

# Incarceration and perinatal smoking: a missed public health opportunity

Dora M Dumont,<sup>1</sup> Donna R Parker,<sup>2</sup> Samara Viner-Brown,<sup>3</sup> Jennifer G Clarke<sup>2</sup>

<sup>1</sup>Division of Community, Family Health and Equity, Rhode Island Department of Health, Providence, Rhode Island, USA

<sup>2</sup>Brown University Center for Primary Care and Prevention, Pawtucket, Rhode Island, USA

<sup>3</sup>Rhode Island Department of Health, Center for Health Data and Analysis, Providence, Rhode Island, USA

## Correspondence to

Dr Dora Dumont, Division of Community, Family Health and Equity, Rhode Island Department of Health, Providence, RI 0290, USA; dora.dumont@health.ri.gov

Received 18 August 2014

Revised 2 February 2015

Accepted 3 February 2015

## ABSTRACT

**Background** Incarceration is simultaneously a public health opportunity and a public health concern. We examined the association between maternal/partner incarceration in the year prior to birth and perinatal smoking.

**Methods** We pooled 2006–2010 data from the Centers for Disease Control and Prevention's Pregnancy Risk Assessment and Monitoring System. Controlling for age, race/ethnicity, education, marital status and other stressors, we assessed prevalence and heaviness of perinatal smoking.

**Findings** Women who reported incarceration of themselves or their partners in the year prior to delivery were more likely to smoke during the last trimester of pregnancy (adjusted OR (AOR) 1.51 (95% CI 1.36 to 1.67)), and they were more likely to smoke more than 10 cigarettes a day compared to smokers who did not report incarceration (AOR 1.35 (95% CI 1.10 to 1.65)). Patterns were similar for the 3 months prior to pregnancy and postbirth smoking.

**Conclusions** Incarceration of a parent in the 12 months before birth is associated with increased risk of fetal and newborn exposure to smoking. The criminal justice system can be utilised by public health practitioners to target perinatal smoking reduction interventions.

## INTRODUCTION

The USA has come to rely on incarceration as the response to a wide array of non-violent offences that are much less likely, in other countries, to result in imprisonment. As a result, a large number of high-risk families come into contact with the US criminal justice system every year when a family member is incarcerated. Correctional facilities have long been used as public health partners in interventions addressing infectious disease transmission, but less often to address the risk factors associated with chronic diseases. The 2010 federal Affordable Care Act (ACA) has expanded insurance coverage, reformed components of the healthcare delivery system and created new public health opportunities, but there are clear limitations to its impact. In order to ensure that the ACA benefits those most in need of services, state and federal health officials should consider expanding partnerships with correctional administrators. Decades of public health interventions have reduced the US smoking prevalence to under 20%, but about 70% of inmates smoked prior to incarceration and while most prisons have implemented full or partial smoking bans, about 97% of incarcerated smokers resume smoking within 6 months of release.<sup>1–4</sup> Identifying-specific associations between incarceration and health behaviours may help public health practitioners and

healthcare providers to target interventions more effectively. We analysed data from the Center for Disease Control and Prevention's (CDC) Pregnancy Risk Assessment and Monitoring System (PRAMS) collected from 2006 to 2010 to assess the association between maternal/partner incarceration in the year prior to birth and smoking behaviours. Our results provide guidance in targeting interventions for high-risk populations, even in nations with far lower incarceration rates.

## Background

The US is experiencing what has been called an epidemic of incarceration.<sup>5</sup> Since the 1970s, several social and political developments have increased the prevalence and duration of incarceration for even non-violent and first time offences,<sup>6</sup> and many more individuals are incarcerated for actions stemming from untreated mental illness.<sup>7</sup> About 700 000 people are released from prison and nearly 12 million pass through jail annually (in general, US prisons hold people sentenced to more than 1 year while jails hold a much larger population awaiting trial or serving shorter sentences).<sup>8 9</sup> Of particular concern is the disproportionate incarceration of young black and Hispanic men: in 2009, the rate of incarceration in state or federal prisons was 487/100 000 for white men, but 3119/100 000 for black men.<sup>10</sup>

People involved with the criminal justice system in the USA are more likely to be unemployed, less healthy and of lower educational attainment than the general population.<sup>6 11 12</sup> Because health insurance is not universal even under the ACA, they also tend to have poor access to healthcare, and correctional facilities are healthcare providers of last resort for many of them. At the same time, some researchers and practitioners are concerned that incarceration exacerbates both poor health and health disparities, especially by altering the life trajectories (employment, marriage, etc) most associated with health.<sup>13–17</sup> Incarceration has also been linked to the health of family members of the prisoner.<sup>18 19</sup> With the exception of situations of domestic violence, parental incarceration has been linked to children's poor mental health,<sup>20 21</sup> and people who were exposed to the incarceration of a household member during their childhood are at increased risk for smoking and heavy drinking in adulthood, even after accounting for other adverse childhood events.<sup>22</sup>

Because incarceration is especially prevalent among adults of childbearing age,<sup>6</sup> its potential effects on pregnancy outcomes are of particular concern. Incarcerated populations are generally excluded from population health data sets and until

**To cite:** Dumont DM, Parker DR, Viner-Brown S, et al. *J Epidemiol Community Health* Published Online First: [please include Day Month Year] doi:10.1136/jech-2014-204820

recently few data sets included incarceration history (ie, whether the participant had ever been incarcerated),<sup>23</sup> making it difficult to identify effects on pregnancy outcomes, though a previous study found strong associations with multiple measures of maternal disadvantage.<sup>24</sup> Results are inconsistent for the much smaller number of deliveries that occur during incarceration.<sup>25</sup> Women who are incarcerated have high rates of addiction, sexually transmitted diseases (STDs) and other health problems that can complicate neonatal health.<sup>26–28</sup> For this population, incarceration may constitute a period of relative stability and improved access to prenatal care that can improve birth outcomes,<sup>25 29 30</sup> although one study found racial differences in these benefits.<sup>30</sup> There are also some findings from previous studies of PRAMS data that included incarceration in their analysis.<sup>31–33</sup> These studies either included incarceration as one of several life events in the year before delivery, or analysed it without controlling for other stressors, but they help to identify the pathways through which incarceration may influence pregnancy (eg, through compromising available resources or increasing relationship dissolution and stress).<sup>33 34</sup> Examining specific perinatal health behaviours may provide further understanding of those pathways.

Smoking during and after pregnancy has long been recognised by the CDC and WHO as a risk factor for impaired infant and childhood development. Although the vast majority of inmates are male, their partners and families frequently share their high-risk profiles, especially with regard to smoking.<sup>3</sup> As a result, incarceration may complicate relationships between stress, smoking and gender even further.<sup>35</sup> We examined the association between exposure to incarceration in the year prior to delivery and perinatal smoking behaviours.

## METHODS

The CDC administers PRAMS annually in coordination with state Departments of Health. Currently, 40 states and New York City participate, reflecting 78% of US births (three states do not make their data available to the public).<sup>36</sup> Participating states conduct stratified random sampling of women who are residents of that state and who have delivered a live-born infant in that state, as identified through states' birth certificate registries. Selected women are mailed a questionnaire 2–6 months following delivery, and states follow-up with non-responders by telephone after three mailings. The data set includes variables from birth certificates as well as responses to the questionnaire. West Virginia and Washington excluded incarcerated women from their sample, but no other states reported doing so. PRAMS reports a 70% response rate threshold through 2006 and a 65% response rate threshold starting in 2007. We pooled all publicly available data from 2006 to 2010 ( $n=200\,226$ ).

**Figure 1** Stressors in the 12 months before the infant's birth.

1. A close family member was very sick and has to go into the hospital.
2. I got separated or divorced from my husband or partner
3. I moved to a new address
4. I was homeless
5. My husband or partner lost his job
6. I lost my job even though I wanted to go on working
7. I argued with my husband or partner more than usual
8. My husband or partner said he didn't want me to be pregnant
9. I had lot of bills I couldn't pay
10. I was in a physical fight
11. My husband or partner or I went to jail
12. Someone very close to me had a problem with drinking or drugs
13. Someone very close to me died

The independent variable of interest was incarceration stress in the year before delivery, as measured by the option "I or my husband or partner went to jail" on a list of potential stressors on the questionnaire (figure 1). Although the question specifies jail, we used it as a proxy for incarceration in any type of correctional facility given the frequent merging of terminology in the US public. The outcome was prevalence of self-reported smoking as well as amount of smoking reported by self-identified smokers ( $\leq 5$ , 6–10, 11–20 or  $> 20$  cigarettes/day). Between 2006 and 2008, smoking behaviour was asked of women who indicated they had smoked 100 cigarettes in the past 2 years. After 2008 (phase 6 of the survey), all women who indicated they had smoked at least one cigarette in the past 2 years were asked follow-up questions about their smoking habits. We examined self-reported smoking in the 3 months before conception; during the last trimester of pregnancy; and at the time of the survey. Covariates were race/ethnicity (non-Hispanic black, non-Hispanic white, Hispanic, all others); age (17–19, 20–24, 25–29, 30–34 and 35 years or older); educational level (8th grade or less completed; 9th–11th grade; high school degree; some college; BA or above); marital status (dichotomised as married vs all other); and any other stressors listed in figure 1 experienced in the year prior to delivery. Other models have collapsed these into four categories of emotional, financial, partner-related and traumatic stressors,<sup>31 32</sup> but we elected to include each stressor individually for greater precision. We tested and rejected models that added income and self-reported reception of supplemental nutritional assistance from Women, Infants, & Children (WIC—a federal programme for low-income perinatal women and children) in the year before birth as measures of socioeconomic status, since results were virtually identical to models employing education but with a greater number of missing responses. Respondents missing values for the independent variable, outcomes, or any of the covariates, were removed from analysis for a final sample of  $n=182\,390$ . We conducted bivariate analyses and multivariate logistic regressions in Stata V11 SE to calculate weighted percentages and OR, using survey weights and strata information as provided by the CDC, to account for complex sampling methodology. For the heaviness of smoking (ie, number of cigarettes per day), we employed ordered multivariate-ordered regressions converted to ORs. The study was exempt from Institutional Review Board approval and the original data collection was approved by the CDC's Institutional Review Board.

## RESULTS

Women who reported incarceration of themselves or their partners in the year prior to delivery were significantly younger than other women (62.5% vs 31.7% under 25 years old), more likely

to be of lower educational attainment and income and less likely to be married (20.2% vs 64.0%; **table 1**). They were more likely to experience other stressors during the same period and to have a greater number of stressors: 24.9% of women reporting incarceration had six or more additional stressors, compared to 2.8% of women reporting no incarceration.

A higher percentage of women reporting incarceration stress also reported smoking during the three periods examined, and they reported smoking a greater number of cigarettes (**table 2**). This association continued when logistic regressions controlled for age, race/ethnicity, education, marital status and other stressors (**table 3**). For example, women who reported incarceration of themselves or their partners were more likely to smoke during the last trimester (adjusted OR (AOR) 1.51 (95% CI 1.36 to 1.67)) and they were more likely to smoke more, with 1.35 the odds of smoking more than 10 cigarettes a day compared to smokers who did not report incarceration stress (95% CI 1.10 to 1.65). AOR were similar for the 3 months prior to pregnancy and smoking at the time of the survey.

Women who reported incarceration stress also had higher odds of reporting that they were smoking the same or more at the time of interview as before pregnancy (AOR=1.32 (95% CI 1.14 to 1.52)). A comparison of model 1 (controlling for demographic covariates) and model 2 (adding the other stressors to model 1) shows that a large part of the increased odds are due to the coexistence of other stressors, but a substantial association remains between incarceration and smoking after adjustment for these other stressors.

## DISCUSSION

Incarceration of the mother or her partner in the 12 months prior to delivery is associated with increased risk of fetal and newborn exposure to smoking. Given the well-known risks of maternal smoking associated with infant and early childhood development, these infants may be at higher risk of later cognitive developmental problems<sup>37 38</sup> in addition to physical ailments such as asthma.<sup>35</sup> Our findings add weight to a growing sense that the unprecedented scale of incarceration in the US

**Table 1** Count and weighted percentage of demographic characteristics of respondents, 2006–2010

	No incarceration in 12 months before birth	Self or partner incarcerated in 12 months before birth	p Value
	n=173 415 (95.5%)	n=8975 (4.5%)	
Age (years)			<0.0001
≤19	17 007 (9.2%)	1883 (22.7%)	
20–24	40 093 (22.5%)	3549 (39.8%)	
25–29	48 910 (29.1%)	2071 (23.2%)	
30–34	39 958 (24.4%)	941 (9.6%)	
≥35	27 442 (14.8%)	530 (4.7%)	
Race/ethnicity			<0.0001
Non-Hispanic white	96 299 (62.3%)	4116 (52.0%)	
Hispanic	25 086 (16.6%)	1013 (13.0%)	
Non-Hispanic black	27 571 (13.9%)	2626 (29.2%)	
Asian, Native American or other	24 459 (7.2%)	1220 (5.9%)	
Education			<0.0001
8th grade or below	6520 (4.3%)	275 (3.5%)	
Grade 9–11	22 052 (12.3%)	2429 (27.9%)	
High school degree	49 082 (27.2%)	3717 (41.0%)	
Some college	43 290 (24.5%)	2161 (22.9%)	
College degree	52 471 (31.6%)	393 (4.7%)	
Married	109 634 (64.0%)	1989 (20.2%)	<0.0001
<i>Other stresses in 12 months before birth</i>			
Divorced/separated	13 043 (6.9%)	3006 (32.0%)	<0.0001
Moved	59 491 (33.0%)	5442 (60.0%)	<0.0001
Homeless	5146 (3.0%)	1538 (15.4%)	<0.0001
Partner lost job	20 662 (12.1%)	2952 (32.9%)	<0.0001
Lost own job	16 657 (9.4%)	2294 (24.7%)	<0.0001
Argued with partner more than usual	42 112 (23.3%)	5484 (59.5%)	<0.0001
Partner did not want pregnancy	13 290 (7.4%)	1959 (20.9%)	<0.0001
Could not pay bills	38 178 (21.0%)	4607 (50.4%)	<0.0001
Got in a physical fight	5430 (2.8%)	2425 (25.4%)	<0.0001
Someone close had a substance problem	19 801 (10.5%)	4548 (48.5%)	<0.0001
Someone close was hospitalised	40 271 (22.9%)	3058 (34.2%)	<0.0001
Someone close died	30 340 (16.6%)	2686 (28.3%)	<0.0001
Total number of stresses aside from incarceration			<0.0001
0	58 274 (35.0%)	328 (4.2%)	
1–2	75 809 (43.6%)	2092 (24.9%)	
3–5	34 002 (18.6%)	4131 (46.0%)	
6–11	5330 (2.8%)	2424 (24.9%)	

**Table 2** Count and weighted percentage of smoking behaviours by incarceration history, 2006–2010

	No incarceration	Incarceration	p Value
Smoked in 3 months before pregnancy	41 221 (21.9%)	5078 (53.5%)	<0.0001
If yes, smoked >10 cigarettes daily	12 820 (30.1%)	1887 (40.0%)	<0.001
Smoked last trimester of pregnancy	22 712 (11.0%)	3520 (35.2%)	<0.0001
If yes, smoked >10 cigarettes daily	3238 (6.4%)	583 (11.5%)	<0.0001
Smoking at time of survey	30 933 (15.8%)	4337 (45.3%)	<0.0001
If yes, smoked >10 cigarettes daily	7843 (16.9%)	1213 (25.7%)	<0.0001
Smoked the same or more in last trimester as prior to pregnancy	7911 (3.8%)	1257 (12.5%)	<0.0001
Smokes the same or more now as prior to pregnancy	30 933 (15.8%)	4337 (45.3%)	<0.0001

plays a crucial role in public health approaches to interventions designed to reach high-risk populations.

Although the data do not allow identification of whether the mother herself or her partner was incarcerated, nationally, nearly 90% of inmates are male. Women in this sample who reported incarceration stress had an AOR of 1.38 (95% CI 1.20 to 1.57) of having had more than two previous live births compared to women who did not report this stressor (data not shown). This higher parity raises the possibility that childbearing women constitute a larger percentage of the population affected by incarceration than the female population overall. Even so, it appears likely that in the vast majority of cases women are reporting on partner incarceration rather than their own. These findings contribute additional evidence to recent findings that men's incarceration has adverse consequences for not only their children's mental health,<sup>39 40</sup> but also for the health of their female partners, who have been identified as a "new vulnerable population."<sup>18 41</sup> Our results suggest ways in which male incarceration may present a public health opportunity to address perinatal smoking, even in countries with far less incarceration than the USA.

Even without evidence of a causal relationship, the strong association between incarceration and perinatal smoking suggests it is

well worthwhile for the medical and public health professions to focus their energies on improving services to criminal justice-involved populations. There are several ways the health and public health professions can work with correctional facilities or correctional systems to address the highly distinctive context for smoking among prisoners and their families. About one in eight of all smokers in America are incarcerated annually,<sup>42</sup> and the spread of prison smoking bans enforces smoking cessation for many of them.<sup>43 44</sup> Incarceration could also present an important opportunity to break smoking habits among prisoners' families. For instance, few facilities or public health interventions take advantage of visiting hours, when family members often have long waits with nothing to do before gaining access to face time with the person they are visiting.

However, interventions at correctional facilities will ultimately have limited success unless they take account of the added psychosocial context of smoking for prisoners and former prisoners. In addition to the various 'free world' reasons for smoking of many disadvantaged people (eg, stress management), prison smoking bans imbue smoking with implications of freedom and independence.<sup>2 45</sup> It is even more important to acknowledge the problem of release from prison or jail, which is a transition filled with stress and anxiety for many prisoners and their families.<sup>2 7 46 47</sup> For individuals or families leading especially chaotic lives, the period of incarceration may have been experienced as a reprieve. Prisoners may also be returning to environmental triggers and social networks increasing the likelihood of smoking resumption.<sup>3</sup> As table 1 shows, women reporting incarceration in the year before their infant's birth already had much higher rates of multiple stressors during the same period. In this context, the relative successes of prison smoking bans are quickly undone, and 97% of smokers return to smoking on release from prison.<sup>42</sup> In order to be successful, traditional treatment programmes must be adapted for this specific population, and particularly for the highly stressful conditions of release that are conducive to relapse.<sup>2 42</sup> A study in a New England prison system found that despite the prevalence of smoking among prisoners' families and partners, prisoners identified family encouragement as a key factor in cessation intentions, suggesting the possible benefits of focusing on a familial instead of an individual approach.<sup>3</sup>

Our findings join with these previous studies to suggest additional considerations in targeting perinatal smoking in this population. First, even male smoking cessation could increase partner interest in cessation. Second, interventions must focus on the often difficult re-entry experience rather than only addressing the incarceration period itself. Finally, the fact that prisoners are mostly male should not forestall stakeholders in maternal and child health from partnering with correctional systems to reach women at high risk of perinatal smoking as well as coexisting stressors.

The study is subject to several limitations. We were unable to isolate the extent to which the association between incarceration and smoking was due to the mother's own incarceration versus her partner's. We were also unable to determine whether the length of the incarceration episode is significant, nor whether the 1-year timeframe of the question masks associations with incarceration from before that period (eg, 2 years before birth). Because all data are self-reported, we are unable to verify the accuracy of independent and dependent variables. Finally, the cross sectional data set does not allow any determination of causality.

Incarceration of a woman or her partner in the year before birth is associated with higher odds of perinatal smoking and

**Table 3** Adjusted OR of women reporting self/partner incarceration in the year before birth compared to women who did not, 2006–2010

	Model 1*	Model 2†
Smoked before pregnancy		
Y/N	2.58 (2.36 to 2.82)	1.54 (1.40 to 1.69)
If Y, >10 cigarettes daily	1.51 (1.35 to 1.70)	1.22 (1.08 to 1.39)
Smoked last trimester		
Y/N	2.52 (2.30 to 2.76)	1.51 (1.36 to 1.67)
If Y, >10 cigarettes daily	1.83 (1.53 to 2.18)	1.35 (1.10 to 1.65)
Smoked the same or more during pregnancy as prior to pregnancy	2.01 (1.77 to 2.27)	1.30 (1.13 to 1.50)
Smoking at time of interview		
Y/N	2.52 (2.31 to 2.75)	1.55 (1.41 to 1.71)
If Y, >10 cigarettes daily	1.56 (1.37 to 1.79)	1.31 (1.14 to 1.52)
Smokes the same or more now as before pregnancy	2.52 (2.31 to 2.75)	1.55 (1.41 to 1.71)

\*Controlled for age, race/ethnicity, education and marital status.

†Controlled for age, race/ethnicity, education, marital status and stressors other than incarceration.

N, no; Y, yes.

heavier smoking habits among those who do smoke. This association persists after controlling for socioeconomic measures and other stressors, including homelessness. This suggests that involvement of either the woman or her partner in the criminal justice system can be utilised by public health practitioners as a critical focus for targeting interventions to high-risk populations.

### What is known on this subject?

There is a well-known association between incarceration and smoking, along with a separate body of research on stressors associated with perinatal health behaviours.

### What this study adds?

Our findings advance current work on incarceration and health outcomes/behaviours by using a population health data set that allowed us to control for many conditions that frequently coexist with incarceration. Rather than providing evidence of a causal association, our intent was to identify the great relevance of the criminal justice system in reducing the remaining pockets of high smoking rates, especially related to pregnancy and early childhood.

**Acknowledgements** The authors wish to acknowledge Rachel Cain of the Rhode Island Department of Health Center for Health Data and Analysis and the CDC PRAMS Working Group: Izza Afgan, MPH (AL), Kathy Perham-Hester, MS, MPH (AK), Mary McGehee, PhD (AR), Alyson Shupe, PhD (CO), Jennifer Morin, MPH (CT), George Yocher, MS (DE), Avalon Adams-Thames, MPH, CHES (FL), Chineolo Ogbuanu, MD, MPH, PhD (GA), Emily Roberson, MPH (HI), Theresa Sandidge, MA (IL), Sarah Mauch, MPH (IA), Amy Zapata, MPH (LA), Tom Patenaude, MPH (ME), Diana Cheng, MD (MD), Emily Lu, MPH (MA), Cristin Larder, MS (MI), Judy Punyo, PhD, MPH (MN), Brenda Hughes, MPPA (MS), Venkata Garikapati, MSc, MS, PhD, MPH (MO), JoAnn Dotson (MT), Brenda Coufal (NE), David J Laflamme, PhD, MPH (NH), Lakota Kruse, MD (NJ), Eirian Coronado, MPH (NM), Anne Radigan-Garcia (NY), Candace Mulready-Ward, MPH (New York City), Kathleen Jones-Vessey, MS (NC), Sandra Anseth (ND), Connie Geidenberger, PhD (OH), Alicia Lincoln, MSW, MSPH (OK), Kenneth Rosenberg, MD, MPH (OR), Tony Norwood (PA), Sam Viner-Brown, PhD (RI), Mike Smith, MSPH (SC), Rochelle Kingsley, MPH (TX), David Law, PhD (TN), Lynsey Gammon, MPH (UT), Peggy Brozicevic (VT), Marilyn Wenner (VA), Linda Lohdefinck (WA), Melissa Baker, MA (WV), Katherine Kvale, PhD (WI), Amy Spieker, MPH (WY), CDC PRAMS Team, Applied Sciences Branch, Division of Reproductive Health.

**Contributors** DD and JC conceived the study. DD conducted analysis and drafted the article. All authors contributed critical revisions and final review.

**Funding** US Department of Health and Human Services-National Institutes of Health-National Institute of Child Health and Human Development, R01 HD054890.

**Competing interests** None.

**Provenance and peer review** Not commissioned; externally peer reviewed.

### REFERENCES

- 1 Lincoln T, Tuthill RW, Roberts CA, et al. Resumption of smoking after release from a tobacco-free correctional facility. *J Correct Health Care* 2009;15:190–6.
- 2 Valera P, Cook SH, Darout R, et al. "They are not taking cigarettes from me...I'm going to smoke my cigarettes until the day I die. I don't care if I get cancer": smoking behaviors of men under community supervision in New York City. *Nicotine Tob Res* 2014;16:800–6.
- 3 Bock B, Lopes CE, van den Berg JJ, et al. Social support and smoking abstinence among incarcerated adults in the United States: a longitudinal study. *BMC Public Health* 2013;13:859.
- 4 Clarke JG, Stein LA, Martin RA, et al. Forced smoking abstinence: not enough for smoking cessation. *JAMA Intern Med* 2013;173:789–94.
- 5 Drucker E. *A plague of prisons: the epidemiology of mass incarceration in America*. New York: The New Press, 2011.
- 6 Pew. *Collateral costs: incarceration's effect on economic mobility*. Washington DC: Pew Charitable Trusts, 2010.
- 7 Dumont D, Brockmann B, Dickman S, et al. Public health and the epidemic of incarceration. *Ann Rev Public Health* 2012;33:325–39.
- 8 Carson A, Sabol W. *Prisoners in 2011*. Washington DC: U.S. Department of Justice, Bureau of Justice Statistics, 2012.
- 9 Minton T. *Jail inmates at midyear 2011—statistical tables*. Washington DC: Bureau of Justice Statistics, 2012.
- 10 West H, Sabol W, Greenman S. *Prisoners in 2009*. Washington DC: U.S. Department of Justice Bureau of Justice Statistics, 2010.
- 11 Binswanger IA, Krueger PM, Steiner JF. Prevalence of chronic medical conditions among jail and prison inmates in the USA compared with the general population. *J Epidemiol Community Health* 2009;63:912–19.
- 12 Western B, Wildeman C. The black family and mass incarceration. *Ann Am Acad Polit Sci* 2009;621:221–42.
- 13 London A, Myers N. Race, incarceration, and health: a life-course approach. *Res Aging* 2006;28:409–22.
- 14 Massoglia M. Incarceration as exposure: the prison, infectious disease, and other stress-related illnesses. *J Health Soc Behav* 2008;49:56–71.
- 15 Massoglia M. Incarceration, health, and racial disparities in health. *Law Soc Rev* 2008;42:275–305.
- 16 Pager D, Western B, Bonikowski B. Discrimination in a low-wage labor market: a field experiment. *Am Soc Rev* 2009;74:777–99.
- 17 Schnittker J, John A. Enduring stigma: the long-term effects of incarceration on health. *J Health Soc Behav* 2007;48:115–30.
- 18 Lee H, Wildeman C, Wang EA, et al. A heavy burden: the cardiovascular health consequences of having a family member incarcerated. *Am J Public Health* 2014;104:421–7.
- 19 Wildeman C, Lee H, Comfort M. A new vulnerable population? The health of female partners of men recently released from prison. *Womens Health Issues* 2013;23:e335–40.
- 20 Wakefield S, Wildeman C. Mass imprisonment and racial disparities in childhood behavioral problems. *Criminol Public Policy* 2011;10:793–817.
- 21 Wildeman C, Western B. Incarceration in fragile families. *Future Child* 2010;20:157–77.
- 22 Gjelsvik A, Dumont DM, Nunn A. Incarceration of a household member and Hispanic health disparities: childhood exposure and adult chronic disease risk behaviors. *Prev Chronic Dis* 2013;10:E69.
- 23 Ahalt C, Binswanger IA, Steinman M, et al. Confined to ignorance: the absence of prisoner information from nationally representative health data sets. *J Gen Intern Med* 2012;27:160–6.
- 24 Dumont DM, Wildeman C, Lee H, et al. Incarceration, Maternal Hardship, and Perinatal Health Behaviors. *Matern Child Health J* 2014;18:2179–87.
- 25 Bell JF, Zimmerman FJ, Cawthon ML, et al. Jail incarceration and birth outcomes. *J Urban Health* 2004;81:630–44.
- 26 Binswanger IA, Merrill JO, Krueger PM, et al. Gender differences in chronic medical, psychiatric, and substance-dependence disorders among jail inmates. *Am J Public Health* 2010;100:476–82.
- 27 Lewis C. Treating incarcerated women: gender matters. *Psychiatr Clin North Am* 2006;29:773–89.
- 28 Nijhawan AE, Salloway R, Nunn AS, et al. Preventive healthcare for underserved women: results of a prison survey. *J Womens Health (Larchmt)* 2010;19:17–22.
- 29 Clarke JG, Adashi EY. Perinatal care for incarcerated patients: a 25-year-old woman pregnant in jail. *JAMA* 2011;305:923–9.
- 30 Howard DL, Strobino D, Sherman SG, et al. Timing of incarceration during pregnancy and birth outcomes: exploring racial differences. *Matern Child Health J* 2009;13:457–66.
- 31 LaCoursiere DY, Hirst KP, Barrett-Connor E. Depression and pregnancy stressors affect the association between abuse and postpartum depression. *Matern Child Health J* 2012;16:929–35.
- 32 Lu MC, Chen B. Racial and ethnic disparities in preterm birth: the role of stressful life events. *Am J Obstet Gynecol* 2004;191:691–9.
- 33 Wildeman C. Imprisonment and infant mortality. *Soc Prob* 2012;59:228–57.
- 34 Braverman P, Marchi K, Egarter S, et al. Poverty, near-poverty, and hardship around the time of pregnancy. *Matern Child Health J* 2010;14:20–35.
- 35 Samet JM, Yoon SY. World Health Organization. *Gender, women and the tobacco epidemic*. Geneva: World Health Organization, 2010.
- 36 Centers for Disease Control and Prevention. Participating PRAMS states. Secondary Participating PRAMS states 19 December 2011. 2012. <http://www.cdc.gov/prams/States.htm>
- 37 Clifford A, Lang L, Chen R. Effects of maternal cigarette smoking during pregnancy on cognitive parameters of children and young adults: a literature review. *Neurotoxicol Teratol* 2012;34:560–70.
- 38 Herrmann M, King K, Weitzman M. Prenatal tobacco smoke and postnatal secondhand smoke exposure and child neurodevelopment. *Curr Opin Pediatr* 2008;20:184–90.

- 39 Geller A, Garfinkel I, Cooper CE, et al. Parental incarceration and child wellbeing: implications for urban families. *Soc Sci Q* 2009;90:1186–202.
- 40 Murray J, Farrington DP, Sekol I. Children's antisocial behavior, mental health, drug use, and educational performance after parental incarceration: a systematic review and meta-analysis. *Psychol Bull* 2012;138:175–210.
- 41 Lee H, Wildeman C. Things fall apart: health consequences of mass imprisonment for African American women. *Rev Black Polit Economy* 2013;40:39–52.
- 42 Clarke JG, Stein LA, Martin RA, et al. Forced smoking abstinence: not enough for smoking cessation. *JAMA Intern Med* 2013;173:1–6.
- 43 Kauffman RM, Ferketich AK, Murray DM, et al. Tobacco use by male prisoners under an indoor smoking ban. *Nicotine Tob Res* 2011;13:449–56.
- 44 Ritter C, Huynh CK, Etter JF, et al. Exposure to tobacco smoke before and after a partial smoking ban in prison: indoor air quality measures. *Tob Control* 2012;21:488–91.
- 45 van den Berg JJ, Bock B, Roberts MB, et al. Cigarette smoking as an expression of independence and freedom among inmates in a tobacco-free prison in the United States. *Nicotine Tob Res* 2014;16:238–42.
- 46 Mallik-Kane K, Visher C. *Health and prisoner reentry: how physical, mental, and substance abuse conditions shape the process of reintegration*. Washington DC: Urban Institute, 2008.
- 47 National Academy of Sciences and Institutes of Medicine. *Health and Incarceration: A Workshop Summary*. The National Academies Press, 2013.