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Efficacy of Frequent Monitoring With Swift, Certain, and Modest Sanctions for Violations: Insights From South Dakota's 24/7 Sobriety Project

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Objectives. We examined the public health impact of South Dakota's 24/7 Sobriety Project, an innovative program requiring individuals arrested for or convicted of alcohol-involved offenses to submit to breathalyzer tests twice per day or wear a continuous alcohol monitoring bracelet. Those testing positive are subject to swift, certain, and modest sanctions.

Methods. We conducted differences-in-differences analyses comparing changes in arrests for driving while under the influence of alcohol (DUI), arrests for domestic violence, and traffic crashes in counties with the program to counties without the program.

Results. Between 2005 and 2010, more than 17 000 residents of South Dakota—including more than 10% of men aged 18 to 40 years in some counties—had participated in the 24/7 program. At the county level, we documented a 12% reduction in repeat DUI arrests ($P = .023$) and a 9% reduction in domestic violence arrests ($P = .035$) following adoption of the program. Evidence for traffic crashes was mixed.

Conclusions. In community supervision settings, frequent alcohol testing with swift, certain, and modest sanctions for violations can reduce problem drinking and improve public health outcomes. (*Am J Public Health.* Published online ahead of print November 15, 2012: e1–e7. doi:10.2105/AJPH.2012.300989)

Alcohol consumption can impose enormous health and safety costs on individuals and society.[1,2] Problem drinkers account for a disproportionate share of these costs.[2,3] Although millions of problem drinkers pass through the criminal justice system each year,[4,5] reducing their alcohol consumption has proven difficult. Those arrested for or convicted of an alcohol-involved offense are sometimes ordered not to drink or frequent bars, but abstinence is difficult to enforce because alcohol passes through the system more quickly than other substances. For example, a 160-pound man who exceeds the legal drinking limit for driving after consuming 5 drinks in 2 hours will likely register a 0.00 in a breathalyzer test 8 hours after drinking.[6–8]

In traditional community corrections settings (e.g., probation and parole), sanctions often occur only after major violations or after a series of minor violations, and they may not be imposed until weeks or months after the offense. However, a growing body of evidence from neurobiology, psychology, and economics suggests that punishment certainty is a stronger deterrent to criminal activity than punishment severity.[9–13] Research also suggests that individuals value immediate rewards more strongly than delayed rewards,[14,15] a tendency particularly pronounced among alcohol-abusing populations.[16,17]

In 2004, South Dakota Attorney General Larry Long proposed an innovative pilot project called the 24/7 Sobriety Project (hereinafter, 24/7) that made twice-a-day breathalyzer tests (i.e., once in the morning and once in the evening) a condition of bail for those who had been rearrested for driving while under the influence of alcohol (DUI). Individuals who failed or skipped tests were immediately subject to a short jail term, typically 1 or 2 days. The 5-county pilot project quickly expanded to incorporate additional counties, individuals arrested or convicted for other offenses (e.g., assault), and additional monitoring technologies. By the end of 2010, more than 17 000 of the roughly 825 000 residents of South Dakota—including more than 10% of men aged 18 to 40 years in some counties—had participated in the program.

Our analysis of data from the South Dakota Attorney General's Office revealed that program participants were ordered to take approximately 3.7 million breathalyzer tests from 2005 to 2010 and that the pass rate exceeded 99% (99.3% of the tests were clean, 0.36% dirty, and 0.34% no shows). With inclusion of the results from continuous alcohol monitoring bracelets (worn by roughly 15% of participants), there were approximately 2.25 million days without a detected alcohol violation. These patterns suggest that the program may have been effective in reducing problem drinking among the target population. If 24/7 successfully reduces alcohol use among problem drinkers, we might expect improvements in alcohol-related public health outcomes following the establishment of the program.

Although 24/7 has won national awards and is being implemented in other states, evidence to date of its effectiveness has been largely anecdotal and descriptive.[18–20] We provide the first rigorous empirical evaluation of 24/7 across a range of public health outcomes by using a differences-in-differences research design that leverages the program's phased implementation across counties using a 10-year county-month panel (January 2001–December 2010).

METHODS

We measured the effects of the program by comparing changes in public health outcomes in counties that adopted 24/7 with changes over the same period in control counties that did not adopt the program. Our approach estimated

program effects on the basis of how within-county changes in the outcomes of interest related to within-county changes in the program's availability; hence, we did not rely solely on cross-sectional variation, which can bias estimates because of unobserved heterogeneity across counties. Although estimates from our approach may be considered conservative because impacts may not always be sufficiently large to be detected at the county level, the scale of the program minimizes this concern.

Operationalizing 24/7 Implementation

To determine when 24/7 was implemented in various counties within the state, we drew from a database provided by the South Dakota Attorney General's Office. This database includes participant-level data (e.g., demographic characteristics, county of residence, dates of participation) as well as detailed information about every test (e.g., date and time of each test, result) for all individuals assigned to the program since its inception. We defined 24/7 as *operational* in each county once the number of county residents participating in 24/7 for a given month equaled or exceeded a quarter of the number of DUI arrests in the county, where the latter was defined as the county's moving monthly average during the previous year to address any seasonality. This definition applied well to both large and small counties and reduced "false positives" resulting from the fact that some counties had a few residents participating before the program's formal establishment. We examined the sensitivity of our results to alternative approaches for defining implementation.

Figure 1 displays the timing of program implementation across South Dakota's counties when defined with this threshold. The 5-county pilot program started in 2005 and quickly expanded within and across counties. Once judges realized that offenders would show up for twice-a-day testing and that virtually all tests were clean, they started extending the program to those arrested for other offenses (e.g., assault, domestic violence) and those who had already been convicted. Judges from other counties learned about the pilot and asked to join the program. By the end of 2006, there were 19 counties administering breathalyzer tests for 24/7 and some counties started using continuous alcohol-monitoring bracelets.

The unanimous passage of House Bill 1072 dramatically expanded the 24/7 program.[21] The bill went into effect July 1, 2007, and provided funds to counties that wanted to adopt the program. The new law allowed judges to order anyone they believed had an alcohol problem, pre- or postconviction, to participate in the program. The law also changed rules for those who lost their license for a repeat DUI offense. It had previously been possible for some of these individuals to receive a permit to drive only to and from work, but these permits were now conditional on 24/7 participation.

Many of South Dakota's large counties were among the early adopters of the program, but some experienced important declines in participation over our analysis period. For example, in Pennington County, there were 570 participants in 24/7 for twice-a-day testing in October 2008; by 2010 the monthly average was 377 participants. One potential explanation for this decline is that 24/7 reduced drunk driving.

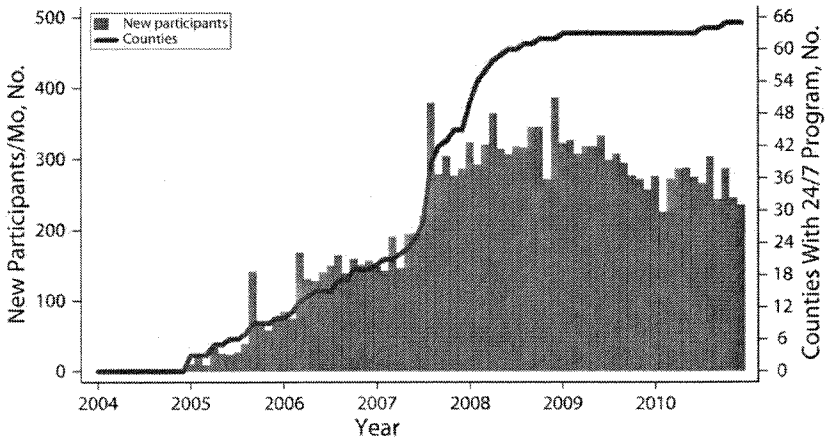
Dependent Variables

We focused on 3 drinking-related public health outcomes: DUI arrests, arrests for domestic violence, and traffic crashes. Arrest data for DUI and domestic violence from 2001 to 2010 were made available by the South Dakota Department of Criminal Investigation. For DUI, we can distinguish first-time offenders from repeat offenders—an important distinction for a program that primarily targets repeat offenders. Information about traffic crashes reported to the police from 2004 to 2010 was made available by the South Dakota Office of Highway Safety. Table 1 presents the descriptive statistics for these outcomes at the county–month level.

In addition to looking at all traffic crashes, we also considered crashes involving male drivers aged 18 to 40 years because this subpopulation is most likely to report driving under the influence of alcohol.[22] This age group also accounts for more than half of 24/7 participants. Approximately 63% of new 24/7 participants entering the program from 2005 to 2010 entered for DUI, 6% for community corrections violations, 5% for domestic violence, 5% for assault (excluding domestic violence), 5% for drug possession, and 17% for other offenses (numbers do not add to 100% because of rounding).

Independent Variables

The analyses controlled for a number of time-varying county characteristics that could influence our outcomes (Table 1). County characteristics measured monthly included the unemployment rate,[23] snowfall,[24] an indicator variable for the Sturgis Motorcycle Festival



Note. We defined 24/7 as operational in each county once the number of county residents in 24/7 for a given month equaled or exceeded one quarter the number of driving under the influence arrests in the county, where the latter is defined as the county's moving monthly average during the previous year to address any seasonality. Calculations to determine when 24/7 was operational in each county exclude 55 individuals (0.3%) who wore a SCRAM bracelet in 2006 and 2007, but were missing residency and 24/7 status information.

FIGURE 1—Participation in South Dakota's 24/7 Sobriety Project, 2005–2010.

TABLE 1—Descriptive Statistics of Model Variables for South Dakota's 24/7 Sobriety Project, 2005–2010

Variable	No.	Mean (SD)	Min	Median	Max
		Dependent			
Arrests					
DUI-1	7920	8.872 (24.812)	0	2	272
Repeat DUI	7920	3.228 (8.341)	0	1	82
Domestic violence	7920	2.742 (8.558)	0	0	85
Traffic crashes					
Total	5544	20.913 (44.789)	0	9	591
Men aged 18–40 y	5544	7.500 (18.547)	0	3	250
		Independent			
Population	7920	11 905 (23 500)	999	5533	183 048
Percentage White	7920	85.178 (24.026)	5.891	96.178	99.779
Men aged 18–40 y share of population	7920	13.266 (3.212)	7.601	12.575	25.190
Unemployment rate	7920	4.080 (1.984)	1.400	3.500	18.600
Police officers per capita[a]	7920	14.075 (5.583)	0	14.097	37.364
VMT per capita[b]	7920	1.601 (1.245)	0.500	1.282	9.444
Bars per capita[a]	7920	5.688 (4.026)	0	5.283	23.328
Package stores per capita[a]	7920	2.017 (2.212)	0	1.522	10.828
Snowfall[c]	7920	0.106 (0.181)	0	0	3.700
Sturgis Rally	7920	0.004 (0.061)	0	0	1
College in session	7920	0.044 (0.206)	0	0	1

Note. DUI = driving while under the influence of alcohol; DUI-1 = first-time DUI; VMT = vehicle miles traveled.
[a]Per capita measure based on rate per 10 000 people.
[b]VMT are based on annualized rate; miles in 10 000s.
[c]Average monthly snowfall in inches.

(equals 1 for Pennington, Meade, and Lawrence counties in August of each year), and an indicator for whether college was in session in the 4 counties with substantial student populations. Other county characteristics available at the annual level include vehicle miles traveled,[25] per capita police officers,[26] per capita on- and off-premises alcohol outlets,[27] and demographic characteristics including total population, share of population that is male aged 18 to 40 years, and share of population that is White.[28] We linearly interpolated these annual series to construct monthly measures.

Statistical Analyses

Our statistical model was:

$$(1)\quad Y_{it} = \alpha(24/7)_{it} + \beta X_{it} + \gamma_i + \delta_t + \varepsilon_{it},$$

where Y_{it} represents a public health outcome in county i and month t. The indicator $24/7_{it}$ captures whether the program was operational in county i and month t. The coefficient of interest, α, measures the effect of 24/7, which we hypothesized to be negative. The vector X_{it} includes the time-varying county-level control covariates already described. County fixed effects (γ_i) capture unobservable characteristics of each county that are fixed over time. Finally, the vector δ_t consists of fixed effects for each month in the sample to control for seasonal and temporal trends that are common to all counties, such as statewide legislative changes.

In the models examining arrests for repeat DUI offenses, we also controlled for first-time DUI arrests. The inclusion of first-time DUI arrests as a control potentially helps account for unobservable factors that affect all types of DUI, such as unobserved enforcement intensity (for example, DUI checkpoints) or reporting changes. Moreover, there is a mechanical relationship between first-time and repeat DUI arrests, because counties with a greater number of first-time DUI arrests have more residents at risk for repeat DUIs, so failing to control for this variable would lead to omitted variable bias. Given that the precise mapping from first-time DUIs into subsequent DUIs is unknown, the relationship is modeled flexibly by using a high-degree polynomial.

Because our outcomes involved count data and included zeros, we estimated equation 1 using Poisson regression. The Poisson model provides consistent estimates of the conditional mean function across a wider range of data-generating processes than some other count models such as the negative binomial model.[29] To conduct valid statistical inference even under a failure of the Poisson equal mean-variance assumption or with arbitrary forms of within-county autocorrelation in error terms, we reported cluster–robust standard errors with clustering at the county level.[30] We conducted our analysis by using Stata/MP version 12 (StataCorp LP, College Station, TX).

RESULTS

Table 2 presents the incident rate ratios (IRRs) estimated from the Poisson regressions of our 5 outcomes. There was no statistically or substantively significant effect of 24/7 on first-time DUI arrests (DUI-1). The null finding is intuitive because 24/7 primarily targeted offenders at risk for repeat DUI arrests. Although, in theory, the program could create a general deterrent effect that reduces DUI-1, such an effect was not apparent in these data. The IRR for 24/7 on repeat DUI was 0.883 ($P = .023$), which represents a 12% reduction in arrests. The analyses also suggest that 24/7 reduced arrests for domestic violence by 9% (IRR = 0.905; $P = .035$; Table 2).

Table 2 shows the effect of 24/7 on traffic crashes overall and among male drivers aged 18 to 40 years. The model did not identify a reduction for crashes overall (IRR = 0.980; $P = .338$); however, there is suggestive evidence that 24/7 may have modestly reduced traffic crashes for male drivers aged 18 to 40 years (IRR = 0.956; $P = .085$).

Table 3 demonstrates that our findings for repeat DUI arrests, domestic violence arrests, and crashes involving male drivers aged 18 to 40 years are robust across alternative specifications. The first 3 rows address

TABLE 2—Results from Poisson Regressions: South Dakota's 24/7 Sobriety Project, 2005–2010

	DUI-1 (n = 7800), IRR (95% CI)	Repeat DUI (n = 7920), IRR (95% CI)	Domestic Violence (n = 7560), IRR (95% CI)	Traffic Crashes (n = 5544), IRR (95% CI)	Traffic Crashes, Men Aged 18–40 y (n = 5544), IRR (95% CI)
24/7 implemented	1.062 (0.955, 1.181)	0.883* (0.794, 0.983)	0.905* (0.825, 0.993)	0.980 (0.941, 1.021)	0.956 (0.909, 1.006)
Population[a]	1.607 (0.745, 3.466)	10.522* (1.343, 82.46)	2.327* (1.069, 5.068)	1.188 (0.838, 1.683)	1.625** (1.184, 2.231)
Percentage White	10.672 (0.002, 45 568)	< 0.001* (< 0.001, 0.904)	< 0.001 * (< 0.001, 0.743)	0.010 (< 0.001, 4.440)	0.009 (< 0.001, 5.234)
Men aged 18–40 y share of population	< 0.001* (< 0.001, 0.654)	< 0.001* (< 0.001, 0.185)	< 0.001 (< 0.001, 18.344)	1.269 (0.003, 570.135)	7.358 (0.015, 3515.884)
Unemployment rate	0.981 (0.944, 1.020)	1.005 (0.975, 1.036)	0.949* (0.902, 0.998)	0.965 (0.930, 1.001)	0.967 (0.935, 1.000)
Police officers per capita[b]	1.008 (0.991, 1.026)	1.002 (0.984, 1.020)	1.004 (0.978, 1.030)	1.020** (1.005, 1.036)	1.018* (1.001, 1.035)
VMT per capita[c]	1.056 (0.887, 1.257)	1.076 (0.698, 1.661)		1.046 (0.952, 1.149)	1.007 (0.916, 1.107)
Bars per capita[b]	1.002 (0.977, 1.027)	0.977 (0.939, 1.017)	1.001 (0.975, 1.029)	0.997 (0.989, 1.005)	1.000 (0.990, 1.010)
Package stores per capita[b]	1.056* (1.002, 1.114)	0.976 (0.913, 1.044)	1.005 (0.956, 1.055)	1.000 (0.978, 1.022)	1.002 (0.980, 1.025)
Snowfall[d]	0.942 (0.725, 1.224)	0.903 (0.677, 1.204)	0.944 (0.843, 1.057)	1.251* (1.048, 1.493)	1.560*** (1.338, 1.820)
Sturgis Rally	2.854 (0.934, 8.723)	1.477*** (1.330, 1.641)	1.240* (1.013, 1.519)	1.642*** (1.293, 2.086)	1.485** (1.154, 1.910)
College in session	1.026 (0.677, 1.555)	0.970 (0.812, 1.159)	0.920 (0.829, 1.021)	1.071 (0.922, 1.244)	1.153* (1.003, 1.327)
DUI-1 polynomial					
First degree		1.241*** (1.181, 1.304)			
Second degree		0.873*** (0.838, 0.910)			
Third degree		1.108*** (1.068, 1.148)			
Fourth degree		0.972 (0.940, 1.004)			
Fifth degree		1.000 (0.982, 1.018)			

Note. CI = confidence interval; DUI = driving while under the influence of alcohol; DUI-1 = first-time DUI; IRR = incidence rate ratio; VMT = vehicle miles traveled. All models included county fixed effects and year–month fixed effects. Ninety-five percent confidence intervals estimated by using robust standard errors clustered at the county level in parentheses. The full sample size for repeat DUI arrests is 7920 based on a full 10-year county–month panel (66 counties × 10 y × 12 mo). The sample sizes for DUI-1 and domestic violence arrests are smaller because some counties reported no arrests for certain offenses to the state Department of Criminal Investigation over the entire time period. For DUI-1, this includes Shannon County whereas for domestic violence this includes Shannon, Dewey, and McPherson counties. Sample sizes for the crash models were 5544 because we only had data for 2004 through 2010 (66 counties × 7 y × 12 mo).
[a]Natural log of monthly linear interpolation of population.
[b]Per capita measure based on rate per 10 000 people.
*$P < .05$; **$P < .01$; ***$P < .001$.
[c]VMT are based on annualized rate; miles in 10 000s.
[d]Natural log of average monthly snowfall in inches.

alternative approaches for determining when 24/7 went into effect in each county. Our base specification defined 24/7 as operational when the number of county residents participating equaled or exceeded our threshold defined as 25% of the county's average number of DUI arrests. In the first and second rows, we considered alternative thresholds based on 40% and 10% cut-offs, respectively. In the third row, we considered whether the threshold should be denominated in terms of county population rather than DUI arrests. For repeat DUI arrests, the reductions remained statistically significant and even become larger with the less conservative 10% threshold (from 12% to 17%; $P = .016$). The point estimates remained similar for domestic violence and crashes, but standard errors increased for domestic violence and often declined for crashes.

We also looked at potential data-reporting problems (Table 3). Tribal police departments are not required to submit arrest and crash data to state agencies. The inclusion of DUI-1 helps us account for such reporting inconsistencies in repeat DUI arrest models, but there could still be bias in the results for domestic violence and crashes. In the fourth row, we re-estimated the models excluding information reported by tribal police departments and the point estimates remained similar.

To ensure the validity of our data on DUI arrests, we compared our county-level DUI arrest data with the number of DUI cases filed by prosecutors, which are collected by a different agency (Table 3). These data series should be highly correlated, but not perfectly correlated because DUI arrests may ultimately be charged as a different offense or not charged at all. Furthermore, for some counties, such as those with tribal agencies, comprehensive arrest information but not prosecution data may be submitted to the state, or vice versa. Although the median (mean) within-county correlation coefficient across the 2 data series was high at 0.93 (0.84), the correlation was low in some counties. (We were only able to obtain county filing information at the annual level, so we correlated county DUI arrest and filing information at the fiscal-year level.) Therefore, in the fifth row, we excluded the 10 counties with correlation coefficients below 0.7 (Table 3). The point estimates remain largely unchanged.

TABLE 3—Sensitivity Analysis: South Dakota's 24/7 Sobriety Project, 2005–2010

	Repeat DUI, IRR (95% CI)	Domestic Violence, IRR (95% CI)	Traffic Crashes, Men Aged 18–40 y, IRR (95% CI)
Definition of 24/7 program implementation			
Change threshold from 25% to 40%	0.899* (0.812, 0.996)	0.909 (0.819, 1.008)	0.951* (0.907, 0.997)
Change threshold from 25% to 10%	0.834* (0.718, 0.967)	0.913 (0.832, 1.002)	0.949 (0.900, 1.001)
Change threshold to 5 residents in 24/7 per 10 000 population	0.892* (0.805, 0.989)	0.894* (0.804, 0.994)	0.955* (0.915, 0.998)
Potential reporting issues			
Exclude arrests and crashes reported by tribal police agencies	0.905 (0.817, 1.003)	0.902* (0.822, 0.990)	0.951 (0.905, 1.000)
Exclude 10 counties where the correlation coefficient for DUI arrest and court is below 0.7	0.883* (0.791, 0.986)	0.896* (0.814, 0.987)	0.955 (0.903, 1.010)
Exclude counties reporting no DUI-1 or domestic violence arrests (Dewey, McPherson, and Shannon counties)	0.885* (0.796, 0.984)	0.905* (0.825, 0.993)	0.952 (0.904, 1.002)
Alternative specifications			
Exclude controls for DUI-1	0.843* (0.715, 0.993)	...	...
Negative binomial (25% threshold)	0.885 (0.781, 1.002)	0.909 (0.822, 1.005)	0.958 (0.906, 1.014)

Note. CI = confidence interval; DUI = driving while under the influence of alcohol; DUI-1 = first-time DUI; IRR = incidence rate ratio. Full results available upon request. Models included the full set of covariates except as noted.
*$P < .05$; **$P < .01$; ***$P < .001$.

We also re-estimated the models excluding counties that did not report either DUI-1 (Shannon) or domestic violence arrests (Shannon, Dewey, McPherson) to the state Department of Criminal Investigation over the 10-year period. Again, the results remain unchanged (Table 3).

In our main results, we included DUI-1 as an explanatory variable in the repeat DUI models to control for unobserved enforcement activities and potential reporting bias. Controlling for DUI-1 may not be desirable if part of the impact of the program comes through changing patterns in DUI-1 offending. Excluding DUI-1 from this model increased the size of the 24/7 reduction (IRR = 0.843; $P = .041$; Table 3).

Finally, when we estimated negative binomial rather than Poisson models, we obtained similar (albeit less precise) point estimates (Table 3).

DISCUSSION

More than 17 000 individuals participated in the 24/7 Sobriety Project between 2005 and 2010 and their tests indicated that there were approximately 2.25 million days without a detected alcohol violation. This does not mean that there was absolutely no drinking on those days. Rather, it provides support for a reduction in the incidence of heavy drinking among a population with a history of problem drinking.

Our analysis provides strong evidence that the 24/7 program reduced the incidence of repeat DUI and domestic violence arrests, and provides suggestive evidence that it may have reduced reported traffic crashes involving men aged 18 to 40 years. The findings are robust to many alternative assumptions and specifications.

These estimated effects are not small. When we used a measure that defines a 24/7 program as operational in a county once the number of residents participating equaled or exceeded a quarter of DUI arrests in the county, we found that program led to a 12% reduction ($P = .023$) in repeat DUI arrests and a 9% reduction ($P = .035$) in domestic violence arrests at the county level.

Some may consider these results to be conservative for 2 reasons. First, aggregate-level impacts depend both on the magnitude of the individual-level impact and the number of program participants. Because in most counties only a fraction of eligible DUI offenders participated in the program (albeit a high fraction in some counties), an analysis using individual-level data could yield larger behavioral effects of the program. However, an important challenge with the individual-level approach is addressing the potential selection issues introduced by judicial discretion regarding who participates and for how long. Our county-level approach overcomes this concern.

Second, defining 24/7 as operational only after the number of residents participating in the program equaled or exceeded a quarter of DUI arrests means that we classified some counties as not operational when the program was actually up and running. This approach could dilute the program effect. In our sensitivity analysis, we considered a less conservative 10% threshold and the reduction for repeat DUI arrests became larger and more precise (17%; $P = .016$) and conversely became smaller for the higher threshold of 40%. The alternate thresholds did not have a noticeable effect on the other outcomes.

Most studies of interventions targeting DUI are not directly comparable to our results because they rely on individual-level analyses or do not focus specifically on repeat DUI arrests; however, there are some that help put our findings in perspective. For California, Rogers found that the implementation of mandatory administrative license suspension

following a DUI arrest reduced all DUI arrests in the state by 4%.[31] For Alberta, Canada, Voas et al. found that the introduction of a province-wide interlock program reduced aggregate DUI reconviction rates by 6%.[32] The authors suggested that this effect is "small" because less than 10% of eligible drivers participated in the program. Finally, Kenkel used nationally representative data to estimate the cross-price elasticity of the demand for drunk driving with respect to the price of alcohol to be 0.74 for men.[33] This cross-price elasticity suggests that it would take a 16% increase in alcohol prices to reduce DUI among men by 12%. Thus, we interpret our 24/7 results to be important contributions to the DUI literature and remind readers that we also found evidence that 24/7 reduced domestic violence arrests.

Limitations

Because 24/7 has only been in existence for a few years, our analysis captured only the short-run effects of the program. As counties gain experience with implementation and as the program is extended to a wider range of problem users, it is possible that impacts will increase. Alternatively, it may be that the deterrent impacts of frequent testing may fade over time as individuals become increasingly removed from their program experience. Understanding the longer-run effects of the program will be important for assessing its overall effectiveness.

Our aggregate analysis delivered an estimate of the average effect of the program, but it seems possible that the program may be more effective for certain types of offenders. Future research that exploits individual-level data to better understand heterogeneity in response to 24/7 would enrich our understanding of the program and inform efforts to export this enforcement model to other jurisdictions.

We did not address the variation in how the program was implemented across and within counties. Although every violation was supposed to be punished with jail time, we know this did not always occur. Future research that accounts for program fidelity would improve our understanding of how 24/7 works.

We also considered only a limited set of public health outcomes. If, as suggested by these findings, 24/7 is successful at reducing problem drinking, potential benefits may extend to a range of outcomes not considered here (e.g., mental health, hospitalization or other forms of health care utilization). Further analysis to more clearly understand the impacts of 24/7 and similar programs on a broader range of outcomes is warranted.

Conclusions

We found strong support for the hypothesis that frequent alcohol testing with swift, certain, and modest sanctions can reduce problem drinking and improve public health outcomes. Our empirical analysis of South Dakota's 24/7 Sobriety Project demonstrated reductions in arrests for repeat DUI and domestic violence as well as suggestive evidence of a decline in traffic crashes involving men aged 18 to 40 years.

Taking these results in a broader perspective, our findings provide support for a new approach to monitoring and influencing behaviors that relies on changes in the certainty and celerity of consequences. We demonstrate the efficacy of this approach with respect to alcohol-related behaviors, but taken together with emerging evidence from a similar program in Hawaii focused on illegal drug consumption (Project HOPE[12]), our findings suggest that this model may have implications for influencing a wide range of problem behaviors.

Although quasiexperimental analyses such as ours provide strong evidence in favor of this approach, we hope that our research encourages funding agencies to support experimental evaluations to provide further evidence on the causal effects of programs such as 24/7 that adopt innovative deterrence approaches. Indeed, it is critical that researchers study whether 24/7 can work outside South Dakota in both rural and urban areas. It will also be useful to explore how testing programs with swift and certain sanctions can best incorporate positive incentives for compliance as well as treatment services. ■

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Contributors

B. Kilmer designed the study and supervised the data collection. G. Midgette was in charge of data management. All authors conducted statistical analyses and contributed to the writing and editing of the article.

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Note. The views expressed herein are only those of the authors.

Human Participant Protection

All relevant ethical safeguards have been met in relation to participant protection, including approval from the RAND Corporation's Human Subject Protection Committee (assurance number: FWA00003425; IRB number: IRB00000051).

References

1. Harwood HJ. *Updating Estimates of the Economic Costs of Alcohol Abuse in the United States: Estimates, Update Methods, and Data.* Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism; 2000.

2. Bouchery EE, Harwood HJ, Sacks JJ, Simon CJ, Brewer RD. Economic costs of excessive alcohol consumption in the U.S., 2006. *Am J Prev Med.* 2011;41 (5):516–524.

3. Cook PJ. *Paying the Tab: The Costs and Benefits of Alcohol Control.* Princeton, NJ: Princeton University Press; 2007.

4. Karberg JC, James DJ. *Substance Dependence, Abuse, and Treatment of Jail Inmates, 2002.* Bethesda, MD: Bureau of Justice Statistics; 2005. Report no. NCJ 209588.

5. *National Surveys on Drug Use and Health.* Rockville, MD: Substance Abuse and Mental Health Services Administration; 2009. Available at: http://oas.samhsa.gov/2k9State/AppC.htm#TabC.12. Accessed January 3, 2012.

6. Widmark EMP. *Principles and Applications of Medicolegal Alcohol Determination.* Berlin, Germany: Urban & Schwartzenberg; 1932.

7. Rivara FP, Dunn C, Simpson E. *Addressing Alcohol Impaired Driving: Training Physicians to Detect and Counsel Their Patients Who Drink Heavily.* Washington,

DC: National Highway Traffic Safety Administration; 2000. Available at: http://www.nhtsa.gov/people/injury/alcohol/impaired_driving/content.html. Accessed January 3, 2012.

8. Lacey JH, Kelley-Baker T, Furr-Holden D, et al. *2007 National Roadside Survey of Alcohol and Drug Use by Drivers: Alcohol Results.* Washington, DC: National Highway Traffic Safety Administration; 2009. Available at: http://www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/811248.pdf. Accessed January 3, 2012.

9. Witte AD. Estimating the economic model of crime with individual data. *Q J Econ.* 1980;94:57–87.

10. Grogger J. Certainty versus severity of punishment. *Econ Inq.* 1991;29:297–309.

11. Eide E. Economics of criminal behavior. In: Boudewijn B, De Greest G, eds. *Encyclopedia of Law and Economics, Vol. 5, The Economics of Crime and Litigation.* Cheltenham, United Kingdom: Edward Elgar; 2000: 345–389.

12. Hawken A, Kleiman MAR. *Managing Drug Involved Probationers With Swift and Certain Sanctions: Evaluating Hawaii's HOPE.* Washington, DC: National Institute of Justice; 2009. Report no. 229023. Available at: https://www.ncjrs.gov/pdffiles1/nij/grants/229023.pdf. Accessed January 3, 2012.

13. Durlauf SN, Nagin DS. Imprisonment and crime: can both be reduced? *Criminol Public Policy.* 2011;10(1):13–54.

14. Ainslie G, Haslam N. Hyper-bolic discounting. In: Loewenstein G, Elster J, eds. *Choice Over Time.* New York, NY: Russell Sage; 1992: 57–92.

15. McClure SM, Laibson DI, Loewenstein GF, Cohen JD. Separate neural systems value immediate and delayed monetary rewards. *Science.* 2004;306(5695):503–507.

16. Vuchinich RE, Simpson CA. Hyperbolic temporal discounting in social drinkers and problem drinkers. *Exp Clin Psychopharmacol.* 1998;6(3):292–305.

17. Petry NM. Delay discounting of money and alcohol in actively using alcoholics, currently abstinent alcoholics, and controls. *Psychopharmacology (Berl).* 2001;154(3):243–250.

18. Gruchow M. Added space creates extra cash for jail: sobriety program leads to a new source of funds. *Sioux Falls Argus-Leader.* January 12, 2009: A1.

19. Loudenburg R, Drube G, Leonardson G. *South Dakota 24/7 Sobriety Program Evaluation Findings.* Pierre, SD: Attorney General of South Dakota; 2010. Available at: http://apps.sd.gov/atg/dui247/AnalysisSD24.pdf. Accessed January 3, 2012.

20. Caulkins JP, Dupont RL. Is 24/7 sobriety a good goal for repeat driving under the influence (DUI) offenders? *Addiction.* 2010;105(4):575–577.

21. South Dakota House Bill 1072, 2007. Available at: http://legis.state.sd.us/sessions/2007/bills/HB1072enr.htm. Accessed October 25, 2012.

22. Substance Abuse and Mental Health Services Administration. *National Surveys on Drug Use and Health, 2010.* Rockville, MD: Substance Abuse and Mental Health Services Administration. Available at: http://www.samhsa.gov/data/NSDUH/2k10NSDUH/2k10Results.htm#3.1.2. Accessed January 3, 2012.

23. Local Area Unemployment Statistics, non-seasonally adjusted. Washington, DC: Bureau of Labor Statistics; 2011. Available at: http://www.bls.gov/lau. Accessed July 20, 2011.

24. National Climatic Data Center. Asheville, NC: National Oceanographic and Atmospheric Administration; 2011. Available at: http://cdo.ncdc.noaa.gov/pls/plclimprod/poemain.accessrouter?datasetabbv=SOD. Accessed May 31, 2011.

25. South Dakota Department of Transportation. *2001–2010 VMT – All Vehicles* [as of May 2, 2011]. Available at: http://www.sddot.com/transportation/highways/traffic/docs/VMTAllvehicles.pdf. Accessed October 25, 2012.

26. US Department of Justice, Federal Bureau of Investigation. Uniform Crime Reporting Program Data: Police Employee (LEOKA) Data, 2000–2009. Ann Arbor, MI: Inter-university Consortium for Political and Social Research Distributor; 2002. Available at: http://www.icpsr.umich.edu/icpsrweb/content/NACJD/guides/ucr.html. Accessed August 8, 2011.

27. US Census Bureau. County business patterns 2001–2010. Suitland, MD: US Census Bureau; 2011. Available at: http://www.census.gov/econ/cbp/index.html. Accessed October 5, 2011.

28. National Center for Health Statistics. Postcensal estimates of the resident population of the United States for July 1, 2000–July 1, 2009, by year, county, age, bridged race, Hispanic origin, and sex, 2000–2009. Prepared under a collaborative arrangement with the US Census Bureau. Atlanta, GA: Centers for Disease Control and Prevention; 2010. Available at: http://www.cdc.gov/nchs/nvss/bridged_race.htm. Accessed July 31, 2010.

29. Wooldridge J. *Econometric Analysis of Cross Section and Panel Data.* Cambridge, MA: MIT Press; 2002.

30. Bertrand M, Duflo E, Mullianathan S. How much should we trust differences-in-differences estimates? *Q J Econ.* 2004;119(1):249–275.

31. Rogers PN. The general deterrent impact of California's 0.08% blood alcohol concentration limit and administrative per se license suspension laws. In: *An Evaluation of the Effectiveness of California's 0.08% Blood Alcohol Concentration Limit and Administrative Per Se License Suspension Laws.* Vol 1. Sacramento, CA: California Office of Traffic Safety; 1995.

32. Voas RB, Marques PR, Tippetts AS, Beirness DJ. The Alberta Interlock Program: the evaluation of a province-wide program on DUI recidivism. *Addiction.* 1999;94(12):1849–1859.

33. Kenkel DS. Drinking, driving, and deterrence: the effectiveness and social costs of alternative policies. *J Law Econ.* 1993;36(2):877–913.