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# The Health Status Of Prisoners At Three Rural Haitian Prisons

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# The Health Status of Prisoners at Three Rural Haitian Prisons

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## **I. Abstract**

Background: Aside from documented high prevalence of infectious disease, little is known about the health status of prisoners in developing countries. In Haiti, prisons typically lack adequate food, clean water, and medical care. Some prisoners, however, may receive additional food from visitors during designated food delivery hours. This study sought to characterize the overall health status of Haitian prisoners as well as to begin to explore the impact of incarceration on health status. We hypothesized that prisoners who had more visitors and shorter lengths of detention would be more likely to have better overall health status, measured by having a higher body mass index (BMI) and better scores on several standardized measures of physical and mental health.

Methods: Data was available for 290 male prisoners in 3 regional Haitian prisons. Socio-demographic information, number of visitors, days of incarceration, and a range of health indicators including standardized measurements of BMI, health-related quality of life, depression, perceived stress, and food insecurity were collected as part of a health surveillance questionnaire. Completed questionnaires were subsequently filed in prison medical records, permitting a medical record review.

Results: Overall, prisoners were generally in poor health: 17% of the sample was underweight (BMI < 18.5), 87.1% rated their health as poor or fair, 91% met criteria for depression, and 65% were highly food insecure. Prisoners with fewer visitors had increased likelihood of being underweight ( $p = 0.045$ ), having lower BMIs ( $p < 0.001$ ), worse physical function ( $p = 0.002$ ), and higher levels of food insecurity ( $p = 0.003$ ). Length of incarceration was negatively associated with physical function ( $p = 0.007$ ) and self-reported overall health status ( $p = 0.005$ ), but was not associated with BMI, food insecurity, or any mental health indicator.

Conclusions: In general, prisoners had poor health outcomes among all three prisons. Our results also suggest that prisoners who do not receive additional food from visitors are at an increased risk for poor nutritional status and physical health and demonstrate the importance of visitors to prisoner health. Last, our finding that physical function and self-reported overall health was worse among prisoners with longer lengths of incarceration implies that prolonged incarceration may be a risk factor for diseases and health conditions not measured our study, indicating the need for additional research to further define health conditions in Haitian prisons.

## II. Background

Compared to non-incarcerated populations, prisoners are known to have elevated rates of both physical and mental illnesses. Higher prevalence of chronic illness and infectious disease among inmates has been widely documented.<sup>i, ii, iii, iv, v, vi</sup> Additionally, mental health research on prison populations has shown that incarcerated individuals are more likely to be diagnosed with depressive disorders and other types of mood and psychotic disorders.<sup>vii, viii, ix, x</sup> Most available data on prisoner health, however, comes from high or middle-income nations. Aside from documented increased rates of infectious disease, relatively little is known about the health status of prisoners in developing countries.<sup>xi, xii</sup>

In low-resource settings, incarcerated populations face a unique set of health challenges compared to prisoners middle or higher-income nations. In developed countries, health professionals often promote prisons as an opportunity to provide medical care to vulnerable populations with high levels of disease, drug use and poverty. Though improvements are needed, prisoners in these settings report increased encounters with the healthcare system and have lower rates of mortality from natural causes than the general population while incarcerated.<sup>xiii, xiv</sup> In contrast, prisons in developing countries typically lack basic infrastructure and prisoners encounter severe overcrowding, inadequate nutrition, and limited or no access to medical care.<sup>xv, xvi</sup>

In Haiti, the poorest nation in the Western hemisphere, the health status of inmates is almost entirely undocumented.<sup>xvii</sup> Nationwide, prisons are reported to be generally without essentials such as clean water, electricity, and medical services. Additionally, the catastrophic earthquake

in January 2010 worsened already severe overcrowding and contributed to infectious disease outbreaks, such as cholera.<sup>xviii</sup> As of December 2010, a nationwide survey estimated that 5,331 prisoners occupied facilities that had the official capacity to house only 2,448 people, not accounting for further reductions in capacity due to damage sustained during the earthquake.<sup>xix</sup> This translates to, at best, an occupation rate of over 200% of the official capacity.

In Haiti's national penitentiary system, food is usually provided only twice a day in a communal bucket.<sup>xx</sup> This system of shared provisions has also been observed in Haiti's rural prisons. Aside from prison rations, some prisoners receive meals from family members and friends.

Documented by the U.S. Department of State in most prisons as recently as 2010, these external food deliveries are a regulated part of the prison system. Distinct from actual visiting hours, prisons have designated, two-hour time blocks in the morning and afternoon during which food, money, and other goods may be brought. Without visitors to facilitate these external food deliveries, however, it is likely that prisoners do not receive adequate nutrition while incarcerated.

The primary objective of this study is to characterize the overall health status of prisoners in Haiti. Given the documented lack of resources in Haiti's prisons, overall physical and mental health status of prisoners is suspected to be poor, with anticipated high levels of mental illness and depression. Additionally, this study sought to explore the relationship between incarceration and health status in developing countries. Overall, we hypothesized that the number of visitors as well as the length of incarceration would be correlated with prisoner health status, including body mass index (BMI), food insecurity, health-related quality of life, depression, and perceived

stress. Specifically, we hypothesized that prisoners with more visitors and shorter lengths of incarceration would be more likely to have lower BMIs and report better overall health status.

### **III. Methods**

#### *Location & Sample*

This study focused on the health status of prisoners in three regional prisons, located several hours outside of Haiti's capital city of Port-au-Prince. Prison A was the most rural of the three prisons, located in a town in Haiti's Central Plateau. Prison B was also located in a rural town in the Central Plateau. Last, prison C was located in a small city in the Artibonite Department region. During the time of the data collection, prison A had a population of approximately 162 prisoners, prison B had a population of approximately 376 prisoners, and prison C had a population of approximately 354 prisoners, for a total count of 892 prisoners. Consistent with international reports, with the exception of a marginal percentage of female and juvenile prisoners at each prison, prisoners were predominantly adult males.

Health surveillance survey information was available for a total of 305 prisoners: Prison A (N=92); Prison B (N=100); and Prison C (N=113). Because both the prison population and our sample were overwhelmingly adult male, information from nine female prisoners from prison B was excluded from our sample. Six male prisoners for whom information was missing for one or both independent variables were also excluded, leaving a sample size of 290 male prisoners, or 32.5% of the total prison population, available for final analysis.



*Data Collection*

Data was obtained through a review of medical records at each of the three prisons. Specifically, data for this study originated from health surveillance surveys that were included in medical records stored at each prison. These health surveillance surveys were verbally administered to prisoners in Haitian Kreyol from May to August 2011 using a convenience sampling method in each of the three prisons. Socio-demographic information collected by the survey included age, marital status, occupation, education level, date of incarceration, and trial status.

*Measures*

Primary independent variables were the number of visitors and length of detention, both of which were reported by prisoners. The number of visitors was a proxy measurement for the number of contacts who delivered external food to an inmate and was calculated by summing the total indicated number of visitors out of 10 possible categories of visitors, including various types of relatives and friends. Because only a small percentage of prisoners listed more than two visitors, this variable was categorized into three levels for analysis: no visitors, one visitor, or two or more visitors. Length of detention was measured by determining the difference, in days, between the date of the survey and self-reported date of incarceration. Overall, most prisoners were able to remember easily their exact date of incarceration. This variable was then categorized into three levels, less than 90 days, 90 days to 1.5 years, and greater than 1.5 years, for analysis.

Data was available for several general measures of health. Body mass index (BMI) was calculated using recorded height and weight measurements, with height measured to the nearest half-inch and weight was measured to the nearest pound. Underweight was defined according to

the international standard as having a BMI less than 18.5.<sup>xxi</sup> The SF-12 Health Survey was used to measure health-related quality of life (HRQoL).<sup>xxii</sup> Scores for the physical component summary (PCS-12), which measures physical functioning, and the mental component summary (MCS-12), which measures mental health, were calculated using the SF-12 algorithm. Scores for both components can range from 0 to 100, with 100 indicating best possible physical and mental health. Self-rated health was also measured using the first item on the SF-12, which asks respondents to rate their overall health as excellent, very good, good, fair, or poor.

Two additional measures of mental health were also included on the health surveillances survey. Depression was measured using the 15-item depression subscale of the Hopkins Symptom Checklist (HSCL). This checklist was previously used in Haiti to measure depression among parents and caregivers of youth affected by HIV.<sup>xxiii</sup> Scores were calculated by summing each response and taking the average. A cut-off value of 1.75 or greater was used as the criteria for depression, which was consistent with several other studies conducted in non-western countries.<sup>xxiv, xxv</sup> Last, perceived stress was measured using the Perceived Stress Scale (PSS), a commonly-used 10-item survey that measures stress over the 30 days prior and up to the administration of the survey.<sup>xxvi</sup> PSS scores can range from 0 to 40, with 40 indicating highest possible perceived stress, and were calculated by summing the corresponding numerical value each response.

Food insecurity was assessed using a four-item Likert scale written for use in the health surveillance survey. For each item, prisoners were asked to state whether they agreed with the statement, disagreed with the statement, or neither agreed nor disagreed with the statement. A

summary score was then calculated by summing the responses to each of the questions. Scores can range from 0 to 4, with scores of 3 or 4 indicating high levels of food insecurity.

### *Data analysis*

Data was entered into Epi Info and imported to SAS 9.2 for analysis, which proceeded in five steps. Descriptive statistics, including frequencies, means, and standard deviations, were calculated for primary independent variables, socio-demographic characteristics, health outcomes, and food insecurity questions and summary scores. In order to detect the presence of significant differences in these outcomes by prison, bivariate analysis was performed using the chi-square test for association for categorical variables and the Analysis of Variance (ANOVA) test for continuous variables. Next, Spearman correlation coefficients were calculated to determine unadjusted correlations between each of the health outcome measures. To determine unadjusted associations between the two primary independent variables and each of the health outcomes, unadjusted analysis was performed using the Mantel-Haenszel chi-square test for trend for categorical variables and the ANOVA test for continuous variables. Last, multivariable linear regression was used to determine the adjusted associations for the dependent variables of BMI, physical function, and food security, outcomes that were found to be significantly associated with one or both of the primary independent variables in the unadjusted analysis. In both unadjusted and adjusted analyses, p-values less than 0.05 were considered statistically significant.

### *Institutional Review Board Approval*

The Yale Human Investigative Committee approved this study as a medical record review.

#### **IV. Results**

##### *Description of sample*

Table 1 reports socio-demographic information, health outcomes, and independent variables for the sample of male prisoners overall and by prison. The mean age (standard deviation) of prisoners was 31.9 (9.8) years. Over half (56.9%) were married or in long-term partnerships and 46.9% reported their occupation as farming. Over half of prisoners (51%) had at least some primary school education while 29% had no education and 21% had at least some secondary school education. Pre-trial detention status was reported by 29.6% of prisoners. Just under half (46.6%) of prisoners reported receiving no visitors while incarcerated, while 33.5% reported having one visitor and 17.9% reported having two or more visitors. The median length of detention was 461 days and ranged from 2 to 2335 days (6.5 years).

There were several significant differences in socio-demographic characteristics between the three prisons. Prisoners in prison A, the most rural prison, were significantly more likely to be married and to be farmers than prisoners in prisons B and C ( $p=0.002$ ,  $p < 0.001$ ). Prisoners in Prison B were significantly less likely to have a visitor compared to prisoners in the other prisons ( $p=0.004$ ). Last, the median number of days in detention also differed significantly by prison, with the lowest at 259 days in prison A and the highest at 667 days in prison B. Average age and education level did not differ significantly by prison.

##### *Health status*

The mean BMI for the sample was 21.1, with 17% of prisoners falling in the underweight category (BMI  $< 18.5$ ). Overall prevalence of depression was extremely high, with 90.6%

meeting standardized criteria for depression. The average score (standard deviation) for physical function was 40.7 (10.9), and the average score for mental health was 34.6 (8.6). Nearly all prisoners (87.1%) rated their health as poor or fair. Last, the average score on the PSS was 22.1 (5.3), out of a possible score of 40.

There were many significant differences in health outcomes between each of the prisons. Prisoners in prison B had a significantly lower BMI on average ( $p=0.004$ ) and a significantly greater portion of prisoners who met the criteria for underweight ( $p=0.006$ ). Prisoners at prison C were significantly less likely to be depressed than prisoners at prisons A and B ( $p < 0.001$ ). Prisoners at Prison C also had significantly better physical function ( $p < 0.001$ ) and significantly fewer prisoners who reported their health as fair or poor ( $p < 0.001$ ) compared to prisoners at prisons A and B. Scores on the MCS-12 and the PSS, measuring mental health and perceived stress, were not significantly different by prison.

### *Food insecurity*

Overall, there were generally high levels of food insecurity. Nearly two thirds (64.2%) of prisoners scored either a 3 or 4 on the food insecurity summary scale, indicating high food insecurity. Specifically, a majority of prisoners agreed with the statements “I have less to eat now than I did before I was brought to prison” (94%), and “I often go to bed feeling hungry” (77%). Less than a third of prisoners agreed with the statement “I get enough food from the prison alone to feel satisfied” (29%). Finally, almost a third of prisoners (31%) agreed with the statement “I sometimes have to do things that I’m not proud of to get more food for myself”.

There was a significant association between food insecurity and prison. Overall, prisoners in prison B were most likely to report high levels of food insecurity ( $p < 0.001$ ). Specifically, prisoners in prison B were significantly less likely to agree with the statement “I get enough food from the prison alone to feel satisfied” than prisoners in prisons A and C ( $p = 0.020$ ). Prisoners in prisons A and B prisons were significantly more likely to agree with this statement than prisoners in prison C ( $p < 0.001$ ). The likelihood of agreeing with the remaining two statements did not differ significantly by prison.

#### *Association between health outcomes*

Table 2 shows correlations between each of the health outcomes. Having a higher BMI was correlated with better physical function, fewer depressive symptoms, and lower levels of food insecurity ( $p = 0.005$ ,  $p = 0.020$ ,  $p = 0.019$ ). In addition to BMI, fewer depressive symptoms were correlated with higher physical function, better mental health status, lower levels of perceived stress, and lower levels of food insecurity ( $p < 0.001$  for all). Along with higher BMIs and fewer depressive symptoms, better physical functioning was correlated with lower levels of food insecurity ( $p < 0.001$ ). Last, along with fewer depressive symptoms, better mental health was correlated with lower levels of perceived stress ( $p = 0.012$ ).

#### *Associations with visitors and health outcomes*

Table 3 shows unadjusted associations between the number of visitors and health outcomes. The reported number of visitors (categorized as 0, 1, and 2 or more) was positively associated with average BMI ( $p < 0.001$ ). Correspondingly, the reported number of visitors was also negatively associated with likelihood of underweight ( $p = 0.045$ ). Specifically, 21.6% of prisoners who

received no visitors were underweight, while 14.7% of prisoners with one visitor were underweight and only 9.6% of prisoners who received 2 or more prisoners were underweight. A similar dose-response relationship was seen between number of visitors and physical function, which were positively correlated ( $p=0.002$ ). Last, the reported number of visitors was significantly associated with food insecurity ( $p=0.003$ ). Overall, prisoners with more visitors had lower scores on the food security scale, indicating lower levels of food insecurity. No significant correlation was found between the reported number of visitors and any of the mental health outcomes (depression, mental health-related quality of life, and perceived stress).

In Table 5, after adjusting for length of detention, prison, and age, the number of visitors remained correlated with mean BMI, physical health, and food insecurity. The dose-response relationship between increasing number of visitors and better health outcomes seen in the unadjusted analysis remained significant in the adjusted analysis. Having one visitor did not reach statistical significance, but having two or more visitors was statistically significant for each outcome (BMI:  $p=0.015$ , physical function:  $p=0.014$ , food insecurity:  $p=0.015$ ).

#### *Associations with length of stay and outcome measures*

Table 4 shows unadjusted associations between days of detention and health outcomes. Length of detention, categorized as 1-90 days (3 months), greater than 90 days to 457 days (1.5 years), and greater than 457 days, was negatively associated with physical function and self-reported health. Specifically, average scores on the PCS-12 were lower over time, indicating worsening physical function ( $p=0.007$ ). This same relationship was observed between length of detention and self-reported overall health, with the percentage of prisoners reporting poor or fair health

increasing over time ( $p=0.005$ ). Length of detention was not significantly correlated with any other health outcome measure. As reported in Table 5, when adjusting for the number of visitors, prison, and age, length of detention remained significantly correlated with physical function ( $p=0.004$ ).

## **V. Discussion**

This study provides the first formal data on the health status of Haitian prisoners. In general, our study found that prisoners at each of the three rural prisons have poor overall health status, with high prevalence of being underweight as well as high levels of self-reported poor health, depression, and food insecurity. As expected, there were significant correlations between most of the health outcomes. Most importantly, we found a positive dose-response relationship between number of visitors and each measure of physical health included in our study. As the number of visitors increased, prisoners were less likely to be underweight and had higher BMIs, better physical function, and lower levels of food insecurity. Additionally, we found that prisoners with longer lengths of detention reported lower physical and were more likely to report their health as poor or fair. Time incarcerated was not, however, correlated with BMI, food insecurity, or the mental health outcomes.

Prisoners in prison B appeared generally to be the worst off among the three sample prisons, with significantly more underweight prisoners, more reports of food insecurity, fewest visitors, and longest average incarceration times. The presence of a significantly greater proportion of underweight inmates at prison B corresponded to the significantly lower number of prisoners who reported receiving “enough food from the prison alone to feel satisfied” compared to the



other prisons, as well as anecdotal reports by both prisoners and guards of infrequent and insufficient food provisions. Conversely, health status of prisoners in prison C, the most urban prison, appeared to be slightly better than the other two prisons, with the lowest percentage of underweight and depressed prisoners as well as fewer reports of poor or fair overall health and food insecurity.

Compared to prisoners in developed countries, prisoners in our sample reported poorer physical function and overall health status.<sup>xxvii</sup> Specifically, 28% of male prisoners surveyed in an Australian- based study indicated poor or fair health on the SF-36, compared to 87.1% of prisoners in our sample. Physical functioning was also drastically lower in our sample compared to the Australian sample. Our sample had a mean score of 40.7, less than half of the mean score of 90.3 for male prisoners in the Australian study.

Our findings demonstrate the importance of visitors on prisoner health status. Visitors may potentially alter the health status of prisoners in a number of ways. They may provide social support, brief relief from an otherwise monotonous and unpleasant experience, or provide basic needs through provision of food, toiletries, and clothing. In this study, we found that having visitors was significantly correlated with all of our physical health-related outcomes, including higher BMI, underweight, physical health status, and food security, even when accounting for length of detention, age, and prison location. This can be explained by noting that, as anticipated, most prisoners who reported having visitors also reported that these visitors most commonly delivered food and money, which can be used to have food purchased and delivered by prison staff. A secondary analysis that adjusted for education level showed that education slightly

attenuated the relationship between number of visitors and physical health, likely because prisoners with higher education levels were also much more likely to have visitors. The lack of association between the number of visitors and any of the mental health outcomes indicates that visitors likely do not impact the mental health status of prisoners, perhaps because opportunities for prisoners to interact with visitors are usually restricted.

Though length of detention did not predict BMI, food insecurity, or any mental health outcome, having a longer length of incarceration was associated with both poorer physical function and worse self-reported overall health. These results were also consistent with a U.S. -based study of prisoners that also found self-reported physical health worsened over time.<sup>xxviii</sup> As noted in the earlier study, it is possible that these findings reflect perceived poorer health rather than actual worsening health, since the measure is self-reported. Our finding also suggests, however, that prisoners may be at an increasing risk for diseases and health conditions not measured in this study the more time they spend in detention. Risk of infectious diseases, in particular, may increase with longer incarceration times.<sup>xxix</sup> In Haiti, cholera, tuberculosis, and skin infections are all existing illnesses that can be easily spread among confined populations.<sup>xxx</sup>

There were several limitations to this study. The convenience sampling method employed by survey administrators could have resulted in a biased sample if healthier prisoners were more likely to be selected or choose to participate. If this were the case, however, this would likely mean that our study would have underestimated the prevalence of poor health outcomes among prisoners. Another limitation was the lack of validated measurement tools in Haiti for psychosocial and mental health outcomes. This may have impacted our ability to accurately

detect health-related quality of life, depression and perceived stress. With the exception of the food insecurity questionnaire designed specifically for use in Haitian prisons, however, the tools used by survey administrators are commonly used instruments that have been validated in a variety of both high and low-income settings.

This research is one of the first studies to assess the overall physical and mental health status of prisoners in a low-income country setting. This study is also one of the first to examine food insecurity among confined populations in a low-resource setting. Our discovery of poor overall health and high levels of food insecurity among prisoners, as well as worse physical health among prisoners without access to external food, shows the importance of prioritizing access to adequate nutrition and medical care for inmates. Additional research on the prevalence of specific infectious and chronic diseases is needed in this setting in order to further inform clinical needs and health policies.

## **VI. Acknowledgements**

First, I would like to give special thanks to all of the prisoners who participated in the health surveillance surveys, as well as to the survey translators and administrators. Many individuals and organizations provided valuable resources and support, including the Haitian Prison Administration Department, Bureau des Avocats Internationaux, the Institute for Justice and Democracy in Haiti, Dr. John May, Health Through Walls, and Partners In Health. I would also like to thank the Wilbur G. Downs International Student Health Travel Fellowship Committee and the Office of Student Research at the Yale School of Medicine for making this research possible. Finally, I would like to thank Drs. Frederick Altice and Mayur Desai from the Yale School of Public Health for their guidance and feedback throughout the research and analysis process.

## VI. Tables

Table 1: Health surveillance survey characteristics of prisoners at three correctional facilities in Haiti

Subject Characteristic	All (N=290)*	Prison A (N=92)*	Prison B (N=87)*	Prison C (N=111)*	p-value <sup>†</sup>
Age (mean ± SD)	31.9 ± 9.8	33.1 ± 11.2	30.6 ± 7.1	31.9 ± 10.3	0.232
Married/Partnered	165 (56.9)	66 (71.7)	46 (52.9)	53 (47.8)	<b>0.002</b>
Farming Occupation	136 (46.9)	60 (65.2)	38 (43.7)	38 (34.2)	<b>&lt;0.001</b>
Education					0.271
None	82 (28.5)	33 (35.9)	20 (23.5)	29 (26.1)	
Primary	147 (51.0)	43 (46.7)	49 (57.7)	55 (49.5)	
Secondary or above	59 (20.5)	16 (17.4)	16 (18.8)	27 (24.3)	
Pre-Trial	85 (29.6)	36 (39.1)	22 (25.6)	27 (24.7)	0.053
Days of Detention, Median (Range)	461.5 (2-2335)	259.0 (2-2335)	667.0 (26-2199)	464.0 (2-2172)	<b>0.005</b>
Visitors					<b>0.004</b>
None	135 (46.6)	41 (44.6)	49 (56.3)	45 (40.5)	
1	105 (33.5)	25 (27.2)	29 (33.3)	49 (44.1)	
2 or more	52 (17.9)	26 (28.3)	9 (10.3)	17 (15.3)	
BMI Category					
Underweight (BMI <18.5)	49 (17.0)	12 (13.0)	24 (27.9)	13 (11.8)	<b>0.006</b>
Mean ± SD	21.1 ± 2.7	21.4 ± 2.6	20.2 ± 2.5	21.4 ± 2.8	<b>0.004</b>
Depression <sup>‡</sup>	249 (90.6)	85 (95.5)	77 (96.3)	87 (82.1)	<b>&lt;0.001</b>
Quality of Life (SF-12)					
Physical Function (mean ± SD) <sup>§</sup>	40.7 ± 10.9	37.0 ± 9.2	38.0 ± 10.5	45.6 ± 10.6	<b>&lt;0.001</b>
Mental Health (mean ± SD) <sup>§</sup>	34.6 ± 8.6	33.6 ± 7.8	34.3 ± 9.4	35.7 ± 8.6	0.236
Self-rated Health – Poor/Fair	250 (87.1)	89 (96.7)	85 (100.0)	76 (69.1)	<b>&lt;0.001</b>
Perceived Stress Scale (mean ± SD) <sup>□</sup>	22.1 ± 5.3	21.7 ± 6.0	22.1 ± 4.3	22.3 ± 5.3	0.784
<b>Food Insecurity</b>					
<i>I have less to eat now than I did before I was brought to prison</i>					0.378

Agree	266 (94.0)	82 (91.1)	80 (95.2)	104 (95.4)	
Disagree	17 (6.0)	8 (8.9)	4 (4.8)	5 (4.6)	
<i>I often go to bed feeling hungry</i>					0.340
Agree	220 (77.2)	67 (73.6)	71 (82.6)	82 (75.9)	
Disagree	65 (22.8)	24 (26.4)	15 (17.4)	26 (24.1)	
<i>I get enough food from the prison alone to feel satisfied</i>					<b>0.020</b>
Agree	83 (29.2)	30 (33.7)	15 (17.7)	38 (34.6)	
Disagree	201 (70.8)	59 (66.3)	70 (82.4)	72 (65.5)	
<i>I sometimes have to do things that I'm not proud of to get more food for myself</i>					<b>&lt;0.001</b>
Agree	87 (31.2)	35 (38.5)	37 (43.0)	15 (14.7)	
Disagree	192 (68.8)	56 (61.5)	49 (57.0)	87 (85.3)	
<b>Food Insecurity Summary Score</b>					<b>&lt;0.001</b>
0-1 (least food insecure)	35 (13.1)	14 (15.7)	4 (4.8)	17 (17.7)	
2	61 (23.7)	21 (23.6)	16 (19.3)	24 (25.0)	
3	113 (42.2)	32 (36.0)	34 (41.0)	47 (49.0)	
4 (most food insecure)	59 (22.0)	22 (24.7)	29 (34.9)	8 (8.3)	

\* Numbers may not sum to total due to missing values and column percentages may not sum to 100% due to rounding.

† P-value for analysis of variance F-test (continuous variable), Kruskal-Wallis Test (days of detention) or  $\chi^2$  test (categorical variable).

‡ Depression is defined as a score of 1.75 or above on the Hopkins Symptom Checklist depression subscale.

§ Scores may range from 1 to 100, with higher scores indicating better health.

□ Scores may range from 0 to 40, with higher scores indicating higher levels of stress.

Table 2: Unadjusted correlations for health outcome measures

<b>Health Outcome</b>	Body Mass Index*	Depression*	Physical Function*	Mental Health*	Perceived Stress*	Food Insecurity*
Body Mass Index	--	-0.171 <b>p = 0.005</b>	0.140 <b>p = 0.020</b>	0.101 p = 0.095	0.023 p = 0.706	-0.144 <b>p = 0.019</b>
Depression	--	--	-0.369 <b>p &lt; 0.001</b>	-0.332 <b>p &lt; 0.001</b>	0.218 <b>p &lt; 0.001</b>	0.225 <b>p &lt; 0.001</b>
Physical Function	--	--	--	0.073 p = .226	-0.083 p = 0.177	-0.260 <b>p &lt; 0.001</b>
Mental Health	--	--	--	--	-0.154 <b>p = 0.012</b>	-0.089 p = 0.154
Perceived Stress	--	--	--	--	--	0.092 p = 0.142
Food Insecurity	--	--	--	--	--	--

\* P-values for Spearman Correlation Coefficients

Table 3: Unadjusted associations between number of visitors and health outcomes

<b>Health Outcome</b>	<b>None (N = 135)*</b>	<b>1 (N = 103)*</b>	<b>2 + (N = 52)*</b>	<b>p-value<sup>†</sup></b>
BMI Category				
Underweight (BMI <18.5)	29 (21.6)	15 (14.7)	5 (9.6)	<b>0.045</b>
Mean ± SD	20.4 ± 2.4	21.3 ± 2.7	22.3 ± 3.0	<b>&lt;0.001</b>
Depression	120 (93.0)	85 (88.5)	44 (88.0)	0.223
SF-12				
Physical Function (mean ± SD)	38.2 ± 10.9	42.3 ± 11.2	43.5 ± 9.0	<b>0.002</b>
Mental Health (mean ± SD)	34.8 ± 8.9	34.2 ± 8.5	35.1 ± 8.4	0.800
Self-rated Health – Poor/Fair	121 (91.7)	85 (82.5)	44 (84.6)	0.087
Perceived Stress (mean ± SD)	22.5 ± 5.3	21.6 ± 5.5	21.6 ± 4.4	0.382
Food Insecurity Summary Score				<b>0.003</b>
0-1 (least food insecure)	12 (9.5)	10 (10.8)	13 (26.5)	
2	21 (16.7)	30 (32.3)	10 (20.4)	
3	61 (48.4)	35 (37.6)	17 (34.7)	
4 (most food insecure)	32 (25.4)	18 (19.4)	9 (18.4)	

\* Numbers may not sum to total due to missing values and column percentages may not sum to 100% due to rounding.

<sup>†</sup> P-value for analysis of variance F-test (continuous variable) and Mantel-Haenszel  $\chi^2$  test (categorical variables).



Table 4: Unadjusted associations between length of detention and health outcomes

<b>Health Outcome</b>	<b>1-90 days (N = 36)*</b>	<b>91 – 457 days (N = 131)*</b>	<b>&gt; 457 days (N = 123)*</b>	<b>p-value<sup>†</sup></b>
BMI Category				
Underweight (BMI <18.5)	8 (22.2)	24 (18.5)	17 (13.9)	0.193
Mean $\pm$ SD	20.5 $\pm$ 2.3	21.0 $\pm$ 2.6	21.3 $\pm$ 2.8	0.207
Depression	30 (90.9)	115 (89.8)	104 (91.2)	0.840
SF-12				
Physical Function (mean $\pm$ SD)	45.5 $\pm$ 11.4	41.0 $\pm$ 11.2	38.9 $\pm$ 10.0	<b>0.007</b>
Mental Health (mean $\pm$ SD)	34.2 $\pm$ 8.3	35.1 $\pm$ 8.6	34.2 $\pm$ 8.8	0.717
Self-rated Health – Poor/Fair	27 (75.0)	111 (85.4)	112 (92.6)	<b>0.005</b>
Perceived Stress (mean $\pm$ SD)	23.2 $\pm$ 5.6	21.7 $\pm$ 5.1	22.1 (5.3)	0.294
Food Insecurity Summary Score				
0-1 (least food insecure)	5 (15.2)	17 (14.3)	13 (11.2)	0.431
2	9 (27.3)	26 (21.9)	26 (22.4)	
3	12 (36.4)	50 (42.0)	51 (44.0)	
4 (most food insecure)	7 (21.2)	26 (21.9)	26 (22.4)	

\* Numbers may not sum to total due to missing values and column percentages may not sum to 100% due to rounding.

<sup>†</sup> P-value for analysis of variance F-test (continuous variable) and Mantel-Haenszel  $\chi^2$  test (categorical variables).

Table 5: Adjusted associations for BMI, physical function, and food security

Variable	BMI		Physical Function		Food Insecurity	
	Adjusted $\beta$ (SE)	p-value	Adjusted $\beta$ (SE)	p-value	Adjusted $\beta$ (SE)	p-value
Visitors						
None	Reference		Reference		Reference	
1	0.64	0.062	2.07	0.126	-0.17	.181
2 or more	1.18	<b>0.015</b>	4.68	<b>0.014</b>	-0.44	<b>.015</b>
Days of detention						
1-90 days	Reference		Reference		Reference	
91 – 457 days	0.94	0.058	-3.36	0.092	-0.08	.676
> 457 days	1.33	<b>0.008</b>	-5.84	<b>0.004</b>	0.02	.915
Prison						
Prison A	0.02	.956	-8.57	<b>&lt;0.001</b>	0.23	0.092
Prison B	-1.05	<b>0.006</b>	-5.96	<b>0.001</b>	0.48	<b>&lt;0.001</b>
Prison C	Reference		Reference		Reference	
Age	0.04	<b>.016</b>	0.05	0.436	-0.02	<b>&lt;0.001</b>
Adjusted R-Squared		0.077		0.186		0.102

## VII. References

- <sup>i</sup> Altice, F. L., Mostashari, F., Selwyn, P. A., Checko, P. J., Singh, R., Tanguay, S., & Blanchette, E. A. (1998). Predictors of HIV infection among newly sentenced male prisoners. *J Acquir Immune Defic Syndr Hum Retrovirol*, *18*(5), 444-453.
- <sup>ii</sup> Binswanger, I. A., Krueger, P. M., & Steiner, J. F. (2009). Prevalence of chronic medical conditions among jail and prison inmates in the USA compared with the general population. *J Epidemiol Community Health*, *63*(11), 912-919.
- <sup>iii</sup> Hammett, T. M., Harmon, M. P., & Rhodes, W. (2002). The burden of infectious disease among inmates of and releasees from US correctional facilities, 1997. *Am J Public Health*, *92*(11), 1789-1794.
- <sup>iv</sup> Hammett, T. M. (2006). HIV/AIDS and other infectious diseases among correctional inmates: transmission, burden, and an appropriate response. *Am J Public Health*, *96*(6), 974-978.
- <sup>v</sup> Harzke, A. J., Baillargeon, J. G., Pruitt, S. L., Pulvino, J. S., Paar, D. P., & Kelley, M. F. (2010). Prevalence of chronic medical conditions among inmates in the Texas prison system. *J Urban Health*, *87*(3), 486-503.
- <sup>vi</sup> Mathew, P., Elting, L., Cooksley, C., Owen, S., & Lin, J. (2005). Cancer in an incarcerated population. *Cancer*, *104*(10), 2197-2204.
- <sup>vii</sup> Zahari, M. M., Hwan Bae, W., Zainal, N. Z., Habil, H., Kamarulzaman, A., & Altice, F. L. (2010). Psychiatric and substance abuse comorbidity among HIV seropositive and HIV seronegative prisoners in Malaysia. *Am J Drug Alcohol Abuse*, *36*(1), 31-38.
- <sup>viii</sup> Butler, T., Andrews, G., Allnutt, S., Sakashita, C., Smith, N. E., & Basson, J. (2006). Mental disorders in Australian prisoners: a comparison with a community sample. *Aust N Z J Psychiatry*, *40*(3), 272-276.
- <sup>ix</sup> Fazel, S., & Danesh, J. (2002). Serious mental disorder in 23000 prisoners: a systematic review of 62 surveys. *Lancet*, *359*(9306), 545-550.
- <sup>x</sup> Assadi, S. M., Noroozian, M., Pakravannejad, M., Yahyazadeh, O., Aghayan, S., Shariat, S. V., & Fazel, S. (2006). Psychiatric morbidity among sentenced prisoners: prevalence study in Iran. *Br J Psychiatry*, *188*, 159-164
- <sup>xi</sup> Fazel, S., & Baillargeon, J. (2011). The health of prisoners. *Lancet*, *377*(9769), 956-965. doi: S0140-6736(10)61053-7
- <sup>xii</sup> Chigbu, L. N., & Iroegbu, C. U. (2010). Incidence and spread of Mycobacterium tuberculosis-associated infection among Aba Federal prison inmates in Nigeria. *J Health Popul Nutr*, *28*(4), 327-332.

- 
- <sup>xiii</sup> Feron, J. M., Paulus, D., Tonglet, R., Lorant, V., & Pestiaux, D. (2005). Substantial use of primary health care by prisoners: epidemiological description and possible explanations. *J Epidemiol Community Health, 59*(8), 651-655.
- <sup>xiv</sup> Fazel, S., & Benning, R. (2006). Natural deaths in male prisoners: a 20-year mortality study. *Eur J Public Health, 16*(4), 441-444.
- <sup>xv</sup> Larouzé, B., Sánchez, A., & Diuana, V. (2008). Tuberculosis behind bars in developing countries: a hidden shame to public health. *Trans R Soc Trop Med Hyg, 102*(9), 841-842.
- <sup>xvi</sup> Noeske, J., Kuaban, C., Amougou, G., Piubello, A., & Pouillot, R. (2006). Pulmonary tuberculosis in the Central Prison of Douala, Cameroon. *East Afr Med J, 83*(1), 25-30.
- <sup>xvii</sup> Central Intelligence Agency. (2012, April 12). *Central America and Caribbean: Haiti*. Retrieved April 22, 2012, from The World Factbook: <https://www.cia.gov/library/publications/the-world-factbook/geos/ha.html>
- <sup>xviii</sup> U.S. Department of State. (2011). *2010 Human Rights Report: Haiti*. Washington D.C.: Government Printing Office.
- <sup>xix</sup> International Centre for Prison Studies. (2010). *World Prison Brief*. Retrieved 4 22, 2012, from International Centre for Prison Studies: [http://www.prisonstudies.org/info/worldbrief/wpb\\_country.php?country=65](http://www.prisonstudies.org/info/worldbrief/wpb_country.php?country=65)
- <sup>xx</sup> May, J. P., Joseph, P., Pape, J. W., & Binswanger, I. A. (2010). Health care for prisoners in Haiti. *Ann Intern Med, 153*(6), 407-410.
- <sup>xxi</sup> WHO Expert Committee on Physical Status: the Use and Interpretation of Anthropometry. (1995). *Physical status : the use and interpretation of anthropometry : report of a WHO Expert Committee*. Geneva: World Health Organization.
- <sup>xxii</sup> Ware, J., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care, 34*(3), 220-233.
- <sup>xxiii</sup> Smith Fawzi, M. C., Eustache, E., Oswald, C., Surkan, P., Louis, E., Scanlan, F., . . . Mukherjee, J. (2010). Psychosocial functioning among HIV-affected youth and their caregivers in Haiti: implications for family-focused service provision in high HIV burden settings. *AIDS Patient Care STDS, 24*(3), 147-158.
- <sup>xxiv</sup> Hashmi, S., Petraro, P., Rizzo, T., Nawaz, H., Choudhary, R., Tessier-Sherman, B., & Kasl, S. (2011). Symptoms of anxiety, depression, and posttraumatic stress among survivors of the 2005 Pakistani earthquake. *Disaster Med Public Health Prep, 5*(4), 293-299.
- <sup>xxv</sup> Vinck, P., & Pham, P. N. (2010). Association of exposure to violence and potential traumatic events with self-reported physical and mental health status in the Central African Republic. *JAMA, 304*(5), 544-552

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<sup>xxvi</sup> Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *J Health Soc Behav*, 24(4), 385-396.

<sup>xxvii</sup> Butler, T., Kariminia, A., Levy, M., & Murphy, M. (2004). The self-reported health status of prisoners in New South Wales. *Aust N Z J Public Health*, 28(4), 344-350.

<sup>xxviii</sup> Lindquist, C. H., & Lindquist, C. A. (1999). Health behind bars: utilization and evaluation of medical care among jail inmates. *J Community Health*, 24(4), 285-303.

<sup>xxix</sup> Massoglia, M. (2008). Incarceration as exposure: the prison, infectious disease, and other stress-related illnesses. *J Health Soc Behav*, 49(1), 56- 71.

<sup>xxx</sup> Awofeso, N. (2010). Prisons as social determinants of hepatitis C virus and tuberculosis infections. *Public Health Rep*, 125 Suppl 4, 25-33.