LOUISIANA VULNERABILITY ASSESSMENT | METHODS BRIEF

STUDY DESIGN

The purpose of the study was to identify areas in Louisiana that are at risk of an outbreak of bloodborne illness or overdose due to high-risk injection drug use (IDU). Our methods and analysis are intended to parallel a nationwide study conducted by the Centers for Disease Control and Prevention (CDC) that examined county-level vulnerability across the nation (Van Handel et al. 2016). Our vulnerability assessment is similar in methods to the nationwide study but uses more recent and more granular data (ZIP Code Tabulation Area (ZCTA) level) in order to identify pockets of vulnerability across the state. Our approach involved a multi-stage variable selection process, use of a multi-level regression model to predict the rate of chronic hepatitis C (HCV) among individuals under the age of 40 (our outcome measure), creation of a vulnerability index that is used to identify areas of high vulnerability, and descriptive analyses of health outcomes and resource gaps across the state of Louisiana.

PREDICTOR VARIABLES

We began by compiling a list of variables that local experts agreed could be predictive of high-risk injection drug use in Louisiana. After compiling the list, we employed a multi-step approach to identify the most parsimonious set of indicators with the strongest predictive association with our proxy measure for risky IDU (chronic HCV in persons under 40). For this, we reviewed and categorized variables in terms of when they were reported, what they measure, variability, and missingness; we imputed missing predictor data where necessary. Following imputation, we conducted a data reduction process using a combination of principal components analysis (PCA), factor analysis, simple regression, and correlation. Variables were retained if they were highly associated with a retained principal component or provided unique information. Lastly, to construct an interpretable and parsimonious empirical model that is predictive of chronic HCV in persons under 40 (our proxy variable), we conducted a final variable selection process that used a stepwise method to select the best set of linear predictors that minimizes information loss. Ultimately, we retained the following 12 variables: percentage of population never married, percentage with no high school diploma, percentage of population that is unemployed, violent crimes, percentage of housing units that are crowded, poor physical health days, rate of injury-related deaths, mean morphine milligram equivalent (MME) rate for opioid analgesics, MME rate for MAT drugs, rate of prescription opioid sales, mental health providers, and primary care providers.

STATISTICAL MODEL

We modeled the rate of new diagnoses of chronic HCV infection in persons under 40 using a multi-level negative binomial regression model. We employed a three-level model where time (two annual observations, 2016 and 2017) is nested in ZCTAs, and ZCTAs are nested in parish, with ZCTA population included in the model as an offset. We assessed model fit using methods suggested by Hilbe (2014). In brief, we conducted tests of overdispersion and investigated with diagnostic assessment-of-fit statistics whether a different count model was more appropriate (e.g., Poisson).

VULNERABILITY INDEX

Following Van Handel et al. (2016), we used unstandardized coefficients obtained from our regression model to determine vulnerability for each ZCTA. The coefficient for each predictor was multiplied by the value for each ZCTA – if two years of data are available, the data were averaged; all variables were summed to create a vulnerability index. To ease interpretation, index scores were ranked, and ranks were reversed coded so that 1 = most vulnerable ZCTA and 510 = least vulnerable.

EXPERT FEEDBACK

Following construction of the vulnerability index and associated maps, we returned to the experts with whom we initially spoke about plausible indicators of risk in Louisiana to discuss the preliminary results. We reviewed the maps we constructed that illustrate the vulnerability index rankings and available high-impact resources and discussed the extent to which these maps comport with their knowledge of the opioid epidemic and available resources in Louisiana. We also discussed the utility of the maps and of the vulnerability assessment more generally, what the State is currently doing to address the opioid epidemic, what they see as the biggest barriers to dealing with the epidemic, and the greatest areas of need in the state.

Findings from PRG's vulnerability assessment can be found in the full report.