

California County Fact Sheets: Treatment Gaps in Opioid-Agonist Medication-Assisted Therapy (OA-MAT) and Estimates of How Many Additional Prescribers Are Needed

Methodological Appendix

Lisa Clemans-Cope, Douglas A. Wissoker, and Marni Epstein

Summary of Methods

This file presents the methodology used to produce county-level estimates of opioid use disorder (OUD) and treatment needs in California counties, for a project funded by the California Health Care Foundation (CHCF). The main objective was to estimate additional buprenorphine-waivered prescribers needed per county to achieve capacity to treat all people with OUD. This analysis is subject to several assumptions and limitations, as described below.

To estimate the demand for treatment, we calculated county rates of OUD, starting with estimates of past-year nonmedical use of prescription pain relievers for 26 substate regions in California from the NSDUH (Lipari et al. 2017), and adjusting these estimates for additional NSDUH estimates of heroin use disorder and recent trends. We then used regression models to predict county-level rates as a function of explanatory variables that have an empirical relationship with OUD (Alzeer et al. 2017; Paulozzi et al. 2017). We tested a variety of models that produced similar patterns of results. We applied county-level estimates of the population from the Centers for Disease Control and Prevention (CDC) to create county-level counts, which were adjusted to match the NSDUH substate counts. To estimate county OUD rates, the share of OUD among those who misuse opioids (0.2 based on 2016 national NSDUH estimates) was applied to estimated opioid misuse rates. To estimate buprenorphine MAT capacity, we drew on the DEA Active Controlled Substances Act (CSA) Registrants database, which includes all DATA-waived buprenorphine prescribers. We mapped prescriber addresses to county using a ZIP code to county crosswalk from UDS Mapper and the Census Bureau, and for ZIP codes that map to more

than one county, we geocoded addresses through the Google Geocoding API. In counties where the number of prescribers from California's CURES data was larger than our estimate based on DEA data, we adjusted the estimated number of waived prescribers, preserving the distribution of waiver limits from the DEA data. We calculated county buprenorphine treatment capacity using a lower bound of estimated average capacity in California of nine patients per provider (Thomas et al. 2017) and an upper bound equal to half of a prescriber's estimated maximum patient waiver limit. Treatment capacity related to out-of-county buprenorphine prescribers and methadone slots at OTPs in the county were added. To compute the treatment gap, i.e. the number of individuals with OUD who do not have access to MAT in their county, we assumed that all individuals with OUD are likely to seek MAT. We calculated the treatment gap by subtracting the low and high estimated range of the treatment capacity in each county from the estimated number with OUD. We computed the estimated number of additional 30-waivered buprenorphine prescribers needed per county to achieve capacity to fill the estimated treatment gap. We present strategies to meet demand for treatment, showing a range using lower and upper estimates of the treatment gap and the treatment capacity. In cases where the number of new prescribers needed would be more than double the number of current buprenorphine prescribers, we present an alternative, more feasible strategy of doubling the number of prescribers. In these cases, we present the percent of the treatment gap that would be filled.

Data Sources and Key Variables

Our estimates are based on several data sources. For several opioid-related county-level indicators, we used estimates available from the [California Opioid Overdose Surveillance Dashboard](#) (CDPH 2017). We used data for 57 counties—all counties except Los Angeles—and seven Los Angeles service planning areas (SPAs), which are sub-county estimates based on census tracts. Staff from the California Department of Public Health provided us with aggregate counts for the relevant Dashboard estimates for Los Angeles SPAs, which are not available publicly.

We drew on the following county-level Dashboard estimates (levels and crude rates for counties and counts for SPAs) for:

- Buprenorphine prescriptions by patient location, 2016, from Controlled Substance Utilization Review and Evaluation System (CURES) 2.0.
- All opioid overdose deaths, 2016, from death certificate data from California Department of Public Health (CDPH) vital statistics Multiple Cause of Death file

- Midyear county populations from CDC WONDER Bridge-Race Population Estimates, produced by the U.S. Census Bureau and the National Center for Health Statistics (NCHS).

We used the same 2016 midyear population estimates used in the California Opioid Overdose Surveillance Dashboard for all further estimates of rates. Population estimates are from the [Bridged-race Population Estimates](#) published by the Centers for Disease Control and Prevention (CDC). We used 2013 Los Angeles SPA population estimates, the most recent available, from the Los Angeles County Office of Planning, Evaluation and Development,¹ to calculate the proportion of the total Los Angeles county population in each SPA. We applied these proportions to the 2016 midyear Los Angeles population estimate from the CDC to estimate the 2016 midyear population in each SPA.

We used past-year [estimates of nonmedical use of prescription pain relievers for 26 substate regions in California](#) (Lipari et al. 2017). These estimates were produced by Substance Abuse and Mental Health Services Administration (SAMHSA), combining 2012 to 2014 data from the National Survey on Drug Use and Health (NSDUH), which provides estimates of the use of alcohol, tobacco, and drugs by the US civilian, noninstitutionalized population aged 12 years or older. The substate regions, created in consultation with the California Department of Health Care Services, are defined by aggregations of California's 58 counties, except Los Angeles, which is split into 7 service planning areas. Additionally, we used the most recent western region measure of prescription pain reliever misuse, the comparable measure to prescription pain reliever nonmedical use in the 2015 NSDUH, and the most recent national measure of nonmedical use of prescription pain relievers, both from the 2015 NSDUH; more detailed geographic data are not available publicly.

Nonmedical use of prescription pain relievers is defined as the use without a prescription that occurred simply for the experience or feeling it caused. Misuse of prescription pain relievers is defined in the NSDUH as use in any way not directed by a doctor, including use without a prescription of one's own, use in greater amounts, more often, or longer than told, or use in any other way not directed by a doctor. Prescription pain relievers do not include over-the-counter drugs. We inflate prescription pain reliever misuse rates to account for the percent of people who misused heroin who did not misuse prescription pain relievers to estimate opioid misuse rates.

We used the [2016 estimated national share of opioid use disorder \(OUD\) among those who misuse opioids to calculate county OUD rates](#). This estimate was produced by Substance Abuse and Mental Health Services Administration (SAMHSA), using 2016 data from the NSDUH. OUD is defined as self-report of heroin use or opioid abuse or dependence consistent with Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria.

As a measure of buprenorphine treatment prescribers, we used the Drug Enforcement Administration (DEA) Active Controlled Substances Act (CSA) Registrants database from the National Technical Information Service (NTIS). The DEA database contains information on all registered prescribers across all types (Doctor of Medicine and Doctor of Osteopathic Medicine, Nurse Practitioner, Physician Assistant), including prescriber name and address, whether the prescriber has obtained a DATA-waiver, authorized patient limit (30, 100, 275), and DATA-waiver expiration date. We mapped prescriber addresses to county using a ZIP code to county crosswalk from [UDS Mapper](#) and the [Census Bureau](#), and for ZIP codes that map to more than one county, we geocoded addresses through the Google Geocoding API in R. These data are valid as of February 2018 and were purchased through [NTIS](#).

We also used aggregate counts of all prescribers and buprenorphine prescribers, by prescriber and patient location, from the Controlled Substance Utilization Review and Evaluation System (CURES). This aggregate data were provided to us by CHCF.

As a measure of methadone treatment providers in the county and an estimate of the number of methadone patients treated, we aggregated data from the 2016 California data from the SAMHSA Opioid Treatment Program (OTP) Directory, which provides the address of each OTP in California (SAMHSA 2016). In December 2016 when the 2016 data were collected, the directory included the number of methadone patients at each OTP in California.

Methods

Prevalence of Opioid Use Disorder (OUD) by County

To estimate treatment need, we calculated estimated rates of past-year opioid abuse or dependence by county. We started with the estimates of past-year nonmedical use of prescription pain relievers for people ages 12 and older, for 26 substate regions in California from the combined 2012 to 2014 NSDUH data. We then adjusted this 2012 to 2014 rate upward to account for the increased prevalence of pain reliever misuse, the comparable measure to nonmedical use in the 2015 NSDUH, observed from the 2012 to 2014 period to the most recent period available, 2015. Using these estimates, we multiply each sub-state rate by 1.109 to adjust for increases in the rate of Rx misuse over time.² Since the substate estimate includes only Rx OUD and not heroin use disorder (HUD), we make an additional upward adjustment to account for the approximately 9.8% of people with an opioid use disorder who have HUD but not also Rx OUD. We multiply each sub-state rate by 1.108 (i.e. $1 \div (1 - 0.098)$) to adjust for these individuals with HUD, resulting in estimated substate misuse rates for people ages 12 and

over. To estimate county rates of OUD, we apply the national rate of OUD among those who misuse opioids (0.18 of those who misuse opioids) to county opioid misuse rates.

Starting with these estimated substate OUD rates,³³ we used ordinary least squares (OLS) regression models to predict county-level OUD rates as a function of explanatory variables that have an empirical relationship with OUD. We used existing research to select independent variables (Alzeer, Jones, and Bair 2017; Paulozzi et al. 2011), presumed to capture variation in counties' underlying OUD rates, as independent variables in the model. We tested a variety of models which produced similar patterns of results, and very good performance for predicting OUD rates. We chose the following parsimonious model: buprenorphine prescription crude rates by patient location in 2016, opioid overdose ED visit rates by facility location in 2015, and the proportion of the population that was age 20 to 24 in 2016, weighted by 2016 county population (R-squared 0.4046). We used this model to predict county-level OUD rates. County-level estimates of the population from the Centers for Disease Control and Prevention (CDC) were applied to these rates to create county-level counts, which were aggregated to the substate regions and adjusted to match the NSDUH substate counts.

Estimated Buprenorphine MAT Treatment Capacity by County

To estimate buprenorphine MAT treatment capacity or treatment “slots”, we calculated county counts of the number of patients who could be treated with buprenorphine MAT. We first counted the number of DATA-waivered prescribers from the DEA database. We then compare the total number of prescribers per county with the number of prescribers who prescribed buprenorphine in 2016 per county from CURES data. In counties where the number of prescribers from CURES data was larger than our estimate from the DEA database, we inflate counts of the number of prescribers with each waiver limit in the county up to the CURES number. We then calculate the number of prescribers from a different county who prescribed to patients in the county from the CURES data; in other words, we calculate the number of out-of-county prescribers who prescribe to patients in the county. Because there is an average of twice as many out-of-county prescribers who prescribe into the county than there are in-county prescribers, we assume out-of-county prescribers treat fewer patients than in-county prescribers. We make an approximation that out-of-county prescribers treat half as many patients as an in-county prescriber with a 30-waiver limit.

Starting with the counts of DATA-waived providers with a 30-, 100-, or 275-patient limit by county, we used a lower bound of treatment capacity from the literature of 9 patients (specifically, 8.8 patients) per waived prescriber based on a California-specific finding from Thomas et al. (2017). This estimate likely over-estimates actual capacity since it describes the average monthly number of patients per

prescriber excluding months during which prescribers had no patients. We assume 4.4 patients per out-of-county prescriber based on the reasoning explained above. Since literature, e.g. Thomas et al. (2017), shows that most buprenorphine-waivered prescribers have a mean patient count well below their patient limit and have numerous months with no patient episodes, we use an upper bound that is lower than the maximum waiver limit. We use an upper bound that assumes all prescribers treat half of their maximum allowable waiver-limit (i.e. 15 for those with a 30-waiver, 50 for those with a 100-waiver, 137.5 for those with a 275-waiver, and 7.5 for out-of-county prescribers). We examined and tested additional estimates of patients per prescriber from the literature (Huhn and Dunn 2017; Blum et al. 2016; Jones et al. 2015; Arfken et al. 2010; Knudsen et al. 2017; Sigmon 2015) In almost all cases, these two estimates of buprenorphine MAT treatment capacity present a range that comprises all the estimates we generated based on the literature.

Estimated Buprenorphine MAT Treatment Gap, Assuming All Individuals with OUD Seek Opioid Agonist Medication-Assisted Treatment (OA-MAT)

To compute the number of individuals with OUD who do not have access to treatment in their county, we started with the county-level counts of the number of individuals with OUD. We assume that all people with opioid use disorder will seek treatment. Recent literature describing treatment in the U.S. suggests that about one-fifth (19.4%) of individuals with OUD received opioid-related treatment in the past year (Wu, Zhu, and Swartz 2016).

We subtracted the number of people estimated to have OUD per county by the treatment capacity in each county, assuming that buprenorphine-waivered prescribers treat an average of about 9 patients each as described above. We also subtract the number of people being treated with methadone in OTPs, and inflate the number being treated in an OTP to account for the assumption that OTPs are operating at only 80% capacity. The number of people being treated with methadone in OTPs in 2016 was obtained from SAMHSA's [Opioid Treatment Program Directory](#), which previously published the approximate number of methadone patients at each OTP, based on federal form SMA-162. The result is an upper estimate of the buprenorphine MAT treatment gap, since the estimated average number of patients per provider is likely to be biased downward. We also computed a lower bound estimate of the treatment gap. We subtracted the number of people estimated to have OUD per county by the treatment capacity in each county, assuming each waivered prescriber treats half of the maximum number of patients allowable (i.e., their waiver limit), resulting in the minimum buprenorphine MAT treatment gap.

Estimated Additional Buprenorphine Prescribers Needed to Fill the Treatment Gap

To compute the estimated number of additional buprenorphine prescribers needed per county to achieve capacity to treat all people with OUD, we calculated several options. We computed how many additional 30-waiver prescribers would be needed to fill the treatment gap under different assumptions. We computed a maximum estimate of the number of new 30-waivered prescribers needed based on the estimate of 9 patients per prescriber and the upper bound buprenorphine MAT treatment gap. We computed a minimum estimate of the number of new 30-waivered prescribers needed based on patient limit of 15 patients (half of a newly waived prescriber's maximum) and the minimum treatment gap, which assumes all current providers treat half of their waiver limit.

The main recommendations include a “cap” on the recommendations to ensure that the estimates of new providers needed are feasible for counties. These recommendations limit the number of new prescribers recommended to the number of current prescribers. This ensures that at a maximum, we recommend that a county double their number of prescribers.

We conducted all analyses with Stata version 14 (StataCorp 2015).

Limitations and Considerations

This study has several limitations. First, the NSDUH survey data used to estimate rates of OUD are based on self-reported information (and are thus subject to recall and social-desirability biases) and exclude some populations likely to have relatively higher rates of OUD, such as people who are homeless and do not use shelters and people who are in institutional settings such as people in jails. As a result, the estimated OUD rates may be high or low. Second, the substate NSDUH estimates that are used as key inputs to our analyses are model-based small area estimates, with limitations described elsewhere (SAMHSA 2015). Third, the estimates related to the number of patients treated by each waived provider may be high or low; improving these estimates is an area for further research. Fourth, to predict county-level OUD rates, one of the independent predictors was opioid overdose ED visit rates by facility location because patient location was not available for this measure. This would tend to slightly bias downwards the rate of OUD for counties where residents with an opioid overdose ED visit was treated in a different county. Fifth, the average treatment duration for buprenorphine MAT treatment is less than one year; thus, a prescriber could potentially use each of their waived slots to treat multiple patients sequentially over the course of a year. Sixth, the treatment gap could be filled under alternative scenarios, e.g. by shifting some providers who are already waived to higher patient limits. These alternatives likely result in lower estimates of additional providers needed, since research

using data from 2011 suggests that providers with higher waiver limits treat more patients, particularly in rural areas (Stein et al. 2015). Seventh, not all individuals with OUD are likely to seek treatment.

Taken together, these limitations related to estimation suggest that the main estimates of additional buprenorphine-waivered prescribers needed per county to achieve capacity to treat all people with OUD who seek care may be somewhat high. Further sensitivity analysis is planned, and estimates could be updated to reflect any new information that becomes available.

Lastly, we note that the clinical impact of increasing the number of buprenorphine-waivered prescribers in a county or any particular area has not yet been documented in the literature, although buprenorphine MAT treatment has been shown to be highly effective. However, an important consideration is that many individuals with OUD need access to more intensive treatment than outpatient MAT treatment, such as residential or inpatient services. And, many individuals need treatment for substance use disorders that co-occur with OUD and comorbid mental health conditions. Treating those additional conditions may decrease the risk of opioid use relapse.

Notes

- ¹ LA Service Planning Area 2013 Population estimates can be found at http://publichealth.lacounty.gov/plan/docs/CHA_CHIP/SPA1Supplement.pdf, http://publichealth.lacounty.gov/plan/docs/CHA_CHIP/SPA2Supplement.pdf, http://publichealth.lacounty.gov/plan/docs/CHA_CHIP/SPA3Supplement.pdf, http://publichealth.lacounty.gov/plan/docs/CHA_CHIP/SPA4Supplement.pdf, http://publichealth.lacounty.gov/plan/docs/CHA_CHIP/SPA5Supplement.pdf, http://publichealth.lacounty.gov/plan/docs/CHA_CHIP/SPA6Supplement.pdf, http://publichealth.lacounty.gov/plan/docs/CHA_CHIP/SPA71Supplement.pdf, http://publichealth.lacounty.gov/plan/docs/CHA_CHIP/SPA8Supplement.pdf.
- ² These 2015 estimates of Rx OUD prevalence are only available for the Western region, which historically has had similar rates of Rx OUD to California.
- ³ Since age plays a major role in predicting OUD, we use crude rates rather than age-adjusted rates in the regression model so that the effects of age are included in the predictions.

References

- Alzeer, Abdullah H., Josette Jones, and Matthew J. Bair. 2017. "Review of Factors, Methods, and Outcome Definition in Designing Opioid Abuse Predictive Models." *Pain Medicine*, July. <https://doi.org/10.1093/pm/pnx149>.
- Arfken, Cynthia L., Chris-Ellyn Johanson, Salvatore di Menza, and Charles Roberts Schuster. 2010. "Expanding Treatment Capacity for Opioid Dependence with Office-Based Treatment with Buprenorphine: National Surveys of Physicians." *Journal of Substance Abuse Treatment* 39 (2):96–104. <https://doi.org/10.1016/j.jsat.2010.05.004>.

- Blum, Kenneth, Mark Gold, H. Westley Clark, Kristina Dushaj, and Rajendra D. Badgaiyan. 2016. "Should the United States Government Repeal Restrictions on Buprenorphine/Naloxone Treatment?" *Substance Use & Misuse* 51 (12):1674–79. <https://doi.org/10.1080/10826084.2016.1200097>.
- CDPH. 2017. "California Opioid Overdose Surveillance Dashboard." California Department of Public Health (CDPH). 2017. https://pdop.shinyapps.io/ODdash_v1/.
- Hughes, Arthur, Matthew Williams, Rachel Lipari, Jonaki Bose, Elizabeth A. P. Copello, and Larry A. Kroutil. 2016. "Prescription Drug Use and Misuse in the United States: Results from the 2015 National Survey on Drug Use and Health." NSDUH Data Review. <https://www.samhsa.gov/data/sites/default/files/NSDUH-FFR2-2015/NSDUH-FFR2-2015.pdf>.
- Huhn, Andrew S., and Kelly E. Dunn. 2017. "Why Aren't Physicians Prescribing More Buprenorphine?" *Journal of Substance Abuse Treatment* 78 (July):1–7. <https://doi.org/10.1016/j.jsat.2017.04.005>.
- Jones, Christopher M., Melinda Campopiano, Grant Baldwin, and Elinore McCance-Katz. 2015. "National and State Treatment Need and Capacity for Opioid Agonist Medication-Assisted Treatment." *American Journal of Public Health*. <https://ajph.aphapublications.org/doi/full/10.2105/AJPH.2015.302664>.
- Knudsen, Hannah K., Jennifer R. Havens, Michelle R. Lofwall, Jamie L. Studts, and Sharon L. Walsh. 2017. "Buprenorphine Physician Supply: Relationship with State-Level Prescription Opioid Mortality." *Drug and Alcohol Dependence* 173 (April): 555–64. <https://doi.org/10.1016/j.drugalcdep.2016.08.642>.
- Lipari, Rachel, Struther Van Horn, Arthur Hughes, and Matthew Williams. 2017. "State and Substate Estimates of Nonmedical Use of Prescription Pain Relievers." Substance Abuse and Mental Health Services Administration (SAMHSA). https://www.samhsa.gov/data/sites/default/files/report_3187/ShortReport-3187.html.
- Paulozzi, LJ, Christopher M. Jones, K. A. Mack, and Rose A. Rudd. 2011. "Vital Signs: Overdoses of Prescription Opioid Pain Relievers-- United States, 1999--2008." *Morbidity and Mortality Weekly Report*. <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6043a4.htm>.
- SAMHSA. 2015. "Substate Estimates from the 2012-2014 NSDUHs: Methodology, SAMHSA, CBHSQ." 2015. <https://www.samhsa.gov/data/sites/default/files/NSDUHsubstateMethodology2014/NSDUHsubstateMethodology2014.htm>.
- "Opioid Treatment Program (OTP) Directory." 2016. <http://dpt2.samhsa.gov/treatment/directory.aspx>.
- "Buprenorphine Treatment Practitioner Locator." 2017. <https://www.samhsa.gov/medication-assisted-treatment/physician-program-data/treatment-physician-locator>.
- Sigmon, Stacey C. 2015. "The Untapped Potential of Office-Based Buprenorphine Treatment." *JAMA Psychiatry* 72 (4):395. <https://doi.org/10.1001/jamapsychiatry.2014.2421>.
- Stein, Bradley D., Rosalie Liccardo Pacula, Adam J. Gordon, Rachel M. Burns, Douglas L. Leslie, Mark J. Sorbero, Sebastian Bauhoff, Todd W. Mandell, and Andrew W. Dick. 2015. "Where Is Buprenorphine Dispensed to Treat Opioid Use Disorders? The Role of Private Offices, Opioid Treatment Programs, and Substance Abuse Treatment Facilities in Urban and Rural Counties." *Milbank Quarterly* 93 (3): 561–83.
- Thomas, Cindy Parks, Erin Doyle, Peter W. Kreiner, Christopher M. Jones, Joel Dubenitz, Alexis Horan, and Bradley D. Stein. 2017. "Prescribing Patterns of Buprenorphine Waivered Physicians." *Drug and Alcohol Dependence* 181 (December):213–18. <https://doi.org/10.1016/j.drugalcdep.2017.10.002>.
- WHO. 2013. "WHO, UNODC, UNAIDS Technical Guide for Countries to Set Targets for Universal Access to HIV Prevention, Treatment and Care for Injecting Drug Users – 2012 Revision." http://www.who.int/hiv/pub/idu/targets_universal_access/en/.
- Wu, Li-Tzy, He Zhu, and Marvin S. Swartz. 2016. "Treatment Utilization among Persons with Opioid Use Disorder in the United States." *Drug and Alcohol Dependence* 169 (December):117–27. <https://doi.org/10.1016/j.drugalcdep.2016.10.015>.

Acknowledgments

This report was funded by California Health Care Foundation (CHCF). We are grateful to them and to all our funders, who make it possible for Urban to advance its mission.

The views expressed are those of the authors and should not be attributed to the Urban Institute, its trustees, or its funders. Funders do not determine research findings or the insights and recommendations of Urban experts. Further information on the Urban Institute’s funding principles is available at urban.org/fundingprinciples.

For more information on this project, see urban.org/policy-centers/health-policy-center/projects/california-county-fact-sheets-treatment-gaps-opioid-agonist-medication-assisted-therapy-oa-mat-and-estimates-how-many-additional-prescribers-are-needed.



2100 M Street NW
Washington, DC 20037

www.urban.org

ABOUT THE URBAN INSTITUTE

The nonprofit Urban Institute is a leading research organization dedicated to developing evidence-based insights that improve people’s lives and strengthen communities. For 50 years, Urban has been the trusted source for rigorous analysis of complex social and economic issues; strategic advice to policymakers, philanthropists, and practitioners; and new, promising ideas that expand opportunities for all. Our work inspires effective decisions that advance fairness and enhance the well-being of people and places.

Copyright © March 2018. Urban Institute. Permission is granted for reproduction of this file, with attribution to the Urban Institute.