

# Decreased Mortality Rates of Inmates With Mental Illness After a Tobacco-Free Prison Policy

Jeff Dickert, Ph.D., Jill M. Williams, M.D., Rusty Reeves, M.D., Michael Gara, Ph.D., Lisa DeBilio, Ph.D.

**Objective:** Negative health consequences of smoking have prompted many correctional facilities to become tobacco free, including the New Jersey Department of Corrections, and this study examined the results of implementing tobacco-free policies.

**Methods:** Mortality rates in the total population of inmates and in a subgroup with identified special mental health needs or mental illnesses (referred to in this article as persons with special needs) were measured from January 2005 through June 2014, a period during which tobacco use was significantly reduced and then eliminated.

**Results:** The total mortality rate of all causes of death combined was three times higher for persons with special needs in 2005 compared with those without special needs. The total annual mortality rate decreased by 13%, from 232 to 203 per 100,000 population between 2005 and 2013. The mortality rate for persons identified as having special needs decreased by 48%, from an average of 676 per 100,000

population over the eight-year period before the ban to 353 per 100,000 in the 18 months after the ban. Reduced mortality among persons with special needs between 2005 and 2014 in half-year increments was correlated with the reduction and elimination of tobacco products (median bootstrapped Pearson  $r = .60$ , 95% confidence interval [CI] = .21 to .86). In strong contrast, however, the bootstrapped correlation between the mortality rate of persons not identified as having special needs and tobacco sales over the same period was not significant (median Pearson  $r = -.13$ , CI =  $-.50$  to  $.28$ ). No other major medical intervention occurred during these years.

**Conclusions:** This striking correlation of quick and substantial reduction of mortality among individuals with a mental illness in association with the reduction and subsequent ban of smoking suggests that smoking may play a major role in the reduced life span of persons with mental illness.

*Psychiatric Services* 2015; 66:975–979; doi: 10.1176/appi.ps.201400429

People in or entering U.S. jails and prisons are prone to high rates of preventable diseases and, as a group, often have poor health status and limited access to health care (1). The incarcerated population presents a variety of poor health conditions, including mental illness, addiction, and chronic disease. An important contributing factor is tobacco, given that the rate of smoking among incarcerated adults is at least three times that of the general population (2). Many inmates report having a tobacco-caused disease, and some report that disease onset occurred at a fairly young age (3). Smoking rates may even increase during imprisonment (4). Rates of serious mental illness in the correctional system are also high, perhaps double the rate seen in the general population (5). Early mortality and high tobacco use rates have been well documented in the population with serious mental illness (6,7). A recent study attributed 50% of deaths in schizophrenia, bipolar disorder, and depression to tobacco use (8). This group also purchases a sizeable portion of all the tobacco sold in the United States (9).

Negative health consequences of smoking have prompted many correctional facilities to become tobacco free. A recent national survey found that a majority of U.S. correctional

systems (60%) are completely tobacco free (10). Most that still allow tobacco ban its use indoors, and no prisons report distributing free tobacco. These tobacco bans have been successful, typically being followed by tobacco cessation treatment, and have not resulted in violence (10). Despite the frequency and relative success of tobacco-free policies within prisons, there are few published reports of the health impact of such policies. One ongoing study is examining how a tobacco ban affects respiratory diseases within the federal prison system, but no study has reported on subsequent changes in mortality rates (11). This article reports on the impact of the reduction in tobacco use and subsequent ban of tobacco on mortality rates for inmates with and without mental illness following a tobacco-free policy in the New Jersey Department of Corrections (NJDOC).

## METHODS

### Policy Implementation

Between 2009 and 2011, the sale of tobacco within NJDOC was reduced by 49%, concurrent with the introduction of smoking cessation programs by health care providers, the

introduction of nicotine replacement lozenges in prison commissaries, the rise in cost of tobacco products, and the end of tobacco sales to inmates under 18 (<1% of the prison population). In 2012, NJDOC leadership made a decision to become entirely tobacco free, including on facility grounds. Each prison commissary (the only legitimate sources for inmates to purchase tobacco) started to limit inmates' purchase of tobacco by reducing store stock; bringing tobacco in from outside the facility was already prohibited. In September 2012, tobacco was no longer restocked in the commissaries, and existing stock was depleted by December 2012. Tobacco sales decreased by 68% between 2006 and 2012, from an average of 107 to 34 products per inmate per year.

The policy to completely ban the sale and use of all tobacco products went into effect on February 15, 2013, and applied to inmates, all employees, and visitors. Access to tobacco treatment was increased during this time, nicotine lozenges were available for purchase in the commissary, and smoking cessation groups were conducted by mental health clinicians. Inmates, however, underutilized these treatments.

### Population Characteristics

NJDOC serves a census of about 23,000 inmates in 13 state prisons. The median total term for the NJDOC's inmates is six years, and the median age is 34. Sixty percent of inmates are black, 23% white, 16% Hispanic, and 1% Asian. All new prisoners receive a mental health assessment within 72 hours of arrival. Those with axis I or II mental disorders (*DSM-IV-TR*) that affect their ability to function in prison are identified as persons with special needs. A small proportion of persons on the special needs roster (about 8% of them) are housed in stabilization or residential units that provide a structured and supportive environment for persons with mental illness. Persons placed on the special needs roster account for about 13% of the total inmate population; this includes all inmates with a serious mental illness. Approximately half of the persons on the special needs roster receive antidepressant medications, 25% receive antipsychotic medications, and 25% do not receive any psychotropic medications. Routine health screening and general health care are also provided to inmates. NJDOC has contracted with the state health university, Rutgers University (through its subsidiary, University Correctional Health Care), for mental health services since 2005 and for general medical services since 2008.

### Mortality Rates

Mortality rates within NJDOC are one of several ongoing measures tracked as part of the institution's quality improvement and monitoring program. Mortality was calculated as number of deaths (all causes) per 100,000 to enable comparison with rates from other U.S. prison systems as compiled by the U.S. Department of Justice, Bureau of Justice Statistics (12). Annual and semiannual mortality

rates were examined over several years in the total inmate sample as well as separately in the subgroup identified as having special needs and those not identified as having special needs. Bootstrap analyses of the correlations between tobacco sales and mortality rates were conducted separately for the persons identified as having or not having special needs (with appropriate blocking for neighboring observations in the time series [13,14]). The Proc Survey Select function of SAS, version 9.3, was used to select bootstrap samples ( $N=10,000$ ) from the data set. The institutional review boards of Rutgers University and NJDOC approved the study.

## RESULTS

### All Mortality

The mean annual mortality rate in NJDOC was 254 per 100,000 between years 2005 and 2011. This rate is comparable to the national rate of 252 per 100,000 among all state prison systems during the same time period (12). Between 2005 and 2013, the annual mortality rate for all inmates decreased by 13%, from an average of 232 in 2005 to 203 (both per 100,000) in 2013 (Table 1).

### Mortality Rates

Mortality rates for persons on the special needs roster for January 2005 through June 2014 were also examined. As expected, annual mortality rates were higher for persons on the special needs roster compared with those not on the special needs roster. Mortality rates for persons identified as having special needs were about three times higher than for persons not identified with special needs (651 versus 167 in 2005). This finding is consistent with national data that showed reduced life expectancy of individuals with mental illness (6,8). The mortality rate for individuals on the special needs mental health roster decreased by about 48%, from an average of 676 per 100,000 over the eight years before the ban to 353 per 100,000 in the 18 months after the ban. In contrast, the mortality rate of those not on the special needs roster remained relatively flat, ranging from 120 per 100,000 to 272 per 100,000 in half-year increments (Figure 1).

From 2006 through 2013, the average age at death for those on the special needs roster compared with those not on the roster was not significantly different, at ages 51.6 and 52.6, respectively. The average age at the time of death showed a slight trend upward from 2005 to 2013, especially for those on the special needs roster, suggesting that inmates are now living longer (Figure 2).

Data for number of deaths attributed to heart disease, cancers, liver disease, respiratory disease, AIDS-related illness, and suicides were available for 2009–2013 (Table 2). This designation came from the physician present at time of death, not from autopsy or medical examiner, and thereby may be prone to some inaccuracy. Deaths attributed to heart disease, cancers, and respiratory disease

**TABLE 1. Statistics concerning New Jersey Department of Corrections inmates with and without mental health–related special needs, January 2005–June 2014**

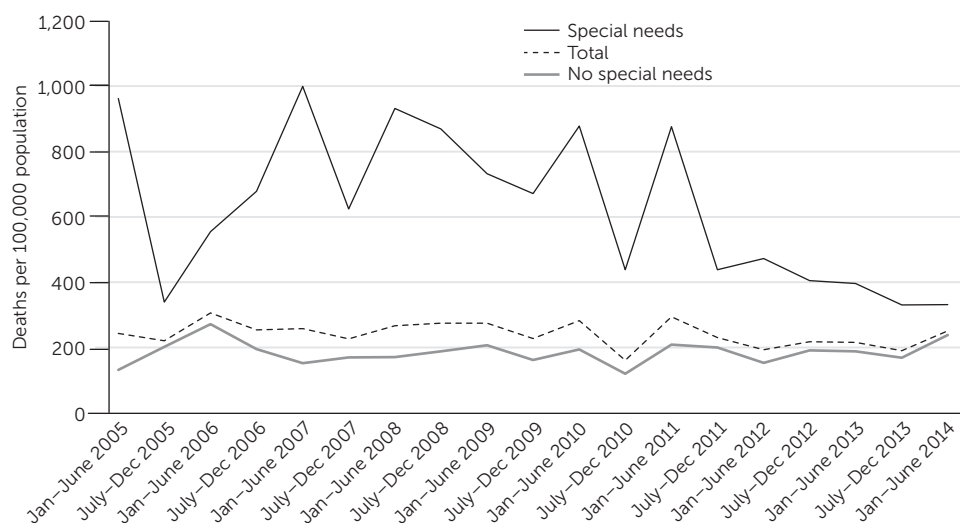
Period	Census	Special needs		Total deaths	Deaths per 100,000				Increased risk of mortality <sup>a</sup>	Tobacco products sold per inmate <sup>b</sup>
		N	%		All inmates	Special needs	No special needs	Difference		
Jan–June 2005	26,239	3,533	13.5	32	243.9	962.4	132.1	830.2	7.28	51.3
July–Dec 2005	26,239	3,533	13.5	29	221.0	339.7	202.6	137.1	1.68	51.3
Jan–June 2006	26,746	3,246	12.1	41	306.6	554.5	272.3	282.2	2.04	51.5
July–Dec 2006	26,746	3,246	12.1	34	254.2	677.8	195.7	482.0	3.46	51.5
Jan–June 2007	25,554	3,202	12.5	33	258.3	999.4	152.1	847.3	6.57	51.6
July–Dec 2007	25,554	3,202	12.5	29	227.0	624.6	170.0	454.6	3.67	51.6
Jan–June 2008	25,436	3,220	12.7	34	267.3	931.7	171.0	760.6	5.45	46.8
July–Dec 2008	25,436	3,220	12.7	35	275.2	869.6	189.1	680.5	4.60	46.8
Jan–June 2009	25,436	3,277	12.9	35	275.2	732.4	207.6	524.8	3.53	31.9
July–Dec 2009	25,436	3,277	12.9	29	228.0	671.3	162.5	508.9	4.13	31.9
Jan–June 2010	24,808	3,191	12.9	35	282.2	877.5	194.3	683.2	4.52	26.8
July–Dec 2010	24,808	3,191	12.9	20	161.2	438.7	120.3	318.5	3.65	26.8
Jan–June 2011	25,139	3,196	12.7	37	294.4	876.1	209.6	666.5	4.18	23.9
July–Dec 2011	25,139	3,196	12.7	29	230.7	438.0	200.5	237.5	2.18	23.9
Jan–June 2012	23,819	2,960	12.4	23	193.1	473.0	153.4	319.6	3.08	16.2
July–Dec 2012	23,819	2,960	12.4	26	218.3	405.4	191.8	213.6	2.11	16.2
Jan–June 2013	23,123	3,029	13.1	25	216.2	396.2	189.1	207.1	2.09	.0
July–Dec 2013	23,123	3,029	13.1	22	190.3	330.1	169.2	160.9	1.95	.0
Jan–June 2014	22,318	3,020	13.5	28	250.9	331.1	238.4	92.8	1.39	.0

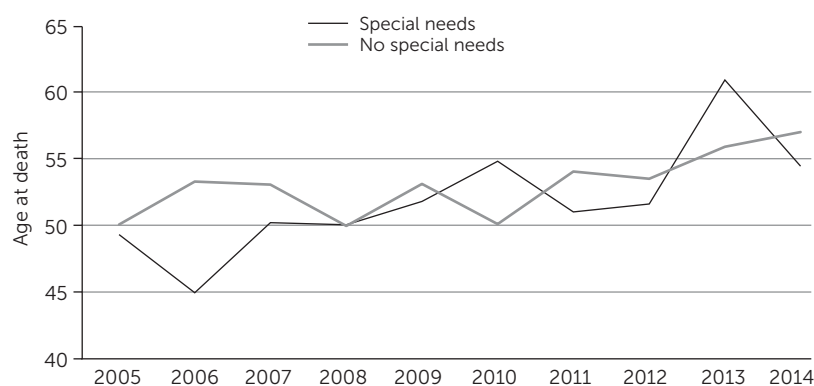
<sup>a</sup> Special needs versus no identified special needs<sup>b</sup> Sold by the New Jersey Department of Corrections

collectively decreased from 13 in 2009 to eight in 2013. Suicides also were reduced, from three in 2009 to one in 2013. For NJDOC, causes of death as a percentage of total deaths for 2009–2013 were comparable to the state prisons' for 2001–2011: heart disease, 25% of all deaths for NJDOC compared with 27% in all state prisons; cancers, 25% for NJDOC compared with 27% for others; liver disease, 16% for NJDOC compared with 10% for others; respiratory disease, 9% for NJDOC compared with 6% for others; HIV, 5% for NJDOC compared with 4% for others; suicides, 4% for NJDOC compared with 6% for others; other categories, 16% for NJDOC compared with 20% for others (12).

A bootstrap analysis (10,000 resamples) of the correlation of the mortality rate of persons identified with special needs to tobacco sales per inmate in half-year increments between 2005 and 2014 was significant, with median Pearson  $r=.60$  (95% confidence interval [CI]=.21–.86). However, for persons not identified as having special needs, the bootstrapped correlation between mortality rate and tobacco sales over the same period was not significant, with median

Pearson  $r=-.13$  (CI=–.50 to .28) (Table 1). The bootstrapped correlation of the difference between the mortality rates of persons identified as having versus not having special needs and tobacco sales over this period was significant with median Pearson  $r=.54$  (CI=.14–.84) (Table 1). When analyses were repeated with monthly data intervals (rather than semiannual), the primary result remained significant ( $p<.05$ ). As expected, the variability of monthly data was pronounced, given that mortality was zero for several months (data not shown).

**FIGURE 1. Mortality rate among New Jersey Department of Corrections inmates with and without mental health–related special needs, by half-year**

**FIGURE 2. Average age at death of New Jersey Department of Corrections inmates with and without mental health–related special needs**

## DISCUSSION

Our finding is similar to a recent report by Binswanger and colleagues (15), who found a 9% reduction in smoking-related deaths in a cross-sectional analysis of U.S. state prison data for 2001–2011. States with the most restrictive tobacco prison bans had the lowest mortality rates, although the investigators did not look at subgroups with mental illness. It is plausible that a greater effect on mortality might be seen in prison populations with mental illness, because these groups smoke at higher rates and have higher levels of nicotine dependence.

A greater effect on mortality was observed for the group with mental illness in that a 48% reduction in mortality rate for persons on the mental health roster was observed in 2005–2012 compared with 2013 and the first half of 2014. The reduction in mortality during the years prior to the complete tobacco ban suggests that even reductions in tobacco use contribute to reduced mortality rate. For persons not identified as having special mental health needs, the average mortality rate remained relatively stable over the same period. This suggests that a reduction in tobacco use and subsequent ban may have a greater impact on individuals with mental illness as a result of their higher tobacco use rates compared with those without mental illness. It is interesting that mortality rates declined even though the NJDOC inmates are an aging population: 7.4% of the population was 50 or

older in 2005 and 13.8% of the population was 50 or older in 2013.

Since the mid-1980s, most federal, state, and local correctional facilities have adopted smoke-free policies. The findings in this study provide a rationale for the few remaining prisons and jails yet to adopt smoke-free policies. The correlation of reduction and eventual ban with the reduction in early mortality of inmates with a mental illness is striking. Unfortunately, a recent study of the effect of forced tobacco abstinence during incarceration suggested that nearly all inmates returned to smoking after release, even those who received brief cognitive therapy in prison for smoking cessation (16). Our results suggest that in order to maintain reduced mortality rates for inmates with serious mental illness who are returning to the community, effective programs must be available both in corrections institutions and in the community to maintain tobacco abstinence. Our results also suggest the potential benefit of restricting or reducing tobacco use among individuals with serious mental illness living in the community. Tobacco bans in residential and outpatient treatment settings would also be expected to have an effect on mortality and should be implemented routinely.

There are limitations to this analysis, which used an aggregate database for mortality in a prison population and did not have individual patient data. The effect of covariates, including specifics about individuals' health history, was not included and would be important for future analyses. In addition, because cigarettes were a commonly traded commodity until the ban, individual consumption cannot be accurately determined. Some inmates may have maintained high use of tobacco until the complete ban took effect. Additional factors, such as length of sentences, were not controlled for among inmates.

Other factors may have contributed to the reduced mortality rates during the years examined. Although there was an administrative change in contract health care vendors in 2008, most of the existing medical practitioners joined the new vendor (Rutgers), thereby keeping care fairly consistent. Rutgers implemented efficiencies and

**TABLE 2. Deaths in the New Jersey Department of Corrections, 2005–2013, by cause of death and special need for mental health care**

Year	Deaths	Special needs		No special needs		Cause of death of persons in special needs group					
		Deaths	Age at death	Deaths	Age at death	Heart disease	Cancers	Liver disease	Respiratory disease	HIV	Suicide
2005	61	23	49.3±14.9	38	50.1±13.6						
2006	75	20	45.0±8.4	55	53.3±12.5						
2007	62	26	50.2±12.0	36	53.1±16.0						
2008	69	29	50.0±12.9	40	50.0±12.6						
2009	62	22	51.8±15.1	41	53.1±10.7	5	5	4	3	0	3
2010	55	21	55.2±15.7	36	50.5±12.1	9	2	4	2	0	2
2011	66	21	51.0±12.9	45	54.0±12.6	4	6	4	1	1	0
2012	49	13	51.6±13.6	35	53.5±11.4	2	5	2	0	1	2
2013	47	11	60.9±13.5	35	55.9±13.4	3	3	0	2	1	1

decreased the costs for providing general medical care and mental health care for the study period (17). We do not expect that the administrative change in health care provider accounted for the decreased mortality rate we found after the ban.

Finally, between 2005 and 2007, NJDOC slowly implemented a shift to a standard, heart-healthy diet. Otherwise, no other major medical policies were implemented during the same years. Nonetheless, further analysis is needed to confirm these findings and control for possible confounders.

Much of the recent literature proposes that the solution to reduce premature death of individuals with a serious mental illness is the integration and colocalization of psychiatric and general medical services with an emphasis on prevention and treatment of cardiovascular disease through programs emphasizing wellness. Policies, however, that restrict or eliminate access to tobacco in the environment are effective strategies for reducing tobacco-related mortality in the general population. This study in a correctional setting suggests that similar policies should be tried with subpopulations with mental illness in other settings as well.

## CONCLUSIONS

This study showed a significant decline in prison mortality between 2005 and June 2014, which coincided with policies that restricted and ultimately eliminated tobacco from the environment. After the ban, a 13% decrease in all causes of death was noted. A greater effect on mortality was observed for the group with mental illness.

## AUTHOR AND ARTICLE INFORMATION

Dr. Dickert, Dr. Reeves, and Dr. DeBilio are with University Correctional Health Care, Rutgers University, Trenton, New Jersey. Dr. Williams and Dr. Gara are with the Department of Psychiatry, Robert Wood Johnson Medical School, Rutgers University, New Brunswick, New Jersey, where Dr. Dickert and Dr. Reeves are also affiliated. Dr. Gara is also with University Behavioral Health Care, Rutgers University, Piscataway, New Jersey. Send correspondence to Dr. Williams (e-mail: jill.williams@rutgers.edu).

The authors thank Lorraine Steefel for her assistance with this project.

Dr. Williams has received unrestricted educational grants from Pfizer. The other authors report no financial relationships with commercial interests.

Received September 22, 2014; revision received December 1, 2014; accepted January 22, 2015; published online May 15, 2015.

## REFERENCES

1. National Research Council and Institute of Medicine: Health and Incarceration: A Workshop Summary. Washington, DC, National Academies Press, 2013
2. Vaughn MS, Del Carmen RV: Smoking in prisons: a national survey of correctional administrators in the United States. *Crime and Delinquency* 39:225–239, 1993
3. Parker DR, Fallone D, Martin RA, et al: The relation between smoking status and medical conditions among incarcerated adults. *Journal of Addiction Medicine* 8:90–95, 2014
4. Kauffman RM, Ferketich AK, Murray DM, et al: Tobacco use by male prisoners under an indoor smoking ban. *Nicotine and Tobacco Research* 13:449–456, 2011
5. Prins SJ: Prevalence of mental illnesses in US state prisons: a systematic review. *Psychiatric Services* 65:862–872, 2014
6. Miller BJ, Paschall CB III, Svendsen DP: Mortality and medical comorbidity among patients with serious mental illness. *Psychiatric Services* 57:1482–1487, 2006
7. Centers for Disease Control and Prevention: Vital signs: current cigarette smoking among adults aged  $\geq 18$  years with mental illness: United States, 2009–2011. *Morbidity and Mortality Weekly Report* 62(5):81–87, 2013
8. Callaghan RC, Veldhuizen S, Jeysingh T, et al: Patterns of tobacco-related mortality among individuals diagnosed with schizophrenia, bipolar disorder, or depression. *Journal of Psychiatric Research* 48:102–110, 2014
9. The NSDUH Report: Smoking and Mental Illness. Rockville, Md, Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality, Feb 5, 2013
10. Kauffman RM, Ferketich AK, Wewers ME: Tobacco policy in American prisons, 2007. *Tobacco Control* 17:357–360, 2008
11. Martin SA, Celli BR, DiFranza JR, et al: Health effects of the Federal Bureau of Prisons tobacco ban. *BMC Pulmonary Medicine* 12:64, 2012
12. Noonan M, Ginder G: Mortality in Local Jails and State Prisons, 2000–2011 Statistics Tables. NCJ 242186. Washington, DC, Department of Justice, Bureau of Justice Statistics, Aug 2013. Available at [www.bjs.gov/content/pub/pdf/mljsp0011.pdf](http://www.bjs.gov/content/pub/pdf/mljsp0011.pdf)
13. McMurphy T, Politis DN: Resampling methods for functional data; in *The Oxford Handbook of Functional Data Analysis*. Edited by Ferraty F, Romain Y. New York, Oxford University Press, 2011
14. Nordman DJ: A note on the stationary bootstrap. *Annals of Statistics* 37:359–370, 2009
15. Binswanger IA, Carson EA, Krueger PM, et al: Prison tobacco control policies and deaths from smoking in United States prisons: population based retrospective analysis. *BMJ (Clinical Research Ed)* 349:g4542, 2014
16. Clarke JG, Stein LAR, Martin RA, et al: Forced smoking abstinence: not enough for smoking cessation. *JAMA Internal Medicine* 173:789–794, 2013
17. Reeves R, Brewer A, DeBilio L, et al: Benefits of a department of corrections partnership with a health sciences university: New Jersey's experience. *Journal of Correctional Health Care* 20:145–153, 2014