

## Supplementary Online Content

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**eTable.** Association of Select Public Health Legal Interventions With Health Outcomes

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable. Association of Select Public Health Legal Interventions With Health Outcomes

| Issue                             | Citation  | Potential mechanism for reducing morbidity or mortality  | Assessments or findings   |
|-----------------------------------|---|--|---|
| <b>Opioids</b>                    |   |  |   |
| Increase access to naloxone       | Utah Code Annot § 2655-105 (2016)                               | Reversing effects of opioid overdoses via (1) standing orders for pharmacist dispensing of naloxone; and (2) Good Samaritan protections for prescribing, dispensing, and administering | Assessment of population in 50 states and DC from 2000-2014 found that a combination of naloxone access and Good Samaritan laws was associated with decreases in OUDs compared to states lacking similar laws. OUDs increased from 2.71/100 000 persons in 2000 to 8.43/100 000 persons in 2014. Among states with naloxone access laws, however, OUDs decreased by approximately 14% ( $P = .033$ ), or 1.18/100 000 persons, over this same period. Among states with Good Samaritan laws, OUDs decreased by approximately 15% ( $P = .050$ ), or 1.26/100 000 persons, over this same period. Among African Americans, OUDs decreased by 23% ( $P = .001$ ), or 1.94/100 000 persons, and 26% ( $P < .001$ ), or 2.19/100 000 persons, respectively <sup>1</sup>   |
| Authorize OAT                     | 12 Virginia Admin Code § 30-130-5000 et seq (2017) <sup>2</sup> | Reducing mortality risks for persons with opioid use disorder by removing barriers or increasing access to OAT involving methadone and buprenorphine <sup>3,4,5</sup>                  | Comparison of 17 568 Massachusetts adult overdose survivors from 2012-2014 found OUD decreases over a year-long assessment compared to those not receiving medication assisted treatment. All-cause mortality among the study group was 4.7 deaths (95% CI, 4.4-5.0 deaths) and opioid-related mortality was 2.1 deaths (95% CI, 1.9-2.4 deaths) per 100 person-years. Among persons enrolled in methadone maintenance treatment (11.6% of cohort, or 2040 persons), decreases were measured in all-cause mortality (AHR, 0.47; 95% CI, 0.32-0.71) and opioid-related mortality (AHR, 0.41; 95% CI, 0.24-0.70). Among persons receiving buprenorphine (17.2% of cohort, or 3022 persons) decreases were measured in all-cause mortality (AHR, 0.63; 95% CI, 0.46-0.87) and opioid-related mortality (AHR, 0.62; 95% CI, 0.41-0.92) <sup>6</sup> |
| <b>Alcohol</b>                    |   |  |   |
| Increase state alcohol sales tax  | Maryland Code Ann, Tax General § 11104(g) (2011)                | Lowering excessive alcohol consumption and related harms via increase of state tax on sales of alcoholic beverages   | Over a 29 mo period a 50% increase in alcohol sales tax (from 6% to 9%) led to a gradual annual reduction of 6% ( $P < .03$ ) in monthly rates of alcohol-positive drivers ( $n = 34\ 098$ ) involved in injury collisions from 227.661 drivers per month from January 2001-July 2011 ( $n = 28\ 906$ ) to 179.03 drivers per month from August 2011-December 2013 ( $n = 5192$ ) <sup>7</sup>  |
| Reduce density of alcohol outlets | San Francisco Planning Code Art 7 § 781.9 (2019)                | Diminishing density of alcohol outlets and consequent reduction in excessive alcohol   | A 2009 meta-analysis of several time-series studies of alcohol outlet density changes concluded density limits may be associated with reducing alcohol consumption and medical and other harms (eg, domestic violence, public nuisances, loitering, vandalism, and other crimes) <sup>8</sup>   |

|                                |  |  |   |
|--------------------------------|--|--|---|
|                                |  | consumption and related harms  |   |
| <b>Tobacco</b>                 |  |  |   |
| Smoke free                     | Wisconsin Stat § 101.123(2)(a) (9) (2010)                | Cutting tobacco use among persons in employment or other public places where primary and second-hand smoke impacts persons' respiratory health | A study of 531 bartenders within 3-6 mos after 2010 implementation of legal antismoking intervention observed a significant decrease in 8 upper respiratory symptoms among non-smoking bartenders (eg, reported 9% decrease, from 37% to 28% ( $P = .003$ ), in “wheezing or whistling in the chest” and a 16%, decrease, from 54% to 38% ( $P = .000$ ), in morning coughing) <sup>9</sup>   |
| Tobacco tax                    | CHIP Reauthorization Act of 2009, 26 USCA § 5701 (2009)  | Decreasing smoking initiation among youth users as well as past-month smoking  | Examination of smoking behaviors of youth/young adults from 2002-2011 showed a 2009 federal tax of .62 cents per cigarette pack was associated with reducing average rates of smoking initiation from 6.7% before the tax increase to 5.1% afterwards. The average rates of youth (aged 12-17) past-month smoking at 10.9% decreased to 8.3% after the tax increase. Odds for both decreased (OR = 0.83, $P < .0001$ ) <sup>10</sup>  |
| <b>Firearm violence</b>        |  |  |   |
| Universal background checks    | California Penal Code § 28050 (2012)                     | Reducing homicide rates through firearm background checks at point of purchase or via license/permit application                               | After simultaneously controlling for 10 state firearm laws in 50 states from 1991-2016, universal background checks were associated with a 14.9% (95% CI, 5.2%-23.6%) reduction in homicide rates <sup>11</sup>   |
| Violent misdemeanor laws       | Hawaii Rev Stat Annot § 134-7 (2013)                     | Lessening homicide rates through prohibitions of firearm possession among those committing violent misdemeanors                                | After simultaneously controlling for 10 state firearm laws in 50 states from 1991-2016, violent misdemeanor laws were associated with a 18.1% (95% CI, 8.1%-27.1%) reduction in homicide rates <sup>12</sup>  |
| <b>Suicide</b>                 |  |  |   |
| Extreme risk protection orders | Indiana Code § 35-47-14 (2016)                           | Lowering suicide rates through the seizure of firearms from individuals deemed a threat to themselves or others                                | Examination of 14 suicide outcomes from 2006-2017 for 395 gun-removal actions showed the proportion of suicides by men involving guns (7 out of 14) decreased compared with the portion of suicides by men involving guns in Indiana's general population (50% vs 58%, respectively) and was lower than expected among firearm owners (65% or higher). Based on comparable case fatality rates, 1 firearm-related fatality was prevented for every 10.1 firearm removal actions <sup>12</sup> |
| Suicide prevention training    | Garett Lee Smith Memorial Act, 42 USCA § 290bb-36 (2016) | Reducing suicides and attempts via funds and technical assistance for states to train those in contact with adolescents to                     | Assessment of 466 counties implementing program activities from 2006-2009 found significantly lower suicide attempt rates (4.9 fewer attempts per 1000 youths) among 16-23 y olds in the following year compared to 1161 similar counties not implementing such activities. Between 2008-2011 more than 79 000 suicide attempts may have been averted <sup>13</sup>   |

|                                  |  |   |  |
|----------------------------------|--|---|--|
|                                  |  | identify high risk youth and offer treatment or service referrals                                       |  |
| <b>Obesity/hypertension</b>      |  |   |  |
| Taxing sugar-sweetened beverages | Berkeley City Ordinance # 7388-N.S. (2015)   | Diminishing obesity and related diseases by decreasing consumption of SSBs                              | Assessment of SSB tax between 2014-2017 concluded that consumption decreased in demographically-diverse Berkeley neighborhoods by 0.55 times per day with residents reporting drinking 52% fewer servings (from 1.25 to .70 servings per day) after passage compared to pre-tax consumption in 2014 <sup>14,15</sup>   |
| Food nutrition in schools        | Child Nutrition & WIC Reauth Act of 2004, 42 USCA § 1751-1769j (2004); Healthy, Hunger-Free Kids Act of 2010, PL # 111-296, 124 Stat 3138 (2010) | Reducing obesity and hypertension risk through school food nutrition policies to lower increases in BMI | An evaluation of 211 5-8th grade students in 12 school districts from 2011-2015 attending schools receiving federal technical support for nutrition programs found (1) less frequent consumption of SSBs (37.95% vs 27.18% of students drank SSBs on 2 or fewer days in the past 7 d; OR = 1.36, <i>P</i> = .025) by the end of the study. Students were also less likely to have an increase in BMI (of less than 1% vs 2%-3%) compared to 193 students at schools not receiving technical support <sup>16</sup>  |
| Posting calorie information      | NY City Health Code § 81.50 (2016)   | Requiring chain restaurants to post calories for standard menu items                                    | Assessment of health data from 61 New York counties from 2004-2012 showed that calorie labeling requirements were associated with a 3.0% decrease (or .818 actual difference) in average BMI among adult populations in 11 counties (BMI mean of 26.790) compared to adult populations in 50 counties (BMI mean of 27.608) that had not required calorie labeling <sup>17</sup>  |
| <b>Social determinants</b>       |  |   |  |
| Expanding health care access     | Affordable Care Act, 42 USCA § 1396a(a)(10)(A)(i) (VIII) (2010)  | Addressing racial disparities via enhanced health care coverage provisions that increase access to care | Examination of ACA's major coverage provisions found a reduction between 2013-2015 in average national racial disparities between Whites and Hispanics and Whites and African-Americans regarding: (1) percentages of uninsured working adults, (2) persons skipping needed care due to costs, and (3) persons lacking a usual provider. Even greater decreases were measured in Medicaid expansion states. Compared to 2013, the overall decline in the uninsured rate amounted to an estimated 2 million more African American adults and an estimated 3 million more Hispanics obtaining health insurance <sup>18</sup> |
| Minimum wage laws                | New York Labor Law § 652 (2016)  | Decreasing STI rates through minimum wage increases   | A nominal \$1.00 increase in the adjusted minimum wage between 2003-2015 was associated with a decrease in some STI rates among women living in 66 large metropolitan areas (19.7% decrease in syphilis from .30 cases per 100 000 to .27 cases per 100 000 cases; 8.5% decrease in gonorrhea infections resulting in 11 fewer cases per 100 000 from 2003 to 2015) <sup>19</sup>  |

This table provides illustrative examples of statutory or regulatory laws (and their citations) at any level of government determined through implementation to be associated with reduced morbidity or mortality related to key factors affecting decreases in life

expectancy. Select published research/other support on their related outcomes is also provided.

Abbreviations: AHR, adjusted hazard ratio; BMI, body mass index; OAT, opioid agonist therapy; OR, odds ratio; OUD, opioid overdose deaths; SSB, sugarsweetened beverage; STI, sexually-transmitted infection.

<sup>1</sup>McClellan C, Lambdin BH, Ali MM, Davis CS, Wheeler E, Pemberton M, Kral AH. Opioid-overdose laws association with opioid use and overdose mortality. *Addict Behav.* 2018;86:90-95. doi: 10.1016/j.addbeh.2018.03.014.

<sup>2</sup>Medicaid Memo. Department of Medical Assistance Services. Medical Society of Virginia website. Updated December, 1, 2016. Accessed April 4, 2020. [https://www.msv.org/sites/default/files/PDFs/12.1.16\\_guideline\\_for\\_opioids\\_non\\_opioid\\_pain\\_relievers\\_revised\\_final.pdf](https://www.msv.org/sites/default/files/PDFs/12.1.16_guideline_for_opioids_non_opioid_pain_relievers_revised_final.pdf)

<sup>3</sup>Methadone and buprenorphine reduce risk of death after opioid overdose. National Institutes of Health website. <https://www.nih.gov/newsevents/news-releases/methadone-buprenorphine-reduce-risk-death-after-opioid-overdose>. Updated June 19, 2018. Accessed April 4, 2020.

<sup>4</sup>Davis CS, Carr DH. Legal and policy changes urgently needed to increase access to opioid agonist therapy in the United States. *Int. J. of Drug Policy.* 2019;73: Nov. 42-48. doi.org/10.1016/j.drugpo.2019.07.006.

<sup>5</sup>Kravitz-Wirtz N, Davis CS, Ponicki WR, et al. Association of Medicaid Expansion With Opioid Overdose Mortality in the United States. *JAMA Netw Open.* 2020;3(1):e1919066. doi:10.1001/jamanetworkopen.2019.19066.

<sup>6</sup>Larochelle MR, Bernson D, Land T, et al. Medication for Opioid Use Disorder After Nonfatal Opioid Overdose and Association With Mortality: A Cohort Study. *Ann Intern Med.* 2018;169:137-145. [Epub ahead of print 19 June 2018]. doi: <https://doi.org/10.7326/M17-3107>.

<sup>7</sup>Lavoie MC, Langenberg P, Villaveces A, et al. Effect of Maryland's 2011 Alcohol Sales Tax Increase on Alcohol-Positive Driving. *Am J Prev Med.* 2017;53(1):17-24. doi:10.1016/j.amepre.2016.12.011.

<sup>8</sup>Campbell CA, Hahn RA, Elder R, Chattopadhyay S, Fielding J, et al. The effectiveness of limiting alcohol outlet density as a means of reducing excessive alcohol consumption and alcohol-related harms. *Am J Prev Med.* 2009;37(6):55-69. doi: 10.1016/j.amepre.2009.09.028.

<sup>9</sup>Palmersheim KA, Pfister KP, and Glysch RL. The Impact on Wisconsin's Statewide Smoke-Free Law on Bartender Health and Attitudes. Milwaukee: University of Wisconsin Center for Urban Initiatives and Research. <https://pdfs.semanticscholar.org/b43b/31f33d4083f9e020d5d66fe636680e0c7f1d.pdf>. Accessed April 4, 2020.

<sup>10</sup>van Hasselt M, Kruger J, Han B, et al. The relation between tobacco taxes and youth and young adult smoking: what happened following the 2009 US federal tax increase on cigarettes? *Addict Behav.* 2015;45:104-109. doi:10.1016/j.addbeh.2015.01.023.

<sup>11</sup>Siegel M, Pahn M, Xuan Z et al. The Impact of State Firearm Laws on Homicide and Suicide Deaths in the USA, 1991-2016: a Panel Study. *J Gen Intern Med.* 2019;34(10): 2021-2028. doi:10.1007/s11606-019-04922-x.

<sup>12</sup>Swanson JW, Easter MM, Alanis-Hirsch K, Belden CM, Norko MA, Robertson AG, et al. Criminal Justice and Suicide Outcomes with Indiana's Risk-Based Gun Seizure Law.

*J Am Acad Psychiatry and the Law*. 2019;47(2):188-197. doi: 10.29158/JAAPL.003835-19.

<sup>13</sup>Godoy Garraza L, Walrath C, Goldston DB, Reid H, McKeon R. Effect of the Garrett Lee Smith Memorial Suicide Prevention Program on suicide attempts among youths. *JAMA Psychiatry*. 2015;72(11):1143-1149.

<https://jamanetwork.com/journals/jamapsychiatry/fullarticle/2461739>.

<sup>14</sup>Lee, MM, Falbe J, Schillinger D, Basu S, McCulloch CE, Madsen KA. Sugar-Sweetened Beverage Consumption 3 Years After the Berkeley, California, Sugar-Sweetened Beverage Tax. *Am J Public Health*. 2019;109(4):637-639. doi: 10.2105/AJPH.2019.304971.

<sup>15</sup>HU, FB. Resolved: there is sufficient scientific evidence that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases. *Obes. Rev*. 2013;14(8):606-619. <https://doi.org/10.1111/obr.12040>.

<sup>16</sup>Ickovics JR, Duffany KO, Shebl FM, Peters SM, Read MA, Gilstad-Hayden KR, et al. Implementing School-Based Policies to Prevent Obesity: Cluster Randomized Trial. *Am J Prev Med*. 2019;56(1):e1-e11.

<sup>17</sup>Restrepo BJ. Calorie Labeling in Chain Restaurants and Body Weight: Evidence from New York. *Health Economics*. 2016;26(10): 1191-1209. doi: 10.1002/hec.3389.

<sup>18</sup>Hayes SL, Riley P, Radley DC, McCarthy D. Reducing Racial and Ethnic Disparities in Access to Care: Has the Affordable Care Act Made a Difference?. The Commonwealth Fund website. [https://www.commonwealthfund.org/publications/issue-briefs/2017/aug/reducing-racial-andethnic-disparities-access-care-has?redirect\\_source=/publications/issue-briefs/2017/aug/racial-ethnic-disparities-care](https://www.commonwealthfund.org/publications/issue-briefs/2017/aug/reducing-racial-andethnic-disparities-access-care-has?redirect_source=/publications/issue-briefs/2017/aug/racial-ethnic-disparities-care). Published August 24, 2017. Accessed April 4, 2020.

<sup>19</sup>Ibragimov U, Beane S, Friedman SR, et al. States with higher minimum wages have lower STI rates among women: Results of an ecological study of 66 US metropolitan areas, 2003-2015. *PLoS One*. 2019;4(10):e0223579.doi:10.1371/journal.pone.0223579.