0.004)
Age: 35 to 44	1.651***	1.652***	2.255***	0.025***	0.025***	0.042***
	(0.072)	(0.072)	(0.119)	(0.002)	(0.002)	(0.004)
Age: 45 to 54	1.667***	1.667***	2.322***	0.032***	0.032***	0.050***
	(0.057)	(0.057)	(0.108)	(0.001)	(0.001)	(0.003)
Age: 55 to 64	0.760***	0.760***	1.149***	0.015***	0.015***	0.024***
	(0.042)	(0.043)	(0.115)	(0.002)	(0.002)	(0.004)
Age: 65 and Over	-1.225***	-1.225***	-1.240***	-0.029***	-0.029***	-0.030***
	(0.046)	(0.046)	(0.130)	(0.002)	(0.002)	(0.005)
Education: HS or Less	0.451***	0.451***		0.005	0.005	
	(0.088)	(0.087)		(0.003)	(0.003)	
Education: Some College or More	0.059	0.059		-0.007**	-0.007**	
	(0.085)	(0.084)		(0.003)	(0.003)	
Income: 1st Quintile	1.973***	1.973***	1.652***	0.043***	0.043***	0.037***
	(0.053)	(0.053)	(0.083)	(0.002)	(0.002)	(0.003)
Income: 2nd Quintile	0.665***	0.665***	0.268***	0.010***	0.010***	0.001
	(0.022)	(0.022)	(0.032)	(0.001)	(0.001)	(0.001)
Income: 3rd Quintile	0.044	0.044	-0.397***	-0.005***	-0.005***	-0.016***
	(0.049)	(0.049)	(0.061)	(0.001)	(0.001)	(0.002)
Income: 4th Quintile	-0.467***	-0.467***	-0.873***	-0.017***	-0.017***	-0.028***
	(0.051)	(0.050)	(0.066)	(0.001)	(0.001)	(0.002)
Income: 5th Quintile	-1.274***	-1.274***	-1.633***	-0.035***	-0.035***	-0.044***
	(0.065)	(0.065)	(0.099)	(0.002)	(0.002)	(0.003)
Observations	5,670,468	5,670,468	2,296,282	5,670,468	5,670,468	2,296,282
R^2	0.044	0.044	0.044	0.024	0.024	0.025
Mean Dependent Variable	3.33	3.33	3.86	0.06	0.06	0.07

Notes: Observations are at the individual level with sample weights. Standard errors are clustered by state. All regressions include state and year fixed effects. "Low Educ" is defined as having a high school degree, less than a high school degree, or missing education information. For both income and education, the omitted category is a dummy equal to one if the relevant information is missing and zero otherwise.

Table A.16: Self-Reported Mental Health: Including State-Specific Linear Time Trends

	Days in Poor Mental Health			21+ Days in Poor Mental Health			
	(1) Full sample	(2) Full sample	(3) Low Educ.	(4) (mean) low_educ	(5) Full sample	(6) Full sample	(7) Low Educ.
Indep. Prescriptive Authority	-0.016	-0.032	0.025		0.000	-0.000	-0.000
	(0.159)	(0.162)	(0.180)		(0.002)	(0.002)	(0.002)
Low Psychiatrist-to-Pop. Ratio		-0.059	-0.103			-0.001	-0.002
		(0.067)	(0.097)			(0.001)	(0.002)
Interaction		0.088	0.102			0.002	0.002
		(0.123)	(0.144)			(0.002)	(0.002)
Observations	5,670,468	5,670,468	2,296,282		5,670,468	5,670,468	2,296,282
R^2	0.045	0.045	0.045		0.025	0.025	0.025
Mean Dependent Variable	3.33	3.33		3.86	0.06	0.06	

Notes: Observations are at the individual level with sample weights. Standard errors are clustered by state. All regressions include state and year fixed effects, as well as state-specific linear time trends. Additional controls include dummies for whether the respondent is male, white, black, hispanic, employed, and has health insurance. Dummies for age groups, education groups, and income quintiles are also included. "Low Educ" is defined as having a high school degree, less than a high school degree, or missing education information. "Low Inc" is defined as being in the bottom two quintiles of income.

Table A.14: Self-Reported Number of Days in Poor Mental Health: Robustness (Leave Out)

	(1) 16	(2) 32	(3) 49	(4) 08	(5) 56	(6) 31	(7) 35	(8) 38	(9) 26
Indep. Prescriptive Authority	-0.111	-0.078	-0.104	-0.035	-0.093	-0.100	-0.095	-0.096	-0.091
	(0.080)	(0.087)	(0.083)	(0.094)	(0.083)	(0.083)	(0.083)	(0.083)	(0.085)
Low Psychiatrist-to-Pop. Ratio	0.117	0.114	0.115	0.116	0.113	0.115	0.114	0.114	0.151**
	(0.075)	(0.075)	(0.075)	(0.075)	(0.075)	(0.075)	(0.075)	(0.075)	(0.068)
Interaction	-0.205*	-0.191*	-0.140	-0.202*	-0.185*	-0.193*	-0.171	-0.189*	-0.221**
	(0.113)	(0.109)	(0.123)	(0.110)	(0.109)	(0.112)	(0.125)	(0.111)	(0.109)
Observations	5,571,593	5,608,071	5,554,971	5,543,660	5,585,488	5,499,136	5,566,294	5,602,195	5,552,622
R^2	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044

	(1) 19	(2) 55	(3) 21	(4) 24	(5) 10	(6) 44	(7) 09	(8) 23	(9) 15
Indep. Prescriptive Authority	-0.095	-0.123	-0.093	-0.081	-0.091	-0.094	-0.091	-0.132*	-0.084
	(0.083)	(0.083)	(0.084)	(0.109)	(0.084)	(0.084)	(0.083)	(0.070)	(0.088)
Low Psychiatrist-to-Pop. Ratio	0.114	0.117	0.113	0.113	0.114	0.113	0.113	0.112	0.114
	(0.076)	(0.075)	(0.075)	(0.074)	(0.075)	(0.075)	(0.075)	(0.075)	(0.075)
Interaction	-0.187*	-0.094	-0.189*	-0.185	-0.187*	-0.185*	-0.185*	-0.176	-0.187*
	(0.110)	(0.129)	(0.110)	(0.112)	(0.110)	(0.109)	(0.110)	(0.111)	(0.110)
Observations	5,571,881	5,591,738	5,534,032	5,534,900	5,600,670	5,588,177	5,568,789	5,579,304	5,573,140
R^2	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044

Notes: Observations are at the individual level with sample weights. Standard errors are clustered by state. All regressions include state and year fixed effects. Additional controls include dummies for whether the respondent is male, white, black, hispanic, employed, and has health insurance. Dummies for age groups, education groups, and income quintiles are also included. "Low Educ" is defined as having a high school degree, less than a high school degree, or missing education information. "Low Inc" is defined as being in the bottom two quintiles of income.

Table A.15: Self-Reported 21+ Days in Poor Mental Health: Robustness (Leave Out

	(1) 16	(2) 32	(3) 49	(4) 08	(5) 56	(6) 31	(7) 35	(8) 38	(9) 26
Indep. Prescriptive Authority	-0.003	-0.002	-0.002	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Low Psychiatrist-to-Pop. Ratio	0.002**	0.002**	0.002**	0.002**	0.002**	0.002**	0.002**	0.002**	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Interaction	-0.003	-0.003	-0.001	-0.003	-0.003	-0.002	-0.002	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	5,571,593	5,608,071	5,554,971	5,543,660	5,585,488	5,499,136	5,566,294	5,602,195	5,552,622
R^2	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024

	(1) 19	(2) 55	(3) 21	(4) 24	(5) 10	(6) 44	(7) 09	(8) 23	(9) 15
Indep. Prescriptive Authority	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.003*	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Low Psychiatrist-to-Pop. Ratio	0.002**	0.002**	0.002**	0.002**	0.002**	0.002**	0.002**	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Interaction	-0.003	-0.002	-0.003	-0.002	-0.003	-0.003	-0.003	-0.002	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Observations	5,571,881	5,591,738	5,534,032	5,534,900	5,600,670	5,588,177	5,568,789	5,579,304	5,573,140
R^2	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024

Notes: Observations are at the individual level with sample weights. Standard errors are clustered by state. All regressions include state and year fixed effects. Additional controls include dummies for whether the respondent is male, white, black, hispanic, employed, and has health insurance. Dummies for age groups, education groups, and income quintiles are also included. “Low Educ” is defined as having a high school degree, less than a high school degree, or missing education information. “Low Inc” is defined as being in the bottom two quintiles of income.

Table A.17: Robustness: Correlates of Law Changes

	Unemployment Rates		No. of Psychiatrists		No. of General Practitioners	
	(1) FE & Pop. Only	(2) All Controls	(3) FE & Pop. Only	(4) All Controls	(5) FE & Pop. Only	(6) All Controls
Indep. Prescriptive Authority	-0.000	0.000	8.109	8.185*	-52.965*	-31.032
	(0.002)	(0.002)	(7.339)	(4.549)	(28.158)	(19.434)
Low Psychiatrist-to-Pop. Ratio	-0.000	0.000	3.786	12.926**	-83.379**	26.667
	(0.000)	(0.000)	(5.801)	(5.780)	(35.827)	(17.914)
Interaction	0.000	-0.000	4.930	10.498	53.362	-5.275
	(0.000)	(0.001)	(14.896)	(9.822)	(73.743)	(49.572)
Observations	925,174	925,174	925,174	925,174	925,174	925,174
R^2	0.850	0.851	0.890	0.944	0.967	0.986

Notes: Observations are at the county-month level, and are population weighted. Standard errors are clustered by state. All regressions include state and year fixed effects. The full controls specifications also include total population, population density, percent male, percent white, percent black, percent hispanic, percent unemployed, percent 18 and under, percent 65 and over, percent with a high school degree or less, percent poverty, and median income quintiles (minus the dependent variable). "Low Educ" is defined as having a high school degree or less.

	General Health		Insured	
	(1) FE Only	(2) All Controls	(3) FE Only	(4) All Controls
Indep. Prescriptive Authority	-0.006	-0.001	0.007	0.003
	(0.007)	(0.007)	(0.005)	(0.005)
Low Psychiatrist-to-Pop. Ratio	0.091*	0.106***	0.012	0.003
	(0.046)	(0.036)	(0.035)	(0.032)
Interaction	-0.014	0.000	-0.002	-0.005
	(0.009)	(0.007)	(0.004)	(0.004)
Observations	6,099,200	6,099,200	6,118,736	6,118,736
R^2	0.009	0.165	0.015	0.172

Notes: Observations are at the individual level with sample weights. Standard errors are clustered by state. All regressions include state and year fixed effects. The full controls specifications also include dummies for whether the respondent is male, white, black, hispanic, employed, and has health insurance. Dummies for age groups, education groups, and income quintiles (minus the dependent variable). “Low Educ” is defined as having a high school degree, less than a high school degree, or missing education information. “Low Inc” is defined as being in the bottom two quintiles of income.