

Effects of Statewide Job Losses on Adolescent Suicide-Related Behaviors

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Suicide among young people has been identified as a serious public health concern. Among youths and young adults 10 to 24 years of age, suicide is the third leading cause of death, resulting in 4600 deaths each year.¹ Every year, 157 000 young people in the 10- to 24-year age group are treated for self-inflicted injuries.¹

A number of individual characteristics and circumstances serve as risk factors for suicide and suicide-related behaviors among adolescents, including suicidal ideation and suicide attempts. Risk factors for suicide-related behaviors include a history of previous suicide attempts, a family history of suicide, a history of depression or other mental illness, alcohol or drug use, stressful life events, and exposure to the suicidal behavior of others.² In addition, low levels of parental monitoring and engagement in risk-taking behaviors are associated with increased suicidal ideation and suicide attempts.³ What is less well understood, however, is how broader contextual factors, such as economic conditions, alter adolescents' risk for suicide and suicide-related behaviors.

Economic downturns such as the recent "Great Recession" represent large changes in the economic context and have well-known effects on adults' physical and mental health, although these physical and mental effects work in opposite directions.⁴⁻⁶ Economic downturns have been shown to improve adults' physical health, including decreasing health risk behaviors such as smoking and decreasing mortality.⁴⁻⁶ In contrast, however, economic downturns worsen adults' mental health, including increasing suicide, one of the most serious mental health consequences.⁶⁻⁸ A recent review article concluded that the economic context of a geographic area is related to the area's overall suicide rate.⁹ Across many studies of different geographic areas, the review showed that, at any given point in time, areas with worse economic contexts have higher suicide rates. Work that has considered

Objectives. We investigated the impact of statewide job loss on adolescent suicide-related behaviors.

Methods. We used 1997 to 2009 data from the Youth Risk Behavior Survey and the Bureau of Labor Statistics to estimate the effects of statewide job loss on adolescents' suicidal ideation, suicide attempts, and suicide plans. Probit regression models controlled for demographic characteristics, state of residence, and year; samples were divided according to gender and race/ethnicity.

Results. Statewide job losses during the year preceding the survey increased girls' probability of suicidal ideation and suicide plans and non-Hispanic Black adolescents' probability of suicidal ideation, suicide plans, and suicide attempts. Job losses among 1% of a state's working-age population increased the probability of girls and Blacks reporting suicide-related behaviors by 2 to 3 percentage points. Job losses did not affect the suicide-related behaviors of boys, non-Hispanic Whites, or Hispanics. The results were robust to the inclusion of other state economic characteristics.

Conclusions. As are adults, adolescents are affected by economic downturns. Our findings show that statewide job loss increases adolescent girls' and non-Hispanic Blacks' suicide-related behaviors. (*Am J Public Health.* 2014;104:1964-1970. doi:10.2105/AJPH.2014.302081)

changes in economic contexts, rather than static conditions, has shown that recessions and unemployment rate increases are positively correlated with suicide rates.^{6-8,10}

Despite the well-known associations between economic contractions and adult suicide rates and the great public concern around adolescent suicide, the relationships between changes in economic circumstances and the suicide-related behaviors of adolescents have received relatively little attention. Evidence exists that adolescent suicide and suicide-related behaviors are more likely to occur in neighborhoods with increased levels of economic disadvantage.¹¹ In addition, recent studies suggest that adolescents' mental health is affected by changes in local economic contexts. Research focused on one US state showed that job losses attributable to mass layoffs increased use of emergency psychiatric care among young people, and increases were especially large among Black youths.¹²⁻¹⁴

Statewide job loss may increase adolescent suicide-related behaviors through changes in parental well-being as well as through changes

in the broader community context. Within families, parental job loss has been associated with increased mental health problems and lower quality parent-child interactions, which in turn affect adolescents' mental health.¹⁵⁻¹⁷ Adolescents may be more aware of their families' worsening economic circumstances than younger children and may be more likely to bear the brunt of their families' increased stress. In the broader community context, changes in the economic and psychological well-being of adults outside of the family may lead indirectly to changes in adolescent functioning.¹⁸ When parents, teachers, coaches, and other adults with whom adolescents interact experience increased stress, this increase in stress may affect adolescents' mental health. Statewide job loss could also lead to loss of resources that affect adolescents' neighborhood, school, or extracurricular activities.

Previous literature suggests that risk of adolescent suicide and suicide-related behaviors varies according to gender and race/ethnicity. Boys are more likely than girls to commit

suicide, but girls are more likely to attempt suicide.² Among all racial and ethnic groups, non-Hispanic Black adolescents are least likely to have planned or attempted suicide,¹⁹ and they also display lower levels of mental disorder.^{20,21}

Racial/ethnic differences in suicide-related behaviors may be particularly relevant given that economic downturns disproportionately affect minority households.²² In addition, because non-Hispanic Black and Hispanic adolescents are more likely than non-Hispanic White adolescents to live in households with lower incomes and fewer assets,²³ they may be less able to buffer the economic consequences of downturns. Even in the case of families who do not experience household job loss, minority adolescents may be more worried than non-Hispanic White adolescents about their future job prospects, insofar as minority workers are more vulnerable to economic downturns than are White workers.²² Consistent with these theories, Black youths' use of emergency psychiatric care has been shown to increase more after statewide job losses than that of White youths.^{12,14}

In our study, we sought to build on previous literature by considering how changes over time in statewide job loss rates across the United States affect the suicide-related behaviors of a nationally representative survey of adolescents in high school. We used the state as the geographic unit because data on suicide-related behaviors for smaller areas of aggregation are not readily available across the country and over time. An important component of the study was our examination of 3 behaviors that are precursors to suicide: suicidal ideation, suicide planning, and suicide attempts.² Understanding factors that influence these precursors may facilitate suicide prevention efforts.

Our measure of economic downturns, statewide job losses attributable to mass layoffs and closings, offers several advantages over more conventionally used measures such as unemployment rates. For example, our measure of job loss, unlike the unemployment rate, can be considered an unanticipated "shock" to a community and is therefore likely to be exogenously related to suicide-related behaviors. Research in economics has demonstrated that statewide job losses typically reflect global changes in technology and trade rather than being driven by changes in either individual or community characteristics that might

themselves be related to adolescent suicide-related behaviors.^{24–26}

In addition, a change in our measure of job loss represents an unequivocally bad piece of economic news. In contrast, the unemployment rate can change for either positive or negative reasons. For example, it can decrease because workers become discouraged and stop looking for work. This "positive" change in the unemployment rate may reflect worker discouragement rather than job growth. The reverse may also be true: as economic conditions improve, workers may decide to reenter the labor market, leading the unemployment rate to increase.

METHODS

We gathered self-reported data on adolescent suicidal ideation, suicide plans, and suicide attempts from the Youth Risk Behavior Survey (YRBS), a national school-based survey conducted biennially to monitor priority health risk behaviors among high school students. The YRBS, administered by the Centers for Disease Control and Prevention, provides nationally representative and, for states that choose to participate, state-representative estimates of high school students' health behaviors. The Centers for Disease Control and Prevention makes available state-specific data only for those states that meet the agency's criterion with respect to representativeness (an overall response rate of 60%).

We used YRBS data from 1997 through 2009 in our analysis. During that period, 45 states participated in the survey at least once, although some states chose not to include questions about suicide-related behaviors in particular years. The YRBS data are weighted to adjust for individual nonresponse and oversampling of non-Hispanic Black and Hispanic participants, as well as for the complex survey sampling design. Our sample included 403 457 adolescents who had available data on all of the independent variables of interest and who had valid weights. Half of the respondents were girls, and the average age of the sample was 16 years. Sixty-six percent of the respondents were non-Hispanic White, 16% were non-Hispanic Black, and 13% were Hispanic.

The YRBS asked adolescents 3 questions regarding suicide-related behaviors in the preceding 12 months: whether they had seriously

considered attempting suicide, whether they had made a plan about how they would attempt suicide, and how many times they had actually attempted suicide. The third question incorporated a categorical response scale, from which we created a dichotomous variable indicating at least 1 suicide attempt in the preceding 12 months. Because the YRBS was typically fielded in the first quarter of the year, the time frame assessed by the dependent variables largely refers to the prior calendar year (e.g., in the case of a student who participated in the YRBS in 1999, a majority of the preceding 12 months referenced in the questions about suicidality referred to 1998).

Data on the independent variable of interest, statewide job loss, were obtained from the Mass Layoff Statistics program of the Bureau of Labor Statistics (BLS), which reports, for each state and the District of Columbia, the number of workers who lost jobs as a result of mass closings or mass layoffs ("mass" is defined as affecting more than 50 workers). The Mass Layoff Statistics data, available since 1995, provide quarterly totals for 2 measures related to the numbers of workers experiencing job loss: total initial claimants (TICs) and separations. Although the BLS provides data on all states, the states themselves may not furnish the BLS with data in a particular quarter. In addition, both the BLS and the states maintain reporting standards that require suppression of data when sample sizes are sufficiently small.²⁷

TICs reflect the total number of workers who filed unemployment insurance claims after a mass closing or layoff. Separations are reported in an employer survey and refer to the total number of workers who lost jobs because of a mass closing or mass layoff. Employers are surveyed about the total number of workers terminated in a mass layoff or closing event after 50 workers from the same firm have filed unemployment insurance claims in a 5-week period.

We used the quarterly information to create yearly totals that aligned with the same time frame as the dependent variables by adding the first quarter of the year in which the YRBS was fielded to the final 3 quarters of the calendar year prior to the year in which the survey was fielded (e.g., the 1999 YRBS was fielded in the first quarter of that year, and the corresponding job loss total included job losses in the first quarter of 1999 and the second, third, and

fourth quarters of 1998). We calculated these yearly totals for both TICs and separations as a percentage of the state's working-age population (individuals 25–64 years of age). Previous work indicates that these measures vary substantially across states and years.²⁴

Both TICs and separations, as measures of mass job loss, include measurement error. Errors in TICs arise because not all workers who lose jobs file for unemployment, and errors in separations occur because employers may either inaccurately report the number of workers affected or fail to report entirely. Because the BLS will miss some events and may misstate the number of workers involved in other events, the total number of workers affected by mass closings or mass layoffs, as measured via either TICs or separations, will be biased away from the true number of affected workers and the number of mass closing or mass layoff events.

Use of either of these noisy measures in isolation is likely to lead to attenuation bias, whereas a composite based on the correlation between the 2 measures can increase the reliability of estimates of mass job loss.²⁸ Because the measurement error processes associated with TICs and separations are correlated but not perfectly correlated, we used a 2-stage specification process to minimize errors in the predictor variable. The purpose of this specification was to reduce measurement error; it was not our strategy for identifying the causal effects of job loss on adolescent suicide-related behaviors, which was an event-study design resting on the exogeneity of mass layoff and mass closing events.

We estimated a 2-stage maximum-likelihood probit regression model specification wherein we used TICs to predict separations and then calculated coefficients for these separations in probit models predicting a given suicide-related

behavior. Using estimated correlations of these 2 measures as our indicator of job loss provides a more precise estimate of job loss than does use of either measure in isolation²⁸ (for additional details about this analytic strategy, see Ananat et al.²⁴).

All of our models incorporated a series of demographic covariates, including the adolescent's race and ethnicity, age, and gender. They also included dichotomous indicators for state of residence and year (the results are robust to different ways of treating over-time variation, including the use of over-time linear and quadratic trends instead of year indicators). The fixed effects for state and year controlled for persistent differences between states and for any event that may have affected all states in a given year, respectively. This approach allowed our estimates to isolate the effects of job losses that were "shocks" to a state (relative to the overall economy in the country each year and relative to a county's own labor market). Likewise, our estimates isolated the effects of job loss on adolescent suicide outcomes net of both persistent differences between states and national differences between years.

In alternate model specifications, we included a set of time-varying covariates measuring other aspects of states' economic well-being. These covariates included the following: the percentage of the state population with incomes below the federal poverty line (derived from the US Census Bureau²⁹), the state unemployment rate (from the BLS³⁰), the state gross domestic product (from the Bureau of Economic Analysis³¹), and the state's home mortgage delinquency rate (from the Mortgage Bankers Association³²).

RESULTS

Table 1 displays descriptive statistics associated with suicide-related behaviors, overall

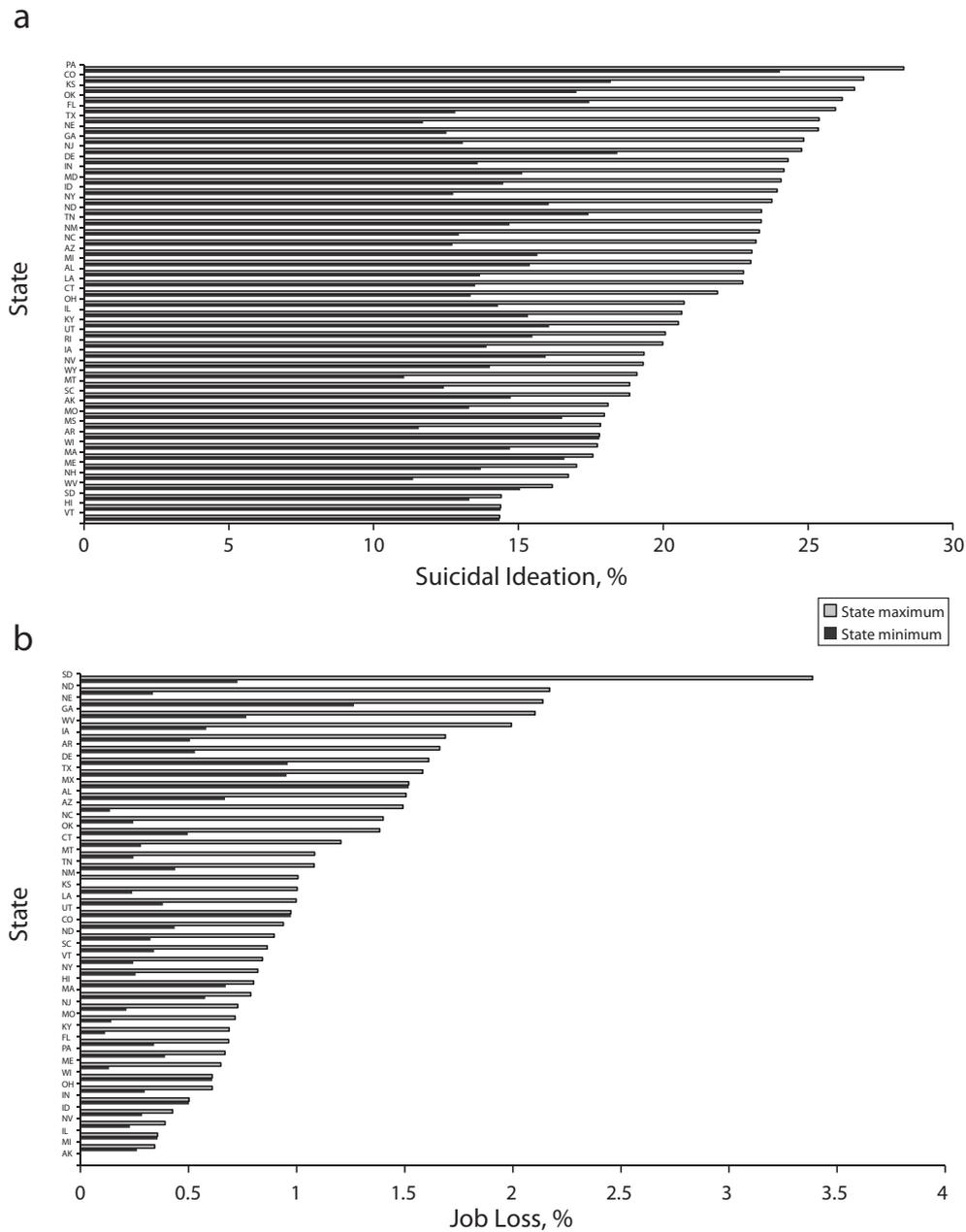
and by gender and racial/ethnic group. Consistent with previous research,² girls were more likely than boys to report suicidal thoughts, plans, and attempts. Also, Hispanics were more likely than non-Hispanic Whites and non-Hispanic Blacks to report each of the suicide-related behaviors. Considerable variation existed in suicide-related behaviors both between states and within states over time. To illustrate this variability, Figure 1a shows, for each state, minimum and maximum suicidal ideation rates from 1997 to 2009. Maximum values occurred in different years in different states, with at least 1 state experiencing a maximum in each year.

On average, across all states and years included in our study, 0.71% of a state's working-age population experienced job loss each year (as measured via separations). Across states and years, the range was 0% to 3.39%. Figure 1b shows minimum and maximum job loss rates in each state. As was the case for suicide-related outcomes, job losses varied both between states and within states over time. Although many states experienced their largest job loss rates during the Great Recession, at least 1 state experienced its maximum job loss in each year assessed.

Probit regression results for job loss and suicide-related behavior outcomes are presented in Table 2. Overall, statewide job loss was not associated with adolescent suicide-related behaviors. However, statewide job loss significantly increased girls' suicidal ideation and suicide plans. Predicted probabilities calculated for given states and years showed that job losses among 1% of the working-age population increased the probability of adolescent girls reporting suicidal ideation by 2.0 percentage points and suicide plans by 2.2 percentage points. Job loss did not affect boys' suicide-related behaviors.

TABLE 1—Percentages of Adolescents Reporting Suicide-Related Behaviors in the Preceding 12 Months: Youth Risk Behavior Survey, United States, 1997–2009

| Behavior | All Adolescents (n = 403 457), % | Girls (n = 203 619), % | Boys (n = 194 477), % | Non-Hispanic Whites (n = 225 389), % | Non-Hispanic Blacks (n = 65 413), % | Hispanics (n = 33 779), % |
|-------------------|-------------------------------------|---------------------------|--------------------------|---|--|------------------------------|
| Suicidal ideation | 16.3 | 20.3 | 12.3 | 16.4 | 13.9 | 15.6 |
| Suicide plan | 12.6 | 15.0 | 10.2 | 12.5 | 11.2 | 12.3 |
| Suicide attempt | 8.5 | 10.4 | 6.5 | 7.4 | 9.5 | 10.7 |



Note. Each state is represented by a pair of bars. The year when states experienced their minimum and maximum values varied. Data on statewide job loss from the second, third, and fourth quarters of 1996 were added to the first quarter of 1997 to get the measure of job losses that were related to the 1997 Youth Risk Behavior Survey.

FIGURE 1—Single-year minimum and maximum state-level adolescent rates of (a) suicidal ideation and (b) job loss: Youth Risk Behavior Survey, United States, 1997–2009.

Finally, comparisons according to adolescents' racial/ethnic group showed that job losses significantly increased suicidal ideation, suicide plans, and suicide attempts among non-Hispanic Black adolescents. Predicted probabilities indicated that job losses

among 1% of the working-age population increased non-Hispanic Black adolescents' self-reported suicidal ideation by 2.3 percentage points, suicide plans by 3.1 percentage points, and suicide attempts by 2.0 percentage points. Job loss did not affect

suicide-related behaviors among non-Hispanic Whites or Hispanics.

Results for the demographic covariates used in the models (not shown but available on request) were consistent with findings from past studies and our reported bivariate

TABLE 2—Probit Regression Results for Job Loss and Adolescent Suicide-Related Behaviors: Youth Risk Behavior Survey, United States, 1997–2009

| Group | Suicidal Ideation, b (95% CI) | Suicide Plan, b (95% CI) | Suicide Attempt, b (95% CI) |
|---------------------|-------------------------------|--------------------------|-----------------------------|
| All adolescents | 0.022 (-0.020, 0.063) | 0.040 (-0.001, 0.082) | 0.009 (-0.041, 0.059) |
| Girls | 0.050* (0.002, 0.098) | 0.056* (0.011, 0.100) | 0.042 (-0.016, 0.101) |
| Boys | -0.014 (-0.070, 0.042) | 0.022 (-0.035, 0.078) | -0.039 (-0.108, 0.031) |
| Non-Hispanic Whites | 0.011 (-0.042, 0.065) | 0.022 (-0.029, 0.074) | -0.021 (-0.082, 0.040) |
| Non-Hispanic Blacks | 0.107* (0.026, 0.198) | 0.127** (0.032, 0.223) | 0.133* (0.008, 0.258) |
| Hispanics | -0.003 (-0.129, 0.123) | 0.039 (-0.083, 0.161) | -0.018 (-0.198, 0.163) |

Note. CI = confidence interval.
*P < .05; **P < .01.

descriptive relationships: relative to boys, girls had an increased probability of reporting each of the suicide-related behaviors, and age was negatively related to each suicide-related behavior. Overall, Hispanics had the highest probabilities of engaging in suicide-related behaviors of any of the racial or ethnic groups.

In supplementary analyses, we included additional state-level covariates (unemployment rate, poverty rate, gross domestic product, and home mortgage delinquency rate) in the models. The covariates were moderately correlated with each other (*r*s ranged from 0.07 to 0.42). Results for girls and

non-Hispanic Black adolescents are shown in Table 3. In the case of girls, adding these measures decreased our overall power but did not alter the relationship between statewide job loss and suicide-related behaviors. Among non-Hispanic Blacks, including the additional state-level covariates actually led to a slight increase in the size of the coefficients.

DISCUSSION

The results of this study showed that statewide job losses increased the suicide-related

behaviors of adolescent girls and non-Hispanic Blacks but did not affect the suicide-related behaviors of boys, non-Hispanic Whites, or Hispanics. Job losses among 1% of a state's working-age population increased the probability of female and non-Hispanic Black adolescents reporting suicide-related behaviors by 2 to 3 percentage points.

Our results suggest that statewide job loss exacerbated preexisting gender differences in suicide-related behaviors. Girls are more likely than boys to have serious mood or anxiety disorders during adolescence,²⁰ both risk factors for suicide, and are more likely to engage in suicide-related behaviors.² We found that job losses increased girls' suicidal ideation and suicide plans but had no effect on the suicide-related behaviors of boys. Although examining the mechanisms that may lead statewide job loss to increase the suicide-related behaviors of girls but not boys was outside the scope of our study, girls may be more strongly affected than boys as a result of differences in socialization, family interactions, or peer relationships. Further research should investigate why girls are more affected by job loss than boys.

Our results also showed markedly different patterns of effects according to adolescents' race and ethnicity. Unlike the case of gender, where job losses exacerbated preexisting

TABLE 3—Probit Regression Results for Job Loss and Adolescent Suicide-Related Behaviors With the Inclusion of Additional State Economic Covariates: Youth Risk Behavior Survey, United States, 1997–2009

| Group and Variable | Suicidal Ideation, b (95% CI) | Suicide Plan, b (95% CI) | Suicide Attempt, b (95% CI) |
|--|-------------------------------|--------------------------|-----------------------------|
| Girls | | | |
| Job loss ^a | 0.046 (-0.002, 0.094) | 0.051* (0.003, 0.099) | 0.032 (-0.028, 0.093) |
| Unemployment rate | -0.011 (-0.038, 0.015) | -0.029* (-0.056, -0.001) | -0.052*** (-0.081, -0.024) |
| Percentage of state population living in poverty | 0.010* (0.000, 0.019) | 0.013* (0.002, 0.025) | 0.016* (0.003, 0.029) |
| Gross domestic product | -0.065 (-0.261, 0.130) | -0.120 (-0.318, 0.077) | -0.239 (-0.528, 0.050) |
| Mortgage delinquency rate | 0.001 (-0.005, 0.006) | 0.005 (-0.000, 0.010) | 0.010* (0.003, 0.017) |
| Non-Hispanic Blacks | | | |
| Job loss ^a | 0.138** (0.039, 0.236) | 0.137* (0.033, 0.241) | 0.153* (0.021, 0.285) |
| Unemployment rate | -0.047* (-0.093, -0.000) | -0.001 (-0.048, 0.046) | -0.058* (-0.112, -0.004) |
| Percentage of state population living in poverty | -0.009 (-0.029, 0.011) | 0.010 (-0.010, 0.030) | 0.007 (-0.021, 0.034) |
| Gross domestic product | -0.115 (-0.549, 0.319) | 0.166 (-0.336, 0.669) | 0.142 (-0.441, 0.725) |
| Mortgage delinquency rate | 0.005 (-0.005, 0.015) | 0.000 (-0.010, 0.010) | 0.016** (0.004, 0.028) |

Note. CI = confidence interval. All models adjusted for age, state of residence, and year. The models for girls also adjusted for race/ethnicity. The models for non-Hispanic Blacks also adjusted for gender.

^aAmong 1% of the working-age population.

*P < .05; **P < .01; ***P < .001.

disparities, the pattern of results by race and ethnicity showed that non-Hispanic Black adolescents were the only group affected by job loss, despite this group's lower levels of preexisting suicide-related behaviors¹⁹ and mental disorders.²⁰ Although we cannot identify why non-Hispanic Black adolescents were more likely than other groups to be affected by community-wide job loss, our results are consistent with previous work showing that local job losses disproportionately increase the use of emergency psychiatric care among Black youths.^{12,14} It is plausible that their status as an economically marginalized group—poverty rates are higher among non-Hispanic Blacks than among non-Hispanic Whites and Hispanics³³—made them particularly vulnerable. Within a given community, job losses might disproportionately affect Black workers.

Furthermore, Black adolescents typically come from families with lower levels of wealth and fewer assets with which to buffer the negative economic consequences of job loss.^{22,23} Because the YRBS did not gather information on adolescents' socioeconomic status, it was not possible to directly examine differences in suicide-related behaviors by socioeconomic status or differences in socioeconomic status by race/ethnicity.

It is unlikely that state-level job losses reflect uniform losses in all communities within a state, and thus it is unlikely that state-level job losses cause uniform changes in suicide-related behaviors across the state. Nonetheless, the relationship between losses averaged across a state and suicide-related behavior changes averaged across the state is interpretable as the aggregate effect of job losses within communities on suicide-related behaviors within communities.

Follow-up analyses increased our confidence that the association between statewide job loss and adolescent suicide-related behaviors was not attributable to other aspects of states' economic circumstances, including the unemployment rate, poverty rate, gross domestic product, or home mortgage delinquency rate. These results suggest that our measure of job loss was not simply a proxy for other aspects of a state's economic climate but instead represented a meaningful economic shock that led to changes in girls' and Black adolescents' suicide-related behaviors.

Some limitations of our study should be noted. First, we focused on job losses rather

than job gains given that behavioral economics research indicates that people generally react more strongly to losses than to gains.³⁴ Therefore, our results cannot be interpreted to mean that job additions would have effects equal and opposite to those caused by job losses. Future research on suicide among adolescents should consider whether statewide job gains decrease suicide-related behaviors in this population. Second, because the YRBS does not provide information on variables such as family income, family stress, and relationships with peers, we were unable to identify potential mechanisms through which statewide job losses affect adolescents' suicide-related behaviors. Finally, the YRBS is fielded only biennially, and thus some of the years during the time period under study were excluded from the analysis.

Because the job losses assessed in this study were likely exogenous to adolescents' suicide-related behaviors, we were able to identify a plausibly causal (rather than simply correlational) effect of statewide job loss on these behaviors. Because local economic circumstances cannot be manipulated in clinical trials but may be important in determining adolescents' suicide risk, research in which strong quasi-experimental designs are used to identify potentially causal relationships is especially valuable. Our results suggest that changes in economic contexts may serve as additional risk factors for suicide among particular groups of adolescents. Our findings may be helpful to mental health, social services, and other professionals who seek to decrease suicide among young people by providing information about the specific groups of adolescents who may be at increased risk during economic contractions. ■

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Contributors

A. Gassman-Pines led the analysis and drafted the article. All of the authors contributed to the conceptualization and design of the study, interpretation of the data, and critical revisions of the article.

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