

Preliminary  
Do not quote without permission

**Has Wider Availability of Prescription Drugs for Pain Relief  
Affected SSDI and SSI Enrollment?**

David Cutler, Harvard and NBER

Ellen Meara, Dartmouth and NBER

Susan Stewart, NBER

July 2017

This research was supported by the U.S. Social Security Administration through Grant #1 DRC12000002-05 to the National Bureau of Economic Research as part of the SSA Disability Research Consortium. The findings and conclusions expressed are solely those of the author(s) and do not represent the views of SSA, any agency of the Federal Government, or the NBER.

This paper is motivated by two facts. The first is the large and growing share of people who receive disability insurance for pain-related conditions. About 40% of older adults have chronic pain, and musculoskeletal conditions (including back and neck pain, arthritis, and related maladies) are the most common conditions leading people to enroll in Social Security Disability Insurance (SSDI; SSA 2015). The second fact is the enormous increase in availability of opioid medications in recent years. Figure 1 shows national shipments of pain-relieving medications, taken from the Drug Enforcement Administration's ARCOS records. The figure shows morphine milligram equivalents (MMEs) per adult per year; 1,400 milligrams is more than one 30-day prescription per adult per year. Between 2001 and 2010, shipments of pain relievers increased by a factor of nearly four. They have remained at that level since.

The impact of the increased supply of opioids on enrollment in disability programs is unclear. On the one hand, greater availability of pain medications may increase the ability of people with musculoskeletal ailments to remain active and working. Studies of people with cardiovascular disease, vision problems, and mental illness have suggested that therapeutic advance in these areas has led to improved physical and mental health (e.g. Chernew et al., 2015). Similarly, withdrawing the pain reliever Vioxx from the market led to increased enrollment in disability insurance (Garthwaite, 2012). On the other hand, opioid pain relievers may not provide the long-term pain relief that was hoped for given a lack of evidence to support efficacy of opioid analgesics to treat chronic non-cancer pain (Reinecke et al., 2015). Pain reduction is less sustained than has been claimed, and many people become addicted to the pain relievers. With ever higher doses of pain relievers required to avoid withdrawal, it is possible that the need for additional medications prompts people to enroll in disability insurance. And

while chemical dependency has not been permitted as a qualifying impairment for DI since 1997, dependency may accompany a host of other physical and behavioral health conditions that contribute to disability insurance receipt.

In this paper, we examine how expanded availability of opioid medication has affected enrollment in the SSDI and Supplemental Security Income (SSI) programs. We use two types of analysis, both relying on cross-state differences in the availability of opioid medications over time. The first analysis is aggregate: we examine the relationship between state-level changes in the availability of opioid medications from 2001 to 2015 and state-level disability insurance applications. We complement this with micro data from the Health and Retirement Study over the same time period. In these data, we examine how people who report pain are treated in different states over time, and how this is related to subsequent disability enrollment. Before discussing these results, we briefly present information on trends in treatment of pain.

## **I. Pain and Its Treatment**

Pain is notoriously difficult to diagnose and to treat. Pain is subjective; two people with the same physical anatomy can present with very different levels of pain. Further, treatment for severe pain historically has been limited. Drugs that reduced pain often had side effects (e.g., GI bleeding from NSAIDs and cardiovascular complications from Cox-2 inhibitors). Morphine was used for those in serious pain, but the short period of action, potential for addiction, and possibly fatal complications of overdose limited its widespread use.

The revolution in pain treatment was the development and marketing of new opioid-related medications like OxyContin (long-acting oxycodone) in the 1990s. Its marketed advantage was that its long-acting properties would mean that pain relief would last 12 hours,

permitting patients to sleep undisturbed without waking during the night to take pain relievers. Although OxyContin was the market leader, there were many combination medications such as Percocet (oxycodone-acetaminophen) Vicodin (hydrocodone-acetaminophen) and others. Opioid medications like Oxycontin were promoted as longer acting than other opioids on the market at that time and less subject to abuse – though later research has called into question both of these assertions (Moghe, 2016; Ryan, Girion & Glover, 2016). With aggressive promotion from pharmaceutical companies, use of opioid medications expanded greatly, as chart 1 shows.

By 2010, it was clear that many opioid drugs were being abused. Deaths and emergency department admissions for opioid-related diagnoses both soared. A mild pushback ensued. ‘Pill mills’ that supplied high doses of medications with little documentation were shut down, and the manufacturer of the most commonly abused medication reformulated the drug into an abuse-deterrent form. It is unclear how much these measures affected use of medications among the broader population. We explore this in our analysis.

We base our analysis on cross-sectional variation in the rise of opioid medications. We have two state-based measures of the use of pain medications. The first is from Meara et al. (2016) and is the share of disabled Medicare beneficiaries receiving a high dose of opioid medications – greater than 120 milligrams of morphine equivalent (MME) doses daily in any calendar quarter. These data are from the Medicare claims records for the fee-for-service population age 21 to 64 enrolled in Part D (prescription drug coverage) aggregated from beneficiary-year measures from 2006 through 2012. On average, 5.8% of disabled beneficiaries received a high dose of opioid drugs in these years, with a range of 1.6% to 11.5%.

The second source of data is from the Department of Justice’s Drug Enforcement Administration (DEA). All shipments of certain medications are required to be reported to the

DEA, which tabulates shipment by recipient 3-digit zip code. We accessed these reports over the period 2001-2016 (data on some, but not all opioids are also available in 2000). We converted the amount of each individual drug into MMEs. We then aggregated the MMEs at the state-year level and formed a measure of MME per adult (ages 16 plus). To aggregate across years, we regressed the natural log of per adult shipments for 2001-2016 on year dummies, and then averaged the residual by state. By definition, the average state has a residual of 0 with a range of -68% to 54%.

Drug shipments to a state are highly correlated over time, even as aggregate shipments have increased. The correlation between per capita shipments in 2001 and 2010 is 0.71.

Shipments to a state are not necessarily all supplied to residents of that state. Florida was famous in the late 2000s for prescribing medication to out-of-state residents (Halden 2017), and Missouri has a similar reputation today (Stick & Sciffer, 2014). In general, however, such cross-state shopping is likely to be rare. Evidence for this is provided by the high correlation between shipments and the share of disabled on high doses of opioids: 0.56. The top 5 states in terms of share of disabled beneficiaries on a high dose of opioids are Nevada, Delaware, Oregon, Florida, and Tennessee. The lowest 5 states are the District of Columbia, North Dakota, Illinois, Minnesota, and New York.

## **II. Drug Use and Disability Insurance Applications: Aggregate Analysis**

We start our analysis using aggregate information on disability insurance applications by state of residence and use of opioid medications. The source of the data on opioid drug use was presented above. Data on SSDI and SSI applications are from the Social Security

Administration.<sup>1</sup> The data are total applications monthly from 1989 through 2016, though data prior to 1992 and in 2016 are incomplete. We aggregate data for 1992 through 2015 into annual totals for either SSDI, SSI, or both. To normalize applications, we form applications per 100,000 people aged 45-64.

Figure 2 shows the relationship between changes in the logarithm of disability insurance applications per older adult and our two measures of use of opioid medications. Figure 2(a) uses data from 2006 to 2010 and relates changes in disability insurance applications to the change in the share of the disabled on a high dose of opioid medications. Figure 2(b) uses the change in the logarithm of opioid prescriptions per adult and presents data between 2001 and 2010. In each case, the relationship between disability insurance applications and opioid use is positive, though not statistically significant: states where opioid use increased more had increases in SSDI/SSI applications.

Other factors may affect disability insurance applications as well, most particularly the state of the economy. In table 1, we control for two additional factors: the change in the logarithm of real state GDP per capita (from the Bureau of Economic Analysis) and the change in the logarithm of house prices (from the Federal Home Loan Administration). In states where income is higher, disability applications grew less rapidly, although the result is not statistically significant. Controlling for income and house price changes, applications increased more in states with greater increases in opioid use, although not statistically significantly.

Even with these state controls, there may be differences across states in DI application trends that we do not capture. To address this, the final column of Table 1 uses a difference-in-difference methodology. We form changes over two time periods: 2005-2010 and 2010-2015. We pool the two time periods and control for state and year effects. Effectively, our regression

---

<sup>1</sup> We are extremely grateful to Alexi Strand for providing the data to us.

considers how the change in shipment growth over the two time periods is correlated with the change in disability insurance application growth over the time period. The coefficient on shipment growth is again positive and this time statistically significant: areas with more rapid increases in opioid shipments over the time period have greater increases in disability insurance enrollment. Further, the effect is large. A one standard deviation greater increase in opioid shipments (30%) is associated with a 5% increase in disability insurance applications.

### **III. Evidence from Micro Data**

Additional evidence on the relationship between opioid prescriptions and disability insurance applications comes from micro data, where we can look directly at who applies for and receives disability insurance.

We use data from the Health and Retirement Study (HRS), a biennial survey of people aged 51 and older conducted since 1992. We start with a sample of people who are aged 51-56 and enrolled in the HRS in 1992, 1998, and 2004. These are the three cohorts in which significant numbers of people were enrolled and for which we have data through retirement age for most individuals. For each cohort, we further subset to people who were working full-time and reported no pain at first interview, but then reported some pain during at least one subsequent wave. The total sample size is 1,760 people.

We then examine the labor force status of this group at their last survey before age 65 (average age 63). We estimate models for four outcomes: working full time (39%), working part time (17%), on SSDI or SSI (9%), and not in the labor force but not on SSDI or SSI (36%). We control for age and its square, gender, education dummy variables ( $\leq$ high school, some college, college grad), weight dummy variables (normal weight, overweight, obese), smoking dummy

variables (current, former, and never smoker), a dummy for gender, year of survey dummy variables.

Table 2 shows the relationship between state opioid use and labor force status pre-65. The upper part of the table uses the share of the disabled receiving high dose opioids as the measure of opioid use. The lower panel shows the equivalent regression using per capita opioid prescriptions. In each case, states with greater use of opioid prescriptions have a larger share of people who enroll in disability insurance.

### **III. Summary**

Our preliminary evidence suggests that increased prescription of opioid medication was associated with greater increases in disability insurance application and enrollment. Further analyses are exploring these findings in additional detail. Realizing that it would be more informative to perform these analyses at a less broad geographic level than state, and that such data were available, we are currently doing our micro-level analyses at the commuting zone level. We will also perform macro-level analyses at the commuting zone level for the years in which such data are available.<sup>2</sup>

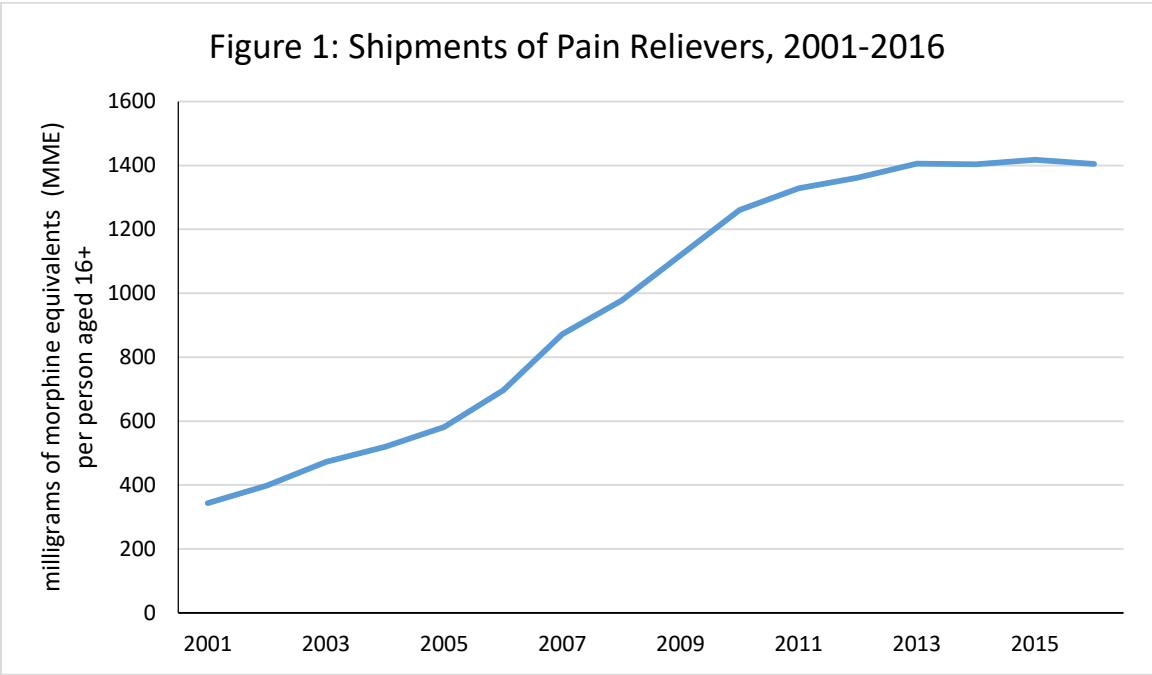
---

<sup>2</sup> We are very grateful to Alexi Strand who is assembling this data for us.



## References

- Michael Chernew, M., Cutler, D.M., Ghosh, & Landrum, MB. (2015) Understanding the Improvement in Disability Free Life Expectancy In the U.S. Elderly Population. NBER Working Paper No. 22306.
- Garthwaite, C. L. 2012. "The Economic Benefits of Pharmaceutical Innovations: The Case of Cox-2 Inhibitors." *American Economic Journal: Applied Economics*, 4(3): 116-37.
- Halden, P. (2017) *The number of daily opioid overdoses in South Florida is overwhelming police*. The Takeaway, PRI, April 20 2017 3:15 pm. <https://www.pri.org/stories/2017-04-20/number-daily-opioid-overdoses-south-florida-overwhelming-police>. Accessed July 25, 2017.
- Moghe, Sonia. *Opioid History: From 'Wonder Drug' To Abuse Epidemic*. CNN, 14 October 2016, <http://www.cnn.com/2016/05/12/health/opioid-addiction-history/>. Accessed June 18, 2017.
- Reinecke, H et al. 2015, "Analgesic Efficacy of Opioids in Chronic Pain: Recent Meta-Analyses," *British Journal of Pharmacology*, 172(2): 324-333.
- Ryan H, Girion L, Glover S, Eds. (2016) *You want a description of hell? 'OxyContin's 12-hour dosing problem*. LA Times; May 5, 2016. <http://www.latimes.com/projects/oxycontin-part1/>. Accessed July 23, 2017.
- Social Security Administration. Annual Statistical Report on the Social Security Administration, 2015. 2016, Rockville, MD, [https://www.ssa.gov/policy/docs/statcomps/di\\_asr/](https://www.ssa.gov/policy/docs/statcomps/di_asr/)
- Stick, A. & Sciffer, A. (2014) Missouri is only state with no prescription drug monitoring program. *Columbia Daily Tribune*, Nov 8, 2014. <http://www.columbiatribune.com/abe79024-12b8-54b0-96ff-104f245b407d.html>. Accessed July 23, 2017.



Note: Data are from the Drug Enforcement Administration’s ARCOS database.



Table 1: Regressions Explaining Growth of DI Applications

Independent Variable	2006-10	2001-10	2005-15
Change in percent with high dose opioids	.012 (.014)	---	---
Change in opioid shipments per adult	---	.042 (.065)	.162** (.080)
Change in ln(real GDP/capita)	-.167 (.219)	-.367 (.225)	-.073 (.240)
Change in ln(House Price Index)	-.015 (.096)	.190 (.142)	.034 (.110)
N	51	51	102
R <sup>2</sup>	.080	.087	.899

Note: The dependent variable is the change in DI applications per 100,000 people aged 45-64.

Table 2: Models for Labor Force Status Before Age 65

Independent Variable	Outcome Relative to Working Full Time		
	Work PT	SSDI/SSI	Not in Labor Force
Percent of people with high dose prescriptions	.014 (.050)	.160** (.072)	.086** (.043)
N		1,760	
R <sup>2</sup>			
Opioid shipment rate in state	.137 (.293)	1.321** (.318)	.415* (.247)
N		1,760	
R <sup>2</sup>			

Note: Data are from the Health and Retirement Study. The sample is people first enrolled in 1992, 1998, or 2004, working full-time and without pain and baseline, and who experience some pain before the last pre-65 interview. Standard errors are clustered at the state level.