Incarceration Weakens a Community's Immune System:
Mass Incarceration and COVID-19 Cases in Milwaukee
Preliminary Results

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The COVID-19 pandemic is highlighting all the social problems that confront a large portion of the U.S. population: the scarcity of stable and meaningful economic opportunities; a weak safetynet infrastructure; the lack of care and support for the elderly; poor access to health services and health insurance; subpar housing and chronic homelessness; and food insecurity, among other things.

The pandemic is also disproportionately affecting communities of color in the United States (Godoy & Wood, 2020; Millett et al, 2020). According to The COVID Tracking Project, though Black people represent only 13 percent of the U.S. population, they account for almost a quarter (24 percent) of COVID-19 deaths where race is known. Moreover, in 38 states, Hispanics have infection rates that are at least twice as high as their share in the population (Godoy & Wood, 2020). And there is also evidence that Hispanics are more likely to experience serious symptoms compared to non-Hispanics (*USA Today*, 2020).

This is not surprising since communities of color are the most vulnerable to the structural problems listed above, which both increases their likelihood of having health conditions that make COVID-19 more severe (Millett et al, 2020) and makes it more difficult for them to mitigate the spread of the virus.

Low-income communities of color also experience disproportionate rates of interaction with the criminal justice system, often resulting in incarceration. The detrimental effect of mass incarceration on community well-being has been well-documented by researchers (see Clear, 2007). We hypothesize that in addition, mass incarceration makes communities more vulnerable to public health crises, such as the COVID-19 pandemic, by damaging social and economic networks at a large scale. We use social disorganization theory (or ecological criminology) as the framework to look at the effect of the number of people sentenced to incarceration (jail or prison) in 2015 on the concentration of COVID-19 cases between March 15 and May 11 of 2020 at the census tract level in Milwaukee. The preliminary results show that the number of incarcerations is a strong predictor of the number of COVID-19 cases above and beyond the effect of minority

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population, poverty, unemployment, and population not in the labor force. The concentration of minorities in the tract's population was the second strongest predictor. Census tracts with a majority minority population or that are diverse experience more COVID-19 cases than tracts with a majority White population. Interestingly, poverty and unemployment seem to have a protective effect against COVID-19 since communities with high levels of both tend to have lower rates of infection. We offer a preliminary discussion of these findings in this report. Further research is needed to see if the results replicate in other jurisdictions, including rural areas, and to control for additional community factors that may be related to the spread of COVID-19.

Neighborhood Disadvantage and Collective Efficacy

Ecological criminology understands communities as human habitats defined by familial and local ties with a differential ability to spring into collective action to enforce behavioral expectations and secure resources needed by the community (Bursik & Grasmick, 1993a, 1993b, 1995). This framework views families and communities as the primary sources of informal social control where social norms are taught and enforced (private and parochial levels of control, respectively). However, families and communities can only do so much to prevent crime or to address other social problems. They need to have collective efficacy, or the ability (Sampson, Raudenbush & Earls, 1997) and willingness (Triplett, Sun & Gainey, 2005) to act collectively to connect to external resources from city hall, the police department and even outside businesses and nonprofits to ensure that the community can address its most pressing needs (public level of control).

When a community has high levels of concentrated disadvantage[3] and residential instability, collective efficacy suffers greatly (Sampson et al., 1997). Concentrated disadvantage weakens private and parochial networks of informal social control. Indeed, when people expend most of their material and emotional resources on figuring out daily survival, they are much less likely to spend time and energy thinking about ways to improve the neighborhood. Furthermore, in these conditions the access to external social networks that can connect the community to resources not available within is very limited, resulting in the social, political, and economic isolation of the neighborhood (Clear, 2007). This turns the police into the most visible form of the public level of control that disadvantaged communities experience, creating an adversarial relationship whereby the police assign "the moral liability of the area itself" (Smith, 1986, p. 316) to all residents of disadvantaged neighborhoods through over-policing practices such as widespread stop-and-frisk (Rengifo & Slocum, 2016; Rengifo & McCallin, 2017). The community in turn sees the police as an illegitimate occupying force and become much less likely to cooperate with

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[3] Concentrated disadvantage represents the confluence of poverty, single-female-headed households with children, unemployment, high density of underaged residents, among other indicators, in the same community.

them (Triplett et al., 2005, p. 93). In fact, Kane (2005) found "that over–rather than under–policing in precincts characterized by extreme structural disadvantage predicted increases in the violent crime rates of these precincts" (p. 488-490). The fear of both crime and police violence makes residents further withdraw from the community in a vicious cycle that continues to weaken collective efficacy (Skogan, 1986) and deepen disadvantage.

In addition, residential instability or the frequent turnover of residents in a neighborhood leads to disengaged and isolated residents who are not invested in a community from which they hope to move out one day. This produces high levels of anonymity that ultimately impede social cohesion and the willingness to form the parochial ties needed to enforce norms and spring into action.

In short, the cumulative effect of concentrated disadvantage and residential instability leads to higher rates of both crime and incarceration, as well as poorer health outcomes such as infant mortality and low birth weight (Clear, 2007). In the next section, we discuss how mass incarceration self-perpetuates by exacerbating community disadvantage and instability.

Neighborhood Disadvantage and Mass Incarceration

The "tough on crime" paradigm that has been the basis of the U.S. response to crime since the 1970s brought about an era of mass incarceration with little return on investment. By now, any American who has read a newspaper article about criminal justice or incarceration is familiar with this oft quoted figure: the United States represents only five percent of the world's population, but it holds 25 percent of all the world's prisoners (Collier, 2014).

However, the benefits of incarcerating people at such high rates are suspect. According to Stemen (2017), increases in incarceration rates between 1980 and 2000 had only a marginal effect on crime rates, reducing them by just six to 25 percent, depending on the study. Furthermore, "the increased use of incarceration [since 2000] accounted for nearly zero percent of the overall reduction in crime" (Stemen, 2017, p. 1).

If the benefits of mass incarceration are suspect, its costs are clear. The Center for Spatial Research at Columbia University has identified single city blocks with such density of prisoners at any given time that states are spending over a million dollars a year on incarcerating the residents of those blocks. Moreover, McLaughlin and colleagues (2016) estimate that the overall cost of incarceration is one trillion dollars (or 6 percent of the country's GDP), of which only $80 billion are accounted for by correctional spending. This means that more than half of the costs of incarceration are social and paid by families and communities.

Mass incarceration is not only financially costly but also incredibly disruptive to the social networks that are the basis for collective efficacy. Clear (2007) has proposed that incarceration works as a form of residential instability where the turnover of residents is not voluntary but coerced by the criminal justice system. He has used the term "coercive mobility" to refer to a constant cycle of removal and reentry of individuals from and to the community, which creates "an environment where a significant portion of residents are constantly in flux—perhaps as many as 15 percent of parent-age, male residents a year" (Clear, 2007, p. 73).

The incarceration of one individual in a disadvantaged neighborhood puts an economic burden on the family members left behind, not only because they are losing the earning capacity of one person but also because of all the costs that are associated with a criminal case and incarceration: bail, lawyers, court fees, commissary money, phone call fees, and travel to faraway correctional institutions to visit the incarcerated person, just to name a few. It also puts an emotional burden on intimate partners and children that may lead to the breakup of the family and negatively affect the psychosocial development of children, as well as on extended family members. Since state prisoners serve on average 2.6 years (Kaeble, 2018) and, in most states, jail sentences are capped at one year, it follows that the incarcerated individual will eventually return to the family and potentially cause more economic and emotional disruption.

On the economic front, the labor market viability of the returning citizen is very limited, because the punishment does not end when the individual is released from prison or jail. Federal and state laws forbid individuals with criminal records from getting certain occupational licenses[4] and student loans, accessing public housing, and voting, among the most salient structural barriers to reentry. This means that the family is more likely to become dependent on the welfare system, even after their loved one returns from prison.

On the emotional front, researchers have found that formerly incarcerated individuals suffer from a number of mental disorders caused or exacerbated by the incarceration itself, including post-traumatic stress disorder, institutionalized personality traits (distrust, difficulty engaging in relationships, hampered decision-making), social-sensory disorientation, and alienation (Liem & Kunst, 2013). This increases the likelihood of family conflict and violence in the community upon their return.

Now, imagine this dynamic at a large scale. Hundreds if not thousands of mostly men (but also women at increasing rates) and their families going through this cycle within the same community over and over again. As Clear (2007) argues, "[w]hen oversubscribed social networks are forced to adjust first to a person's being removed, and then must accommodate the

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[4] The National Inventory of Collateral Consequences of Conviction identified over 15,000 laws and regulations limiting occupational licensing for people with criminal records.

person's return, they are even less likely to shift attention to collective action at the community level" (p. 84). Concentrated incarceration thus weakens collective efficacy and increases social disorganization, leading to higher crime rates, the very thing that it is supposed to deter.

Finally, not only does mass incarceration hurt the community's ability to tackle social ailments but it also creates a perverse macroeconomics dynamic whereby public resources are shifted away from community improvement toward sustaining correctional institutions. As Clear (2007) notes, "[once] they are arrested and incarcerated, these people's economic value is transformed and transferred into penal capital—the demand for salaried correctional employees to provide security. It's also transferred to the locality of the prison, where the penal system's employees reside" (p. 89).

Mass Incarceration and Public Health

The reciprocal nature of the relationship among concentrated disadvantage, collective efficacy, and incarceration may also impact the public health of a community. Much has been written about the impact that incarceration has on the health of individuals who have served jail and prison sentences (Hatzenbeuhler, Keys, Hamilton, Uddin, & Galea, 2015; Massoglia & Pridemore, 2015; Wildeman & Wang, 2017). Incarceration has negative health impacts on these individuals, such that having been incarcerated, regardless of the length of the sentence, results in worse health outcomes over their lifespans.

Further, an individual's experience with incarceration has an impact on the health of their partners (Wildeman, Goldman, & Lee, 2019), neighbors (Hatzenbeuhler et al., 2015), and children (Davis & Williams, 2011). These effects are wide ranging, including both physical and psychological health factors, such as obesity, lower life expectancy, and stress-induced cortisol level increases. Women who care for the families of men who are incarcerated also experience greater incidences of stress, depression, and anxiety (Wildeman, Goldman, & Lee, 2019). Children whose parents are incarcerated are at a higher risk for poor health outcomes such as obesity, substance use, and heart disease, as well as for behaving in inappropriate or disruptive ways at home and in school (Davis & Williams, 2011; Massoglia & Pridemore, 2015; Wakefield & Wildeman, 2011). The loss and return of a parent to the family also heightens tensions in the home, affecting how adult members of the family interact with one another (see review of literature in Wildeman, Goldmann, & Lee, 2019), how they manage parenting and the stress and stigma they face in their communities. Outside of the family unit, friends and neighbors who experience the incarceration of a member of their social network also indirectly report significantly more risk factors for poor health and psychological stress (Kruger & DeLoney, 2009; Tyler, Brockmann, & Goldman, 2017).

The negative social and behavioral outcomes for family members of those who have been incarcerated are made worse by the ongoing barriers facing the individual to gaining employment, continuing or completing an education, and accessing satisfactory medical care (Massoglia & Pridemore, 2015; Tyler, Brockmann, & Goldman, 2017; Western, 2002), as discussed in prior sections. Households affected by an individual's incarceration are also more likely to rely on welfare and housing assistance, and face greater economic hardships (Wildeman, Goldman, & Lee, 2019).

This strain is experienced not only by the individual and their family, but is felt by the broader community. In areas with a high rate of incarceration, communities lose members who may otherwise be contributing to the economic development of the neighborhood, engaging in social connections with their neighbors, and supporting the rearing of children (Hatzenbuehler et al., 2015). When these individuals return to the community, the negative effects of incarceration on their health returns along with them, and introduces an additional stressor to the community already affected by their earlier departure to serve a sentence. At the neighborhood level, then, poorer public health outcomes are observed overall, including asthma, high rates of sexually transmitted infections (including immunodeficiency syndromes and AIDS infection rates), and poor mental health (Massoglia & Pridemore, 2015; Wildeman & Wang, 2017).

The rate at which members of these communities are incarcerated means that the impact of incarceration on the social determinants of health at the community level is heightened. Davis & Evans (2018) proposed that unhealthy behaviors and attitudes are transmitted across communities through social connections, community norms, and behavioral modeling. Communities experiencing a level of disadvantage and with low collective efficacy are particularly at risk for poor health and social outcomes. As we note, incarceration has further deleterious impacts on the health of these communities, while also limiting their access to care and specialists, and reducing shared trust with physicians (Nowotny & Kuptsevych-Timmer, 2018). Thus, exploring incarceration as a determinant of public health across communities in the United States is critical to understanding how public policy, criminal justice involvement, and public health are intertwined and affect the most vulnerable when it matters most.

The Study

Following on the findings from previous research, we hypothesize that communities with higher levels of incarceration are more vulnerable to the spread of COVID-19 due to the impacts of mass incarceration on collective efficacy and concentrated disadvantage. We look at the effect of the number of people sentenced to incarceration in 2015 on the concentration of COVID-19 cases between March 15 and May 11, 2020 at the census tract in Milwaukee county.

The Study Site

This study analyzed data at the census tract level in the county of Milwaukee, Wisconsin. Milwaukee is an urban center in the southeastern part of the state, including 948,201 residents of the city of Milwaukee and surrounding suburban areas (U.S. Census Bureau, 2018). The median age of the county is 35.1 years, and residents report a median household income of $49,636. The majority of Milwaukee county residents identify as White (50.7%), while 25.9% of residents identify as Black, and 15.4% of residents indicate Hispanic ethnicity. Compared to the rate in Wisconsin (11.1%), almost one-fifth of the county's population falls below the poverty line.

Despite having a relatively diverse population overall, Milwaukee county is a racially segregated county. In 2018, the county included 297 census tracts. In 114 (38.4%) tracts, minorities made up three-quarters of the population, and in another 147 (49.5%), minorities made up fewer than two-fifths of the population. Milwaukee county is also home to the 53206 zip code, which has been highlighted as the zip code with one of the highest incarceration rates in the state (Levine, 2019).

As of April 20, 2020, 73% of deaths related to COVID-19 in Milwaukee county were black residents (Millett et al, 2020), despite making up only one-quarter of the county's population.

Data Sources

COVID-19 Cases: Data for the outcome variable, number of COVID-19 cases (between March 15 and May 11, 2020) at the census tract level in Milwaukee, were collected from the Wisconsin Department of Health Services COVID-19 data dashboard. These data are updated daily and contain information on the number of positive and negative cases, as well as the number of deaths.

Incarcerations: As part of a larger project to measure the performance of local criminal justice by Measures for Justice, we collected data on criminal cases filed in Milwaukee courts in 2015 from the Wisconsin Consolidated Court Automation Programs (CCAP). These data are rich with information about case outcomes, including sentencing. We identified the number of criminal cases filed in court in 2015 that resulted in a jail, prison or a split sentence[5] and aggregated it up to the census tract level.

Demographic Predictors: We obtained information on the following demographics from the Census Bureau's 2018 American Community Survey 5-Year Estimates:

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[5] Split sentences involve a period of incarceration followed by a period of probation.

- Percent of the population who belong to a minority group.[6]
- Percent of the population below the poverty line.
- Percent of the population 16 and older who were unemployed.
- Percent of the population 16 and older who were not in the labor force.[7]
- Percent of the population 60 and older.

Methodology

We use the census tract (N=297) as a proxy for neighborhood. This decision is both grounded in previous ecological studies (Sampson, Morenoff, and Gannon-Rowley, 2002; Wooldredge, 2002) and in the fact that the COVID-19 data for Milwaukee was available at that level.

The outcome variable is a count, and it is positively skewed and over-dispersed. A classical OLS regression approach is not appropriate for this kind of data. We thus use a negative binomial with log link function approach to conduct the analyses. In addition, since we suspected the concentration of COVID-19 cases would be spatially autocorrelated, meaning that it is influenced by the concentration of cases in neighboring tracts, we created a spatial lag variable (average number of cases in all the immediate neighboring tracts) using a queen first order weights matrix.

We run multiple models to compare the relative effect of incarcerations and minority population on COVID-19 cases individually, as well as their combined effect alone and while controlling for other demographics and the spatial lag.

Results

The summary statistics in Table 1 below show that, on the average, Milwaukee has rather high levels of poverty, lack of participation in the labor force, minorities, and incarcerations. In addition, on average, there were about 13 COVID-19 cases per census tract between March 15 and May 11, 2020.

Moreover, the average prison sentence for Milwaukee in 2015 was 4.5 years, while the average jail sentence was just 3.7 months. This means that there is a high likelihood that those who were sentenced to incarceration in 2015 will have already returned to their communities.

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[6] This variable groups residents who are African American, Hispanic/Latino, Asian, Native American, Pacific Islander, and Multiracial.

[7] Includes retired persons, students, those taking care of children or other family members, and others who are neither working nor looking for employment.

Table 1. Descriptive Statistics

	Mean (SE)	Median	St. Dev.	Min	Max	Skewness (SE)
COVID-19 Cases	12.87 (.74)	10.00	12.76	0	105	2.52 (.14)
Incarceration Sentences	16.77 (.76)	15.00	13.11	0	80	1.10 (.14)
% Minority Population	52.01 (1.91)	41.32	32.93	0	100	.150 (.14)
% Population 60+	6.62 (.46)	0.00	8.00	0	27.24	.737 (.14)
% Below Poverty Line	22.63 (.91)	18.80	15.67	0	78.40	.698 (.14)
% Unemployed	7.23 (.31)	5.52	5.46	0	31.23	1.36 (.14)
% Not in Labor Force	35.16 (.53)	35.24	9.10	0	63.18	.06 (.14)

Table 2 shows the correlations between each predictor and the outcome, and among predictors. All predictors, except for the percentage of the population who are 60 years old or older, are weakly to moderately positively correlated with the number of COVID-19 cases. The number of incarceration sentences presents the strongest correlation, though still moderate, among all predictors, followed by the percentage of minority population.

Table 2. Correlations Matrix

|	COVID-19	Inc.	% Min.	% Pov.	% Unemp.	% Not in Labor Force	% Pop. 60+
COVID-19	1	-	-	-	-	-	-
Incarcerations	.431**	1	-	-	-	-	-
% Minority	.388**	.760**	1	-	-	-	-
% Poverty	.183**	.566**	.751**	1	-	-	-
% Unemployed	.189**	.656**	.728**	.574**	1	-	-
% Not Labor Force	.200**	.455**	.503**	.554**	.428**	1	-
% Pop. 60+	.041[NS]	.379**	.481**	.328**	.396**	.123*	1

* Significant at the .05 level.
** Significant at the .01 level.
[NS] Not significant.

The distribution of the percent of minority population is bimodal and shows a high degree of racial segregation (see Graph 1 and Map 1 below). Similarly, most census tracts seem to have very few people who are 60 years old or older (the average in Table 1 is just 6.6 percent) with a

number of tracts in the center and the northwest of the city having larger concentrations of residents in this age group (see Graph 2 and Map 2 below). Since the distributions of these two variables are far from normal and attempts to normalize them were unsuccessful, we turned them into categorical variables as follows. We replaced the percent of minority population with three dichotomous variables: high minority concentration tract (75 to 100 percent; N=114), diverse tract (40 to 74.99 percent; N=36), and low minority concentration tract (0 to 39.99 percent; N=147). Likewise, we replaced the percent of population 60 or older with three dichotomous variables: no residents 60 and older tract (0 percent; N=161), medium concentration of residents 60 and older tract (1 to 14.99 percent; N=83), and high concentration of residents 60 and older (15 to 27.24 percent; N=53).
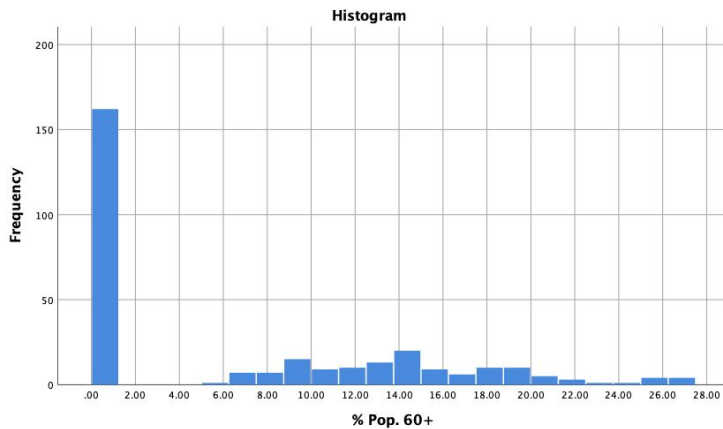
Graph 1. Distribution of Percent Minority Population
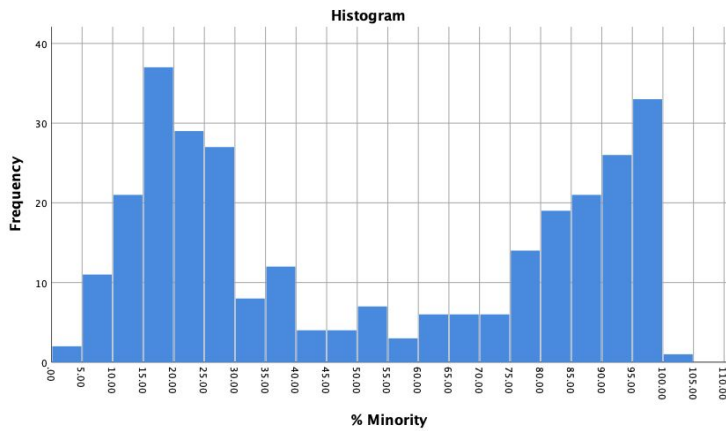
Map 1. Spatial Distribution of Percent Minority Population
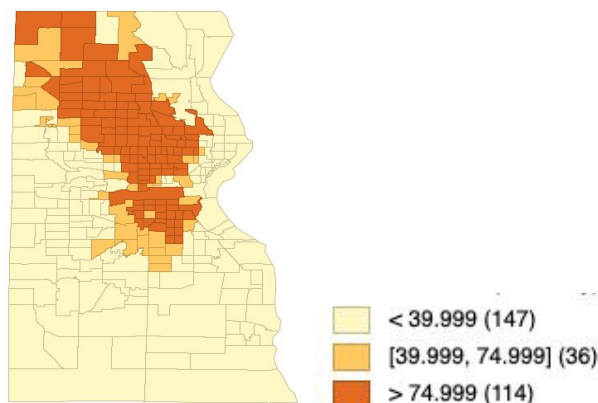
Graph 2. Distribution of Population 60 and Older

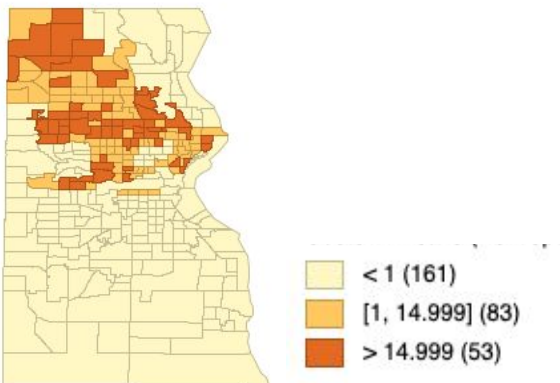**Map 2. Spatial Distribution of Population 60 and Older**

Table 3 below shows the results of independent sample t-tests comparing the average number of COVID-19 cases across the six new categorical variables. Census tracts with a high concentration of minority residents have, on average, about six fewer COVID positive cases than other census tracts, while tracts with a low concentration of minority residents (or a high concentration of White residents) have, on average six more COVID positive cases than other census tracts. The average number of COVID positive cases in diverse census tracts doesn't differ significantly from tracts with high or low minority concentrations. We will use the low concentration of minority residents census tracts as the reference category in the subsequent regression analyses.

None of the categorical variables related to the percentage of the population who are 60 years old or older show a statistically significant difference in the average number of COVID positive cases. Since the correlation between the percentage of the population who are 60 and older is not statistically significant and neither are the differences in means for the categorical versions of the variable, we will exclude this variable for the regressions below.

Table 3. Comparing COVID-19 Means Between Groups for Categorical Variables

	F	t (df)	Mean Difference (SE)
High Minority Concentration	2.737[NS]	-5.797** (295)	-8.376 (1.445)
Diverse	.360[NS]	-.054[NS] (295)	-.122 (2.272)
Low Minority Concentration	4.071*	5.658** (292.496)	7.977 (1.410)
No Residents 60+	1.336[NS]	-.307[NS] (295)	-.457 (1.488)
Medium Concentration Pop. 60+	6.732**	1.690[NS] (252.964)	2.221 (1.314)
High Concentration Pop. 60+	2.432[NS]	-1.178[NS] (295)	-2.277 (1.932)

* Significant at the 0.05 level.
** Significant at the 0.01 level.
[NS] Not significant.

Table 4 summarizes the results of multiple negative binomial models to test the individual and multivariate effect of the key variables, 2015 incarceration sentences and 2018 concentration of minority residents, on COVID-19 cases at the census tract level in Milwaukee. Spatial lags were also included to compare to the same model without controlling for spatial autocorrelation. The spatial lag was significant and improved the goodness of fit in the three models testing the effect of incarceration sentences (Model 2), concentration of minorities (Model 4) and both (Model 6). However, the spatial lag becomes statistically not significant when we control for other community characteristics such as poverty, unemployment, and population not in the labor force (Model 8). We focus on interpreting models 2, 4, 6 and 7 (controlling for other community characteristics but excluding the spatial lag).

First, we will compare the models testing the individual effect of incarcerations (model 2) and concentration of minorities (model 4). The goodness of fit statistics show that the model using incarcerations as a predictor is a better fit than the one focusing on the concentration of minorities (Model 2 Deviance < Model 4 Deviance; Model 2 AIC < Model 4 AIC; Model 2 LRχ^2 > Model 4 LRχ^2). Though the magnitude of the effect of minority concentration is larger than the effect of incarcerations, the latter is stronger based on the Wald χ^2 statistic.

We then created a model looking at the effect of both incarcerations and concentration of minorities on COVID positive cases simultaneously (Model 6). This model is an improvement over the bivariate models (lower Deviance, lower AIC, higher LRχ^2). Furthermore, after controlling for the effect of both predictors on the outcome, the concentration of minorities becomes not statistically significant.

Table 4. Bivariate and Multivariate Negative Binomial Regression Models Predicting COVID-19 Cases

Predictors	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	B [SE] Exp(B) (Wald χ^2)	B [SE] Exp(B) (Wald χ^2)	B [SE] Exp(B) (Wald χ^2)	B [SE] Exp(B) (Wald χ^2)	B [SE] Exp(B) (Wald χ^2)	B [SE] Exp(B) (Wald χ^2)	B [SE] Exp(B) (Wald χ^2)	B [SE] Exp(B) (Wald χ^2)
Intercept	1.91** [.11] 6.743 (300.628)	1.90** [.11] 6.672 (299.514)	2.18** [.09] 8.837 (626.960)	2.17** [.09] 8.755 (619.328)	1.88** [.11] 6.573 (278.336)	1.87** [.11] 6.510 (272.864)	1.50** [.27] 4.483 (31.381)	1.52** [.27] 4.585 (31.742)
Incarcerations	.034** [.01] 1.034 (39.298)	.03** [.01] 1.031 (31.276)	-	-	.03** [.01] 1.028 (15.392)	.03** [.01] 1.028 (15.121)	.03** [.01] 1.032 (18.186)	.03** [.01] 1.031 (17.460)
High Minority Concentration	-		.71** [.13] 2.040 (30.197)	.60** [.14] 1.827 (19.735)	.25^{NS} [.17] 1.283 (2.121)	.13^{NS} [.18] 1.140 (.541)	.88** [.23] 2.402 (15.230)	.77** [.24] 2.163 (10.437)
Diverse	-		.38* [.19] 1.468 (3.931)	.32^{NS} [.20] 1.371 (2.607)	.25^{NS} [.20] 1.282 (1.598)	.20^{NS} [.20] 1.219 (1.006)	.55** [.21] 1.737 (7.016)	.50* [.21] 1.645 (5.542)
% Below Poverty Line	-		-	-	-	-	-.02** [.01] .981 (10.846)	-.02** [.01] .982 (9.281)
% Unemployed	-		-	-	-	-	-.05** [.02] .952 (8.885)	-.04** [.02] .957 (6.874)
% Not in Labor Force	-		-	-	-	-	.02** [.01] 1.022 (7.608)	.02* [.01] 1.021 (6.338)
Spatial Lag	-	.16** [.05] 1.171 (9.565)	-	.14** [.05] 1.152 (8.165)	-	.15** [.05] 1.158 (7.872)	-	.08^{NS} [.06] 1.081 (1.937)
Goodness of Fit Deviance	345.931	336.251	359.596	351.252	343.116	335.049	317.234	315.291
AIC	2093.754	2086.074	2109.420	2103.075	2094.939	2088.872	2075.057	2075.114
Pearson χ^2 /df	.871	.909	1.138	1.198	.944	.965	.778	.842
Likelihood Ratio χ^2	44.149**	53.829**	30.484**	38.828**	46.964**	55.031**	72.846**	74.790**

Finally, we ran a model controlling for additional community characteristics (Model 7). This model is a significant improvement over the previous models (much lower Deviance and AIC, and much higher LRχ^2). The number of 2015 incarcerations sentences is the strongest predictor (Wald χ^2=18.186) in the model. For every additional incarceration sentence in 2015, there is an increase in the odds of COVID-19 cases of 3.2 percent in 2020. This finding supports our hypothesis that mass incarceration weakens the ability of communities to mitigate the spread of infectious diseases, such as COVID-19.

High concentration of minorities in a census tract is the second strongest predictor (Wald χ^2=15.230). The odds of COVID-19 cases are 2.4 times higher in tracts with high concentration of minorities and 74 percent higher in diverse census tracts compared to those with a low concentration of minorities (or predominantly White tracts). This matches all the reports that communities of color are disproportionately affected by the virus.

Interestingly, the 2018 percent of residents below the poverty line (third strongest predictor) and the percent of residents 16 years old and older who were unemployed predict lower odds of COVID cases (1.9 percent and 4.8 percent respectively). Perhaps the protective factor of high poverty and unemployment relates to the fact that residents from these neighborhoods are less likely to travel to work and may make fewer trips to the store. These findings are similar to Millet's and colleagues' (2020), which argue that "employment presumably increases the likelihood of exposure to COVID-19, and this might differentially impact black Americans because only one in five black Americans has an occupation that permits working from home" (p. 34). Finally, the percent of residents 16 and older who are not in the labor force predicts 2.2 percent higher odds of COVID cases. This group includes people with disabilities and retirees[8] who may have pre-existing conditions that make them more susceptible to COVID-19. It also includes people who are dedicated full-time to the care of family members, potentially including the vulnerable elderly and people with disabilities. In addition, these full-time caretakers may also be more exposed because they are likely the ones getting groceries and other needs for the household.

Discussion

In the context of ecological criminology, we explored the effect of incarceration rates on the number of COVID-19 cases in Milwaukee County neighborhoods and found preliminary support for our hypothesis. The number of incarcerations is a strong predictor of the number of COVID-19 cases above and beyond the effect of other predictors in the model, including poverty, unemployment, and population not in the labor force. Indeed, incarceration is an aggravating factor in poor health outcomes for disadvantaged communities.

Of course, we know that interaction with the criminal justice system in these communities begins long before individuals are sentenced to incarceration. Communities with high rates of incarceration have experienced the entire process of the criminal justice system to the point of sentencing, and feel the effect of the punishing process.

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[8] In 2014, 21.9 percent of those who reported not participating in the labor force were ill or retired (Hipple, 2015).

Today, the world faces a pandemic, and communities across the entire country grapple with over-policing and disparate system contact. The loss of life in the name of law and order, and the overwhelming backlash to protests of the system suggest that the pendulum is swinging back in the direction of tough on crime. Yet, the criminal justice literature has shown that the high concentration of incarcerations wears on communities in multiple ways, including family disruption, social capital erosion, and economic and financial stagnation and deterioration. The public health literature suggests that incarceration also has substantial effects on poor health outcomes of neighborhoods that experience a steady removal and return of their community members. Here, we offer a preliminary discussion of these findings in this report. Further research is needed to see if the results can be replicated in other jurisdictions, including rural areas, controlling for additional community factors that may be related to the spread of COVID-19.

The U.S. The Department of Health and Human Services has committed to achieving health equity and improving the health of all groups in 2020 (Office of Disease Prevention and Health Promotion, 2020). Meeting this goal necessitates further study of how incarceration weakens the immune system of a community such that it cannot fight off infections, social or physiological.

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