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Release from US immigration detention may improve physical and psychological stress and health: Results from a two-wave panel study in California

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Title Page

• **Title**

Release from US Immigration Detention May Improve Physical and Psychological Stress and Health: Results from a Two-Wave Panel Study in California

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Keywords

immigrants, health outcomes, mental health and illness, stress, immigration detention, incarceration, immigration, migrants/refugees

Highlights

- Few studies examine release from immigration detention and its health consequences.
- Release from immigration detention on bond is associated with improved mental health.
- Reunification with family, physical freedom, and autonomy may be mechanisms for improved health.
- To improve health, policymakers should prioritize alternatives to detention.

Abstract

Imprisonment in the U.S. criminal legal system is associated with adverse health outcomes, but we know far less about the health consequences of immigration detention. Also understudied is whether and how the health of formerly incarcerated people, including individuals detained by immigration authorities, may change following release from imprisonment.

This study is the first to assess changes to psychological and physical stress and general health following release from immigration detention. We use two waves of panel data collected from 79 individuals while they were imprisoned by U.S. Immigration and Customs Enforcement in California, and then following their release on bond as they await adjudication on their immigration legal proceedings.

Multivariable analyses reveal that study participants reported fewer physical, psychological, and overall symptoms of stress, as well greater likelihood of excellent overall general health after release from immigration detention, compared to while they were detained. In qualitative analysis of open-ended responses, released immigrants cited reunification with family, physical freedom, and autonomy to make their own choices as key mechanisms for reduced stress and improved health.

Understanding processes that mitigate stress is critical to meeting the physical and mental health needs of detained and released immigrants. While imprisonment is associated with poor health, release from immigration detention may reverse some of the stress and adverse health consequences. Alternatives to detention would likely mitigate some of the harmful health consequences of immigration detention.

1. Introduction

US Immigration and Customs Enforcement (ICE) maintains the world's largest immigration detention system, with hundreds of thousands of individuals detained annually across hundreds of facilities nationwide [1]. Immigration detention facilities, which are generally subcontracted to for-profit corporations and federal, state, and local jails, share the same physical characteristics of jails and prisons used in the context of criminal incarceration [2]. Immigration detention is a structural determinant of health, part of a continuum of experiences faced by immigrants before, during, and after migration that can limit their ability to live full, healthy lives [3].

Incarceration can lead to poor physical and mental health [4, 5], due to systemic disadvantages faced by people who are imprisoned, exposure to stressful and unhealthy environments, and limited access to healthcare during imprisonment. However, there is very limited data on the health of individuals experiencing detention by US immigration authorities, partly due to a systematic lack of data transparency by immigration authorities and detention facility operators [6]. Still, existing research and investigative reports have shown that immigration detention is a stressful environment where detained individuals may be subject to physical and psychological abuse, exposure to disease, and inadequate provision of medical care and/or gross medical negligence [2, 3, 7, 8].

There is also a dearth of research on how immigrants' health may change once they are released from detention, and the potential mechanisms that could influence those changes. Studies of individuals imprisoned in the criminal legal context find that the transition to life outside prison is challenging [9, 10], with many formerly incarcerated individuals facing stigma, trauma, economic strain, chronic illness, and difficulty accessing needed care [11]. Far fewer studies assess formerly incarcerated peoples' health following release or compare health outcomes to while they were imprisoned. While formerly incarcerated people are often less healthy than never-incarcerated people, some studies document health improvements among formerly incarcerated people as they leave prison and transition back into society [12].

Our objective is to assess stress and overall health among immigrants following their release from detention, compared to during detention. We draw on two waves of panel survey data, gathered during detention and then following release on bond. We then draw on qualitative data to provide insight into potential mechanisms that may influence stress and health following release from imprisonment.

Throughout our analyses, we use “detention” and “people/person in detention” to distinguish imprisonment under immigration law from imprisonment under criminal law. However, we note that immigration detention facilities are often indistinguishable from jails and prisons—many are subcontracted within jails and prisons. We use “imprisonment” throughout to refer to the general experience of being imprisoned or incarcerated.

2. Theory

2.1. Imprisonment and the stress process

Stress process theory is a framework for understanding the links between health problems and exposure to various forms of stress [13-15]. According to stress process theory, *stressors* are “external circumstances that challenge or obstruct”, and *stress* is the “internal dysfunctions that result from these circumstances” [15]. Stress can be acute and related to specific events, anticipatory, and/or chronic; stress can also be cumulative and linked to a host of poor health outcomes [15].

Stress process theory helps explain why imprisonment—whether under criminal or immigration law—can lead to negative health and stress, as well as why release may alleviate some of that stress even while potentially introducing new stressors. Imprisonment can be considered both an acute stressor and a setting that generates chronic stress. The initial shock of imprisonment can be jolting as individuals experience severe constraints on their freedom, the pain of separation from family and loved ones, and adjustment to an environment of social and physical control. Carceral settings such as jails, prisons, and detention facilities can also generate chronic stress by exposing individuals to physically and emotionally unhealthy environments. For example, imprisoned people are more likely to be exposed to infectious disease, violence, and conditions linked to stress-related morbidity (e.g., hypertension) [4, 16]. Social isolation and disrupted ties to family and loved ones can also lead to chronic stress. Consistent with the predictions of stress process theory, it is well established that imprisonment can lead to poor health outcomes and even portend a mortality penalty [5].

However, we know less about the health of individuals experiencing imprisonment by immigration authorities. Recent research argues that detention, like imprisonment under criminal law, likely generates substantial stress and poor health. A study of people detained in California found that nearly half (43%) had at least one diagnosed chronic health condition—17% with neuropsychiatric conditions—and nearly one in five had experienced disruptions in care upon entering immigration detention [6]. Immigration detention can also expose individuals to stressful and unhealthy environments. Analyses of administrative data from ICE found that imprisoned immigrants with mental illness were more likely to experience solitary confinement, and for longer periods of time, despite decades of research establishing the harms of the practice [17, 18]. Detention also exposes people in detention to infectious disease and inadequate and/or grossly negligent medical care that can have fatal consequences [3, 8]. Such violations of detention standards often go unaddressed, even when raised by federal inspectors [7].

Immigration detention is also marked by extensive uncertainty [19] because detention can extend indefinitely and detained individuals do not know what will happen to them at the end of their deportation proceedings. This uncertainty can generate anticipatory stress [15]—that is, stress about things that have not yet happened—e.g., deportation, separation from family, etc. Stress events, chronic stressors, and anticipatory stress can individually and collectively contribute to increased stress and poor health during detention. Yet no existing research has examined the prevalence of health conditions or stress following release from immigration detention, relative to during detention. Our study aims to begin to fill this gap.

2.2. Release and the stress process

Stress process theory can also help us understand the experiences of individuals released from imprisonment. While existing literature from the criminal law context makes clear that reintegration—or, the process of leaving carceral settings and re-entering the community—is challenging, it is also possible that leaving carceral settings could lead to improved health by reducing or changing the chronic stressors in individuals' lives.

Stressors following release may include difficulty finding work and stable housing, stigma and discrimination, and limited support within one's social network, conceptualized by some as the “afterlife of mass incarceration” [20]. Formerly incarcerated individuals are more likely to experience functional health limitations [21] and mood disorders [22] compared to those who have not been incarcerated. In the immigration context, those released on bond likely continue to contend with removal proceedings and the anticipatory stress of deportation [23].

Yet formerly imprisoned individuals may still experience health benefits following release. For example, studies in the criminal law context show that people released from prison may have optimistic expectations for their health and wellbeing and may experience improvements to depression and stress, compared to their experiences during imprisonment, and depending on access to social supports [24-26]. Some may even experience relief, joy and elation, especially in the initial period following release [10]. However, few studies have assessed immigrants' health during detention, and no studies have followed individuals after release from immigration detention. Our research is the first to assess changes in stress and health outcomes following release from immigration detention, compared to during detention.

3. Material and methods

3.1. Study Design, Participants, and Setting

We analyze two waves of surveys from a study of immigrants who were detained by ICE and then released on bond in the United States [6, 27, 28]. A baseline survey was conducted in detention facilities (in person) and a post-release survey (in person or via phone) took place approximately 18 weeks following release on bond. Study materials were adapted from a study designed to assess reintegration outcomes among newly released prisoners, the Boston Re-entry Study [29], and customized for noncitizens detained and released under US immigration law.

Participants were drawn from a complete census of individuals who had been held by immigration authorities in California during the study period and had been scheduled a bond hearing under *Rodriguez v. Robbins* (hereafter *Rodriguez*), class action litigation requiring bond hearings before an immigration judge for individuals who had been detained by ICE for 180 days or longer. A bond hearing allows for the individual to be considered for release from detention while their immigration legal case is adjudicated. *Rodriguez* created an unprecedented opportunity to explore the post-release experiences of noncitizens who were released on bond from ICE custody. The study emerged from a research-practice partnership with a civil rights organization that worked with *Rodriguez* class members, invited them to participate in the study, and conducted the baseline survey.

Participants were imprisoned in one of four facilities in the jurisdiction of *Rodriguez* that ICE subcontracted to detain immigrants under US immigration law, including three local jails and one facility operated by a private, for-profit correctional corporation. The practitioner partner conducted a survey with as many individuals as possible who were scheduled a *Rodriguez* bond hearing during the study period ($n=565/614$ [92%]). Of the 474 (84%) who agreed to participate in the post-release survey if released on bond, 292 were deported, 46 were lost to follow up, and 136 were released. Of those who were released, 79 (58%) participated in an additional post-release survey. These individuals who completed both a baseline and post-release survey constitute the primary analytic sample. Appendix Table A compares all participants who completed only the baseline survey to those who completed both a baseline and post-release survey. We include additional detailed information about the study sample and methodology in the appendix.

The surveys captured detailed information about participants' demographic background; work, criminal, immigration, and legal history; family and household; experiences within jails and detention facilities; and experiences following release. Both surveys contained detailed questions about physical and mental health, representing the first research on detained immigrants to capture health information. All study participants were at least 18 years old, spoke English or Spanish, and had been scheduled a bond hearing under *Rodriguez*. Surveys lasted between 90 to 120 minutes. Detained participants did not receive compensation for participating. Post-release study participants received a \$40 gift card incentive, along with a bilingual pamphlet containing information about free- and low-cost services available to immigrants in their geographic area. Data collection procedures were approved by the Institutional Review Boards (IRBs) at Stanford University and the University of Southern California. Analysis of de-identified study data for the present analysis was approved by the IRB at the University of California, Davis.

3.2. Measures

3.2.1. Stress and health outcomes

We examined four health outcomes, all of which were assessed at both baseline and post-release. We derived the first three outcomes from an index of physical and psychological stress symptoms, adapted from the American Psychological Association's (APA) Stress in America survey, an annual, nationwide study aiming to explore perceptions of stress [30]. Participants were asked (yes=1, no=0) if they had experienced any of the following physical or psychological indicators of stress in the past month: 1) headaches; 2) frequent upset stomach or indigestion; 3) muscular tension; 4) inability to sleep or sleeping too much; 5) teeth grinding; 6) change in appetite; 7) frequently feeling as though you could cry; 8) feeling nervous or sad; 9) irritability or anger; 10) lack of interest, motivation or energy; and 11) fatigue.

Following the APA [31], we summed responses into three indices: physical stress (items 1-6), psychological stress (items 7-11), and overall stress symptoms (items 1-11). These indices have high internal consistency, with Cronbach's alpha (α) scores as follows: the physical stress index α is 0.75 at baseline and 0.72 at post-release; the psychological stress index α is 0.68 in both waves of the survey; and the overall stress index α is 0.85 at baseline and 0.81 at post-release.

Our fourth outcome was adapted from a widely used, validated, and translated measure of self-reported overall physical health, the Patient-Reported Outcomes Measurement Information System (PROMIS) [32]. Study participants were asked to describe their current overall physical health on a Likert scale of excellent, good, fair, or poor. We created a binary measure of excellent health (excellent=1; good, fair or poor=0). Cell size constraints prohibit the use of ordered logit models to model this outcome variable.

3.2.2. Post-release

For analysis of panel data, we created a binary variable, “post-release” which denotes whether each observation in the data set is from the baseline survey (=0) or the post-release survey (=1). This was our primary explanatory variable of interest.

3.2.3. Covariates

Our multivariable analyses control for participant background characteristics that may be associated with detained immigrants’ health due to systematic structural inequalities, including: self-reported sex (1=male, 0=female), age in years (continuous, rescaled in the multivariable analyses by dividing by 10 years), educational attainment (1=high school degree/GED or more, 0=less than high school), ethnicity (1=Hispanic/Latina/o, 0=any other), and self-reported English language proficiency (1=speaks English very well or pretty well, 0=just a little or not at all). We also include a variable for undocumented immigration status as a proxy for fewer long-term legal options for relief from deportation (1=undocumented, 0=any other visa or legal immigration status). Additionally, we control for the number of weeks imprisoned including detention (continuous, calculated by subtracting release date from imprisonment date), which we rescale in the multivariable analyses by dividing by 24 weeks. We also control for whether the participant had any diagnosed health condition (1=yes, 0=no), whether the individual had seen a healthcare professional since release (1=yes, 0=no).

In supplemental analyses, we also examined the role of additional covariates that could influence stress following release, including a binary measure of employment (1=employed, 0=not employed) and difficulty paying bills (1= yes, 0=no). These variables (by themselves or together) were not statistically significant in the models and do not substantively impact the overall findings (Appendix Table B).

3.3. Statistical Analysis

We pooled data from both survey waves to form a panel dataset with two observations for each participant. We then estimate the following equation:

$$Y_{jit} = \beta_0 + \beta_1 PostRelease_{it} + \beta_2 X_{2it} + \dots + \beta_p X_{pit} + \varepsilon_{it}$$

We specify the above equation separately for each of our four outcome variables (Y_j) where the subscript j denotes the dependent variable, the subscript p denotes the independent variable, the subscript i signifies the individual participant, and the subscript t signifies the survey wave. The estimated coefficient ($\hat{\beta}_1$) for the binary variable *PostRelease* is of primary interest and

represents the average difference in our outcome measures between survey waves conditional on controls. X_p represent the time-invariant covariates described above. Standard errors were adjusted for clustering and heteroskedasticity to account for correlated residuals across the two survey waves among participants.

An alternative analytical approach would be to use participant-level fixed effects to estimate the within-person change for our stress outcome measures between the two survey waves. This participant-level fixed effect approach would rely on regression with the form:

$$Y_{jit} = \beta_0 + \beta_1 PostRelease_{it} + \beta_2 Respondent_i + \varepsilon_{it}$$

However, because we are also interested in the estimated coefficients for time-invariant demographic control variables, we elected not to use a fixed effect approach in our main analyses.

We fitted ordinary least squares (OLS) regression models to estimate the relationship between release and the three stress indices and a logistic regression model to estimate the relationship between release and excellent health, net of covariates. We also examined the use of Poisson regression to model the stress index outcomes. The estimated conditional associations and predictions are comparable (Appendix Table C). We used OLS rather than Poisson given that the conditional variance was consistently greater than the conditional mean, a key violation of an assumption of Poisson regression.

The dataset contains small amounts of missing data, ranging from 0-6.3% across the outcome and control variables. Given the relatively small sample, we allow the sample size to vary across models (n=139-144 observations); results do not change when we limit to a sample with no missingness. We conducted all analyses in Stata 16.

3.4. Free-response text content analysis

The survey instruments asked a series of open-ended questions during detention and following release. To assess participants' perspectives about the benefits of release, we examined responses to the open-ended question, "What is the best part about being out of detention?" Participants' answers were captured verbatim and Spanish-language responses were translated to English for analysis. Our analyses proceeded across iterative steps, following a conventional approach to qualitative content analysis in which thematic categories are derived directly from text data [33]. First, to identify broad themes describing experiences or perceptions regarding being out of detention, we distilled each response into key words or phrases that capture the primary benefits of being released. For example, if a participant answered, "being with my family," we coded this as "family." We then synthesized related themes to generate a final thematic list. For example, we combined responses such as "seeing my son" and "hugging my mother" as "family," and "free to choose" and "freedom to move around" as "autonomy." The final thematic list was reviewed and verified by each author. We then generated a word cloud to visualize these sentiments and illustrate broad themes.

4. Results

4.1. Sample characteristics

Table 1 presents univariate sociodemographic characteristics, showing sample proportions or medians. Our analytical sample is mostly male (proportion=0.86), Hispanic/Latina/o (0.85), and undocumented (0.84). The median age is approximately 38 years (IQR: 20-69 years). Approximately half (0.46) of study participants had a high school degree or higher and reported speaking English well or very well (0.52). The median length of detention was 43 weeks (IQR: 32-71 weeks). Nearly half of participants had been diagnosed with a chronic health condition (0.42). Less than a third had seen a healthcare professional since release (0.29). The median length of total imprisonment is 43.29 weeks (IQR: 31.71-71.43).

– Table 1. About here –

Overall, study participants reported fewer stress symptoms following release on bond: 70% reported fewer stress symptoms after release, compared to during detention, and 10% reported the same number of stress symptoms (median = 1 fewer stress symptom, IQR=0-5 fewer stress symptoms). Table 2 provides descriptive statistics about our main outcome variables for the detention and release periods. During detention, participants reported an average of 3.88 (out of a total of 7) physical stress symptoms and 2.46 (out of a total of 4) psychological stress symptoms in the past month; after release, these figures dropped to 2.39 physical stress symptoms and 1.76 psychological stress symptoms. During detention, participants reported experiencing, on average, 6.34 stress symptoms of any kind (out of a total of 11); this decreased to an average of 4.15 symptoms following release. Finally, while over a quarter of participants reported excellent health during detention (proportion=0.27), nearly half (0.43) reported excellent health following release. Appendix Table A shows no significant differences between individuals who completed only the baseline survey and those who completed both the baseline and post-release survey across the outcomes of interest.

– Table 2. About here –

4.2. Multivariable analysis

Table 3 contains longitudinal multivariable regression results. Columns 1, 2, and 3 show the results of OLS regression models analyzing the indices of physical stress, psychological stress, and any stress, respectively. Column 4 presents odd ratios from logistic regression analysis of the binary measure of excellent health. We find that release from detention (as indicated by the post-release variable) is associated with significant reductions in stress symptoms (physical stress $b = -1.48$; $p < 0.001$; psychological stress $b = -0.70$, $p < 0.001$; and overall stress $b = -2.18$, $p < 0.001$) and an increase in the odds of excellent overall health (OR=2.41, $p=0.006$). Appendix Table D shows the estimated post-release coefficient from the alternative fixed effects approach described above and demonstrates that the two approaches deliver similar results.

– Table 3. About here –

– Figure 1. About here –

Figure 1 displays the adjusted predictions (i.e., predictive margins), based on the regression results in Table 3, for the number of physical stress, psychological stress, and any stress symptoms, and the adjusted probability of excellent health, before and after release from detention. The predicted count of physical stress symptoms falls by 38% from detention to release (from a predicted 3.9 symptoms to 2.4 symptoms). The predicted count of psychological stress symptoms falls by 29% (from 2.4 to 1.7 symptoms). Finally, the predicted total count of stress symptoms falls by 35% (from 6.3 to 4.1 symptoms). The predicted probability of having excellent health rises by 69% from detention to release (from a predicted probability of 0.26 to 0.44).

4.3. Potential mechanisms

Figure 2 presents a visualization of our thematic analysis of study participants' responses to an open-ended question about the best part about being released from detention. The larger the word or phrase, the more commonly it was used by participants.

– Figure 2. about here –

As Figure 2 demonstrates, participants overwhelmingly described the importance of being reunited with family. For example, one participant emphasized how important it was to finally be able to have physical contact with his children, “Now I can see my children, I can hug them” (“*Ya puedo ver a mis hijos. Los puedo abrazar*”). Relatedly, another described participating in family life as contributing to improved wellbeing: “Being around family members and friends...[I’m] a coach [so I now can] see my kids happy and having a good time. I just went to my niece's *quinceañera* and my sister's birthday. It was a two-day party [laughs].”

Study participants also described being “free,” having “freedom” or “autonomy,” or being free from the controlled environment of detention as one of the best parts of being out of detention. For example, several participants shared how difficult it was to be locked in a cell most of the day without being able to be outside. Another described the best part of release as follows: “[I can] breathe fresh air, enjoy the sunlight, live with my wife, be with family, be free.” Another said, “I can eat whatever I want. I can walk barefoot, watch TV. Its’s the little things, but it means a lot.” Another summed it up in this way: “Freedom: there is nothing more precious.”

Other released immigrants described how being free enabled them to better fight their deportation cases and advocate for themselves. For example, release enabled one participant to “fight my case, not be cramped up in a cell where you can't work, research, or find an attorney. Freedom gives you time to do what you need to do.”

For many study participants, these potential mechanisms co-existed. Furthermore, participants connected their release to improved wellbeing. The following two quotes illustrate this:

“Being free, I get to do what I want, be with family. My whole mentality is different.”

“I feel free and much less stressed...without family, one is nothing” (“*me siento libre y menos estresada...sin familia uno no es nada*”).

5. Discussion

5.1. Contributions

While a significant body of research has examined the impact of imprisonment on health, our study adds to the literature by assessing whether and how release on bond while awaiting adjudication of an immigration legal proceeding may influence individuals' health in the immigration legal context. We find that release from immigration detention is associated with lower levels of psychological and physical stress and better general health. The predicted count of overall (physical and psychological) stress symptoms decreased by nearly a third, from an average of 6.3/11 to 4.1/11 symptoms following release, and the predicted probability of excellent health rose by nearly two-thirds following release (from 0.26 to 0.44). Immigration detention mirrors the “pains of imprisonment” documented in other carceral settings [2], comprising social isolation, confinement, regimentation and lack of autonomy, as well as the dangers of the prison environment; release could mitigate stress by removing those proximal stressors.

Our analysis of open-ended responses provides insight as to how release may mitigate stress from the perspectives of released individuals, with study participants focusing both on *gain* of positive experiences (e.g., with family, children) as well as *absence* of negative experiences (e.g., lack of autonomy) following release. Family as a particularly salient theme highlights the importance of considering household impacts of imprisonment and release. There is growing evidence of vast negative socioeconomic, health, and health service utilization consequences of imprisonment, in the criminal and immigration contexts, for various family members, including children [34-36]. Given the negative impacts of imprisonment for families and households, future studies should continue to explore the household impact of release above and beyond the individual incarcerated individual.

Our study also contributes to literature on reintegration following imprisonment. Prior studies have focused on the stress of the transition to life outside the prison, with fewer studies on the ways release may facilitate positive health outcomes. We find evidence that release from imprisonment can improve health outcomes. However, we note that levels of stress following release still reflect higher stress than the average American. The APA reported that between 73-77% of Americans experienced psychological or physical stress symptoms, compared to 81-88% of participants in our post-release sample [31]. This discrepancy underscores the importance of understanding the potential improvements in health after release on bond in the context of the stress of life outside of carceral settings. It is well established that formerly incarcerated people face extensive structural barriers that make the transition to life following imprisonment challenging. They may experience difficulty maintaining good health and access to care in the community, finding employment, housing, and re-establishing or re-building familial relationships [10, 20, 37-41]. Our results suggest that immigrants likely continue to experience stressors even after release from detention [23]. In particular, our participants continued to face deportation stress and uncertainty; indeed, removal proceedings were ongoing for all but one participant. We

suspect that our findings would likely be enhanced within a sample of individuals who had won relief from deportation.

Notably, imprisonment stressors follow and build upon stressors encountered during arrest and conviction [42]. Individuals may also have experienced stress-inducing disadvantage prior to imprisonment—e.g., from socioeconomic disadvantage, discrimination, or acculturative stress—that then carries into detention and release. Future work should strive to encompass the totality or cumulative trauma of the experiences of individuals who experience interactions with law enforcement. Studies should also account for immigrants' distinct experiences prior to, during, and following migration [3]. Furthermore, while the post-release surveys in our study took place within a few months following release, it is possible that health status may change over time. Future research should strive to assess outcomes over a longer follow-up period.

5.2. Limitations

The results of this study should be viewed in light of several limitations. The data came from one geographic area and may not represent all people currently in detention. In addition, as with any study of prisoner reentry, it is possible that post-release survey participants differ from those who remained imprisoned, were deported, or who were released but did not participate in the post-release survey. To assess this hypothesis, we conducted two-tailed tests to compare individuals who completed both the baseline (in-detention) and post-release surveys to those who completed only the baseline survey. Appendix Table A shows that stress and health outcomes are not significantly different between the two groups, though small sample sizes could preclude detection of significant results. Importantly, our aim was not to represent all formerly detained immigrants or causally explain their health, but to descriptively examine the potential health consequences of the transition to life outside detention among a group of formerly detained immigrants.

While we did not find health differences between individuals who participated in both waves of the study and those who only participated in the baseline survey, it is still possible that potential sampling bias could impact study results. For example, if individuals who may be more likely to report stress are overrepresented in the post-release sample (e.g., individuals with chronic health conditions), this could overestimate the effect of release on stress. Relatedly, the potential overrepresentation of individuals who may continue to suffer from unique forms of post-release stress (e.g., undocumented immigrants with potentially fewer options for relief from removal, relative to documented immigrants) could underestimate the effect of release.

An additional limitation is that our analysis of health conditions is limited to self-reported data. Small sample sizes also limit the potential for disaggregation by health conditions such as mental health conditions compared to other chronic conditions. Structural barriers to healthcare access prior to detention may also influence awareness and severity of health conditions reported; indeed, 60% of the sample lacked health insurance access in the 12-month period prior to detention, though the inclusion of this factor as a covariate does not influence our model results (Appendix Table B). Finally, our study measures stress using a symptom-based approach; alternative approaches could include a summation of life events, such as exposures to violence or trauma in home and receiving countries, during migration journeys, and during detention.

Overall, studies that can examine multiple pre-, during-, and post-migration factors in a larger sample could bolster our findings and further explicate the experiences of released individuals.

Despite these limitations, as one of few studies of detained immigrants' health in the United States, our findings provide an important foundation for understanding detainees' health profiles and the impact of release on stress and general health.

6. Conclusion

Immigration law enforcement can be understood as a social determinant of health, negatively impacting individuals directly through surveillance, detention and deportation, as well as extending to family members, including children [34, 35]. This analysis extends prior research by demonstrating the potential health-promoting effect of release from immigration detention. Our results suggest that alternatives to detention would likely help to mitigate some of the health harms of immigration imprisonment.

Our study findings are relevant for understanding the impacts of imprisonment in both the criminal and immigration legal contexts. However, they may be especially critical to understanding the specific impacts and policy context of immigration detention. Because immigration law is administrative law, detention lacks many of the basic constitutional protections usually applied to the criminal law context, including the right to publicly appointed counsel and the ability to appeal a detention decision. This can result in prolonged detention without trial, lasting months or years [43, 44] in conditions that can be harmful or even deadly to detainees' health and wellbeing [6, 8]. Furthermore, there is often little oversight or accountability when violations of detention standards occur [7, 8]. Our study can therefore provide critically important context for policy makers to reconsider immigration detention practices. In particular, given the potential health benefits of release, our results strongly support policies that prioritize alternatives to detention rather than imprisonment.

TABLES & FIGURES

Table 1. Demographics of study sample

Variable	N	Proportion or Median	Range or IQR
Male	79	0.86	0/1
Age (Years)	79	38.01	30.62-43.15
High school degree or higher	79	0.46	0/1
Hispanic/Latina/o ethnicity	79	0.85	0/1
Speaks English well	79	0.52	0/1
Undocumented	79	0.84	0/1
Diagnosed with chronic health condition	76	0.42	0/1
Length of total imprisonment (weeks)	75	43.15	31.71-71.43
Seen by healthcare professional since release	77	0.29	0/1

Table 2. Health and stress measures in detention and post-release

Variable	In Detention				Post-Release			
	N	Proportion or Mean	SD	Min/Max	N	Proportion or Mean	SD	Min/Max
Physical stress symptoms	76	3.88	2.11	0/7	74	2.39	1.99	0/7
Psychological stress symptoms	76	2.46	1.37	0/4	74	1.76	1.38	0/4
All stress symptoms	76	6.34	3.29	0/11	74	4.15	3.03	0/11
Excellent health	78	0.27	0.45	0/1	77	0.43	0.50	0/1

Table 3. Regression Results

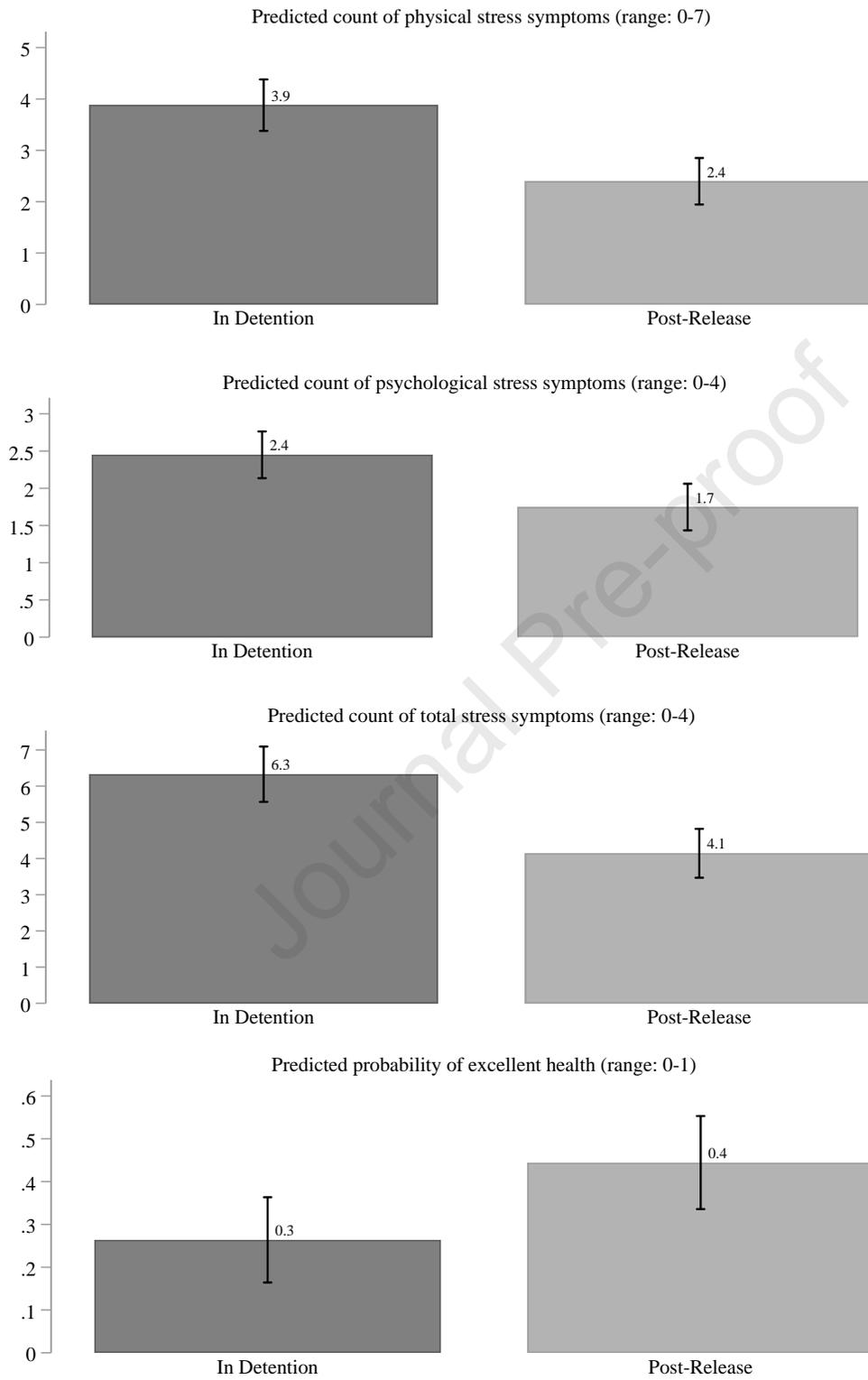
Variables	(1) Physical stress index <i>b</i> (SE)	(2) Psychological stress index <i>b</i> (SE)	(3) Stress index <i>b</i> (SE)	(4) Excellent health OR (SE)
Post-Release	-1.48*** (0.28)	-0.70*** (0.19)	-2.18*** (0.41)	2.41** (0.77)
Male (ref: Female)	-0.91 (0.67)	-0.74 (0.45)	-1.65 (1.07)	1.58 (1.08)
Age (Rescaled by 10 Years)	0.02 (0.20)	-0.05 (0.14)	-0.03 (0.33)	1.13 (0.23)
Latina/o ethnicity (ref: Non-Latina/o)	1.24+ (0.62)	0.90* (0.41)	2.14* (0.98)	0.32+ (0.22)
Highschool degree or higher (ref: Less than HS)	-0.09 (0.51)	0.16 (0.30)	0.08 (0.74)	1.12 (0.56)
Speaks English Well	0.23 (0.54)	0.39 (0.29)	0.62 (0.78)	0.76 (0.39)
Undocumented (ref: Has legal status)	-0.20 (0.62)	-0.15 (0.38)	-0.35 (0.95)	1.44 (0.95)
Diagnosed chronic health condition	0.64 (0.51)	0.38 (0.27)	1.03 (0.73)	0.79 (0.42)
Total incarceration (Rescaled by 24 Weeks)	0.02 (0.09)	-0.01 (0.06)	0.01 (0.15)	1.05 (0.12)
Seen healthcare professional since release	0.30 (0.53)	0.17 (0.31)	0.47 (0.80)	0.34* (0.18)
Constant	3.19* (1.45)	2.15* (0.94)	5.34* (2.30)	0.38 (0.55)
Observations	139	139	139	144
R-squared	0.22	0.19	0.23	

Notes: Columns 1-3 report standard OLS coefficients. Column 4 reports odds ratios.

Clustered, robust standard errors in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Figure 1. Predicted stress and health outcomes, from detention to release



Note: 95% confidence intervals shown. Based on regression results in Table 3.

Appendix

Sample

Appendix Figure A is a flow diagram representing the study process. The study's overall goal was to assess post-release outcomes for a group of people who were detained by ICE for six months or longer and had been scheduled a bond hearing under *Rodriguez*. The study's practitioner partner received a list of individuals who had been scheduled a bond hearing with only names and dates of hearings. Because it was impossible to know the outcome of the bond hearing in advance, and because some individuals granted bond could be released the day of their bond hearing and therefore unable to participate in the study, the study team surveyed individuals prior to hearings, with the joint goal of establishing baseline characteristics and gathering consent for post-release interviews should the individual be granted bond and released. The objective was to secure a large enough baseline sample to be able to interview a sizeable group of individuals following release.

To that end, the baseline survey was conducted with as many individuals as possible who were scheduled a *Rodriguez* bond hearing between May 2013 and March 2014 (n=565; participation rate 92%). ICE does not release detailed daily population counts so we are unable to assess what portion of all people detained were approached for participation.

Of individuals who participated in the Baseline, 474 (84%) agreed to participate in the post-release survey if released on bond. However, given that individuals were recruited while in custody of immigration authorities, 292 (62%) were deported and therefore ineligible to participate in the post-release study. This is comparable to the overall deportation rate in immigration courts in California among individuals with criminal records, 61% [45]. Another 46 individuals (10%) were granted bond but could not be located by the research team; we therefore cannot determine whether these individuals were released, remained detained due to inability to pay bond, deported, or some other outcome.

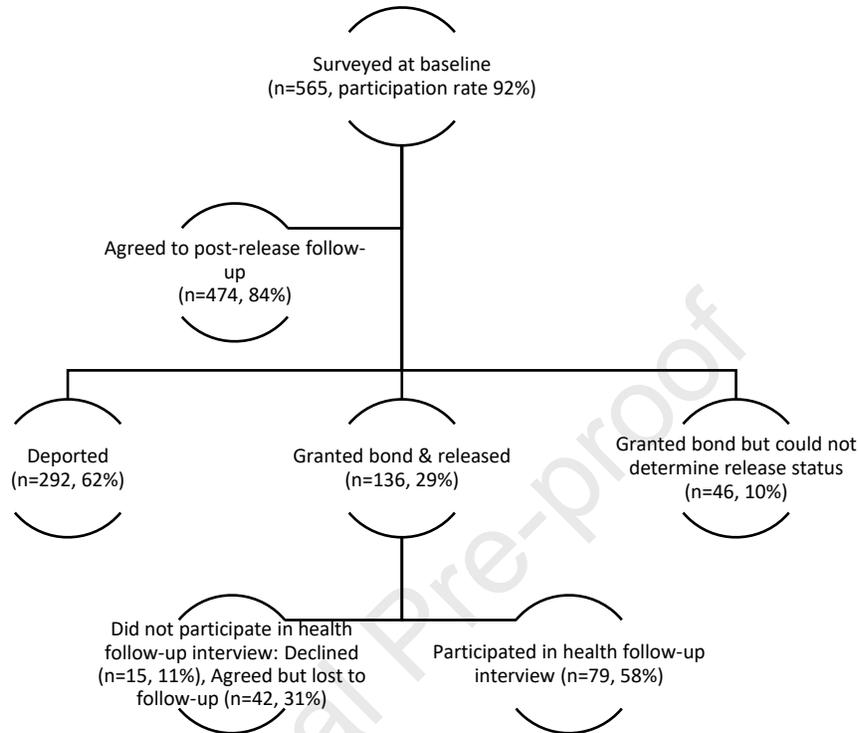
Of 136 participants who were granted bond and confirmed released, 79 participated in the post-release survey that included health related questions (58%), 42 (31%) agreed to participate but were lost to follow-up and/or could not be scheduled for a detailed health interview prior to study completion, and 15 (11%) declined to participate.

Formerly imprisoned individuals are an extremely difficult-to-reach population; our sample size is comparable to other studies of prisoner reentry in the criminal law context (with sample sizes ranging from 22-122) [9, 46], with the exception of a study that enrolled 740 participants [47]. Studies with higher response rates generally accomplish this by partnering with law enforcement agencies to facilitate post-release contact [29, 48]; that option was neither possible or desirable in the present study.

As with any sample of formerly imprisoned people, it is possible that released people will differ from those who remain imprisoned or are lost to follow-up for any other reason (e.g., in this case, deportation). Appendix Table A compares all participants who completed only a baseline

survey to those who completed both a baseline and post-release survey and shows no significant differences across our outcomes of interest (as measured at baseline).

Appendix Figure A. Flow Diagram of Study Process



Appendix Table A. Comparison of samples

	Completed only Baseline Survey (n=488)	Completed Baseline & Post- Release Survey (n=79)	Statistically Different at $p < 0.05$?*
<i>Outcome variables</i>			
Physical stress symptoms (count)	3.39	3.88	No ($p = 0.06$)
Psychological stress symptoms (count)	2.29	2.46	No ($p = 0.31$)
All stress symptoms (count)	5.68	6.34	No ($p = 0.09$)
Excellent health (proportion)	0.29	0.27	No ($p = 0.75$)
<i>Control variables</i>			
Age (years)	37.27	37.77	No ($p = 0.66$)
Male (proportion)	0.93	0.86	Yes ($p = 0.03$)
High school degree or higher (proportion)	0.42	0.46	No ($p = 0.50$)
Hispanic/Latina/o ethnicity (proportion)	0.89	0.85	No ($p = 0.27$)
Speaks English well (proportion)	0.52	0.52	No ($p = 0.99$)
Undocumented (proportion)	0.69	0.84	Yes ($p = 0.01$)
Length of total incarceration (weeks)	60.78	60.27	No ($p = 0.96$)
Diagnosed with chronic health condition (proportion)	0.43	0.42	No ($p = 0.93$)

* Note: Differences are based on two-tailed tests: chi-squared tests (for binary variables) and t-tests (for continuous variables).

Appendix Table B. Regression results from primary specification with additional controls

Variables	(1)	(2)	(3)	(4)
	Physical stress index <i>b</i> (SE)	Psychological stress index <i>b</i> (SE)	Stress index <i>b</i> (SE)	Excellent health OR (SE)
Post-Release	-1.44*** (0.28)	-0.70*** (0.20)	-2.14*** (0.42)	2.53** (0.88)
Male (ref: Female)	-1.11 (0.76)	-0.93+ (0.48)	-2.03+ (1.17)	1.19 (1.06)
Age (Rescaled by 10 Years)	0.07 (0.21)	-0.04 (0.16)	0.03 (0.35)	1.32 (0.35)
Latina/o ethnicity (ref: Non-Latina/o)	1.35* (0.66)	0.89* (0.39)	2.24* (0.98)	0.25+ (0.20)
Highschool degree or higher (ref: Less than HS)	-0.32 (0.53)	0.05 (0.33)	-0.27 (0.79)	0.93 (0.51)
Speaks English Well = 1, Speaks English well	0.54 (0.60)	0.54 (0.34)	1.09 (0.87)	1.01 (0.58)
Undocumented (ref: Has legal status)	-0.24 (0.65)	-0.15 (0.40)	-0.39 (0.99)	1.34 (0.80)
Diagnosed chronic health condition	0.53 (0.59)	0.35 (0.32)	0.88 (0.85)	0.65 (0.36)
Total incarceration (Rescaled by 24 Weeks)	0.03 (0.10)	-0.01 (0.06)	0.02 (0.15)	1.11 (0.15)
Seen healthcare professional since release	0.35 (0.54)	0.18 (0.32)	0.53 (0.81)	0.31* (0.17)
Weeks since release	-0.00 (0.01)	-0.00 (0.01)	-0.01 (0.02)	1.02 (0.01)
Health insurance before incarceration	0.36 (0.45)	0.17 (0.31)	0.52 (0.70)	0.91 (0.46)
Employed post-release	0.33 (0.59)	0.28 (0.31)	0.61 (0.85)	1.49 (1.05)
Late on bills since release	-0.00 (0.01)	0.00 (0.01)	-0.00 (0.02)	0.99 (0.02)
Constant	2.80+ (1.50)	2.07* (1.03)	4.87* (2.42)	0.19 (0.31)
Observations	137	137	137	142
R-squared	0.22	0.20	0.24	

Notes: Columns 1-3 report standard OLS coefficients. Column 4 reports odds ratios.

Clustered, robust standard errors in parentheses.

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$

Appendix Table C. Results from primary specification alternatively estimated with Poisson regression, Average Marginal Effects (AMEs)

Variables	(1)	(2)	(3)
	Physical stress index <i>b</i> (SE)	Psychological stress index <i>b</i> (SE)	Stress index <i>b</i> (SE)
Post-Release	-1.48*** (0.27)	-0.70*** (0.18)	-2.19*** (0.40)
Male (ref: Female)	-0.90 (0.67)	-0.74 (0.46)	-1.64 (1.07)
Age (Rescaled by 10 Years)	0.03 (0.20)	-0.03 (0.14)	-0.00 (0.33)
Latina/o ethnicity (ref: Non-Latina/o)	1.24* (0.57)	0.85* (0.37)	2.10* (0.89)
Highschool degree or higher (ref: Less than HS)	-0.08 (0.48)	0.16 (0.29)	0.08 (0.71)
Speaks English Well	0.25 (0.50)	0.39 (0.27)	0.63 (0.73)
Undocumented (ref: Has legal status)	-0.23 (0.60)	-0.16 (0.36)	-0.39 (0.91)
Diagnosed chronic health condition	0.62 (0.49)	0.37 (0.26)	0.99 (0.70)
Total incarceration (Rescaled by 24 Weeks)	0.03 (0.08)	-0.01 (0.05)	0.02 (0.13)
Seen healthcare professional since release	0.30 (0.48)	0.19 (0.28)	0.49 (0.72)
Observations	139	139	139

Notes: Results from Poisson regression with AMEs reported. These results can be directly compared with the OLS coefficients from Models 1-3 in Table 3.

Clustered, robust standard errors in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Appendix Table D. Results from alternative participant-level fixed effect regression

Variables	(1)	(2)	(3)
	Physical stress index <i>b</i> (SE)	Psychological stress index <i>b</i> (SE)	Stress index <i>b</i> (SE)
Post-Release	-1.46*** (0.27)	-0.67*** (0.19)	-2.13*** (0.40)
Constant	3.87*** (0.13)	2.43*** (0.09)	6.30*** (0.20)
Observations	139	139	139
R-squared	0.31	0.17	0.31
Number of participants	72	72	72

Note: Clustered, robust standard errors in parentheses.

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

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