Decomposing Neighborhood Social Processes and their Interaction Effects on the Relationship between Family Support and Adolescent Suicide Attempts

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Abstract

Maimon et al. investigated the concept of collective efficacy to explain how neighborhood effects play a role in family structure and the individual-level etiology of adolescent suicide attempts in contemporary society (Maimon, Browning, and Brooks-Gunn 2010). When operationalized in their study, collective efficacy is estimated as a composite measure of two related social processes, social cohesion and social capital. However, it is questionable whether this method is the best way to define Collective Efficacy. To test this, we create three alternative measures of collective efficacy, one based on the construct's more traditional theoretical conception (i.e., social cohesion + informal social control), and two more based on factor analyses. We then insert these three new measures of collective efficacy, along with the original, to compare their interaction effects on the Family Attachment – Suicide Attempts relationship using Logistic Hierarchical Linear Models. Taking place in 78 neighborhoods on the Southside of Chicago over the period 1994-1995, results from these models indicate that the interaction between collective efficacy and family attachment in relation to adolescent suicide attempts is fairly consistent over the four measures. Results also suggest that social capital may be a more appropriate mechanism to explain youths' suicide attempts than social control. A further analysis comparing subgroups by family structure implies that family attachment and collective efficacy may have different effects on children's suicide attempts according to number of parents in current family.

Introduction

According to Maimon et al., suicide has increased "dramatically" among adolescents living in the United States over the past fifty years (Maimon, Browning, and Brooks-Gunn 2010). Like many of the mental illnesses underlying this outcome, little is known about the specific etiology of suicide. Maimon, et al. posit that it is likely to be

a combination of individual and social factors that culminate into a suicide attempt (Maimon, Browning, and Brooks-Gunn 2010). Psychology studies have targeted individual predictors such as depression, sex, age, and substance use. Sociological investigations have examined the role of contextual factors such as social disorganization, lack of family support, and poor peer relationships. Maimon et al. bring a new approach by testing the combined role of contextual and individual – level factors on suicide attempts among adolescents living in Chicago neighborhoods (Maimon, Browning, and Brooks-Gunn 2010). Informed by Durkheim's Suicide Theory and Sampson's Theory of Collective Efficacy, Maimon and his co-authors tested the discrete and combined effects of neighborhood-level collective efficacy and individuals' perceived levels of family attachment and support. In addition to these two constructs, which were the primary foci of the study, a number of other neighborhood and individual –level variables in-line with previous work on suicide etiology were also considered in the study. Our study sought to validate and expand upon the aforementioned authors' study by teasing out what elements of collective efficacy are driving its relationship with adolescent suicide attempts, and to see if other conceptions of collective efficacy better explained the interaction effect on family attachment and support. Before delving into the methodology of how we accomplished this, we first review some background on the theoretical backing behind our study.

Background

Emile Durkheim's Suicide Theory

In his book 'Suicide,' Durkheim argued that suicide was a behavior affected by social mechanisms, and thus suicide rates were a fact best investigated through a lens of social phenomenon. Durkheim suggested different types of suicide, such as egoistic and anomic suicide. According to his explanation, egoistic suicide is a result of insufficient integration of individuals to a society (Durkheim 1897). As one loses attachment to a society, the meaning of life is solely left to the individual, which can lead to a failure in finding meaning in life. Through ecological analyses of different regions in Europe, he showed a correlation between higher suicide rates and

prevalence of Protestantism, which was then considered to provide less social integration.

In contrast, anomic suicide, he hypothesized, is caused by lack of regulatory function of a society. Values and systems of a society control desires of individuals so that people have attainable goals and therefore feel happier. Malfunction of these values and systems result in people pursuing unattainable goals, which in turn may lead to suicide (Durkheim, [1897] 1966; Jones, 1986). These assumptions were also examined in recent empirical studies. For example, Breault found that Durkheim's theory held in the United States when investigated at both state and county level by showing strong differences in suicide between Catholics and non-Catholics (Breault, 1986). Studies of Stockard and O'Brien (2002) and Baller and Richardson(2002) also supported the idea that social integration and regulation were related with suicide rates (Stockard and O'Brien, 2002; Baller and Richardson, 2002).

While these articles investigated suicide rates among groups rather than at the individual level, Maimon and Kuhl(2008) found support for Durkheim's theory, analyzing individual suicide attempts. In the study based on a sample of 6,369 youths, higher levels of social integration, especially in terms of religion, were associated with low numbers of suicide attempts. By simultaneously investigating structural and individual level variables, this study was able to demonstrate a link between the two levels. Maimon et al. (2010), the article upon which our study is based, utilized a similar multilevel approach to connect Durkheim's theory. Overall, this has been quite a rare, though much needed, approach within the field of suicide etiology research.

Theories of neighborhood social processes

The interaction effect of neighborhood-level social processes on family attachment and adolescent suicide attempts was the central finding of the Maimon et al. paper. Our paper delves even deeper into these social processes by deconstructing collective efficacy into its subcomponents and examining their respective relationships with suicide attempts. Therefore, it is essential we first outline the

basic theoretical underpinnings of each of these social constructs – collective efficacy, social cohesion, social control, and social capital.

Social capital

There are a wide range of definitions for social capital, but the main idea is that social ties yield value (Field 2008). This value accrual is facilitated by three key features of social organization: trust, networks, and norms(Morenoff, Sampson, and Raudenbush 2001). A more elaborate definition comes from Pierre Bourdieu, one of the first to develop the concept, "Social capital is the sum of resources, actual or potential, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition" (Field 2008). Robert Putnam further refined this definition by emphasizing that the networks enabling social capital rely on "a high degree of trust and shared values"(Field 2008). Thus, social capital arises from "the structure of social organization", and is intimately linked to the other neighborhood social processes central to our study. In particular, social cohesion is dependent upon the mutual trust element of social capital, and informal social control depends upon the social norms component.

Social Cohesion

Social cohesion "refers to the extent of connectedness and solidarity among groups in society" (Berkman and Kawachi 2000). That is, in addition to the presence of mutual trust and reciprocity (social capital), social cohesion includes the "absence of latent social conflict – whether in the form of income/wealth inequality; racial/ethnic tensions; disparities in political participation; or other forms of polarizations…" (Berkman and Kawachi 2000). Social cohesion, thus, emphasizes a further step from mutual trust to solidarity – i.e., "a shared sense of morality and common purpose"(Forrest and Kearns 2001).

Informal Social Control

Again extending on a subcomponent of social capital, informal social control is strongly based on the idea of norms. Norms combined with willingness for action in support of community norms captures the key elements of informal social control. "According to Sampson, a community oriented approach to informal social control rests on the assumption that the only truly effective means of maintaining public norms is by neighbors assuming responsibility for one another" (Silver and Miller 2004). In neighborhoods with high levels of social control residents feel they have control over their environment (Morenoff, Sampson, and Raudenbush 2001).

Collective Efficacy

Collective Efficacy is traditionally described as a blending of social cohesion (mutual trust and solidarity) and informal social control ("expectations and willingness for action"). For example, Robert Sampson defines neighborhood collective efficacy as the "linkage of trust and cohesion with shared expectations for control" (R. J. Sampson 1997). Cagney describes collective efficacy as "the ability of the community to come together for the common good"(Cagney et al. 2009). The key idea being that cohesion among individuals combined with shared expectations for the social control of public space leads to collective action to assure these desired goals. However, Maimon et al. took a slightly different approach by combining social cohesion with social capital to define collective efficacy. This was likely due to social capital's relationship to intergenerational support and the fact that the study focused on a population of adolescents (aged 12 to 16). In any event, it is certainly worth finding out which conception of collective efficacy best relates to the data at hand.

Research Design

Data

Data used in this study come from The Project on Human Development in Chicago Neighborhoods (PHDCN), directed by the Harvard School of Public Health. According to the project's authors, the PHDCN is a "large-scale, interdisciplinary study of how families, schools, and neighborhoods affect child and adolescent

development. It was designed to advance the understanding of the developmental pathways of both positive and negative human social behaviors. At the same time, the project also provided a detailed look at the environments in which these social behaviors take place by collecting substantial amounts of data about urban Chicago, including its people, institutions, and resources" (Earls et al. 1995). In the spirit of the PHDCN's mission of exploring both social and individual, our study makes use of both major components of the PHDCN – the Community Survey and Longitudinal Cohort Surveys. Both surveys utilized stratified random sampling of 343 clusters of census tracts – referred to as "neighborhood clusters" by the study authors. The Community Survey was administered to 8,218 residents in 1994 to those aged 18 and older, with questionnaires designed to unveil resident perceptions on a range of facets concerning their neighborhood. In particular, questions targeted "the social, economic, organizational, political, and cultural" features of neighborhoods (Earls et al. 1995).

The second component, the Longitudinal Cohort Surveys, "was a series of coordinated, longitudinal studies that followed over 6,000 randomly selected children, adolescents, and young adults over time to examine the changing circumstances of their lives, as well as the personal characteristics, that might lead them toward or away from a variety of antisocial behaviors" (Earls et al. 1995). For our study, we used the first wave of the Longitudinal Cohort Survey (LCS) for all predictor variables. The second wave was used for the outcome variable, adolescent suicide attempts. Participants were divided into cohorts, according to their age at the start of Wave 1 of the LCS. We included only those from the 12 and 15 -year-old age cohorts.

Neighborhood Variables

Neighborhood-level variables used in this study are based on previous work by Maimon and Earles – which are in turn grounded in Sampson's' theoretical framework of social disorganization theories (Earls et al. 1995; Maimon, Browning, and Brooks-Gunn 2010; Robert J Sampson and Raudenbush 2012). As discussed in the Background, collective efficacy is traditionally composed of social cohesion and

informal social control, but may also (as was done by Maimon et al.) be made up of social cohesion and social capital. Social Cohesion is composed of five questions trying to get at residents' perceptions of mutual trust and reciprocity. For example, "people in this neighborhood can be trusted" and "people around here are willing to help their neighbors". Informal Social Control asks questions such as "people in the neighborhood would scold a child if the child showed disrespect to an adult". Such questions tried to get at an underlying sentiment that individuals' fellow residents are willing to execute actions in order to support social norms. Social capital, the value obtained from norms, networks, and resources, was primarily focused on the potential value acquired by children and adolescents in the Community Survey utilized in our study. As such, the types of questions asked were "parents in neighborhood know their children's friends", and "there are adults in this neighborhood that children can look up to". The complete set of questions asked for each of these three neighborhood social measures is given in Table 1. All survey questions are based on the following five-level response profile: "Strongly Agree", "Agree", "Neither Agree nor Disagree", "Disagree", or "Strongly Disagree". Before incorporating these neighborhood variables into our analyses we scaled each individual question such that each had a mean of 0 and standard deviation of 1. Survey questions were then averaged together to form a single composite measure for each of these three social processes.

We define four total collective efficacy measures in our study, Collective Efficacy 1, Collective Efficacy 2, Collective Efficacy FA1, and Collective Efficacy FA2. Each is some form of composite measure comprised of the questions underlying social cohesion, social capital, and informal social control. Collective Efficacy 1 is an average of the Social Cohesion and Social Capital measures described above. This measure was used to replicate the work of Maimon et al., and as a baseline for our extended analyses. Collective Efficacy 2 is an average of Social Cohesion and Informal Social Control – in-line with the more traditional theoretical approach to defining collective efficacy. Collective Efficacy FA1 is a combinatorial metric stemming from the factor analysis that we ran on items from social cohesion and social capital questions. Similarly, Collective Efficacy FA2 is a summary measure

from our factor analysis that included social cohesion and informal social control items.

Our models also controlled for neighborhood-level measures of concentrated poverty, and immigrant concentration. The Concentrated Poverty variable is defined as "the first principal component of the percentage of residents below the poverty line, receiving public assistance, unemployed, and households headed by a female" (Maimon, Browning, and Brooks-Gunn 2010). Immigrant concentration represents the percentage of residents within a given neighborhood that identify as Latino or are foreign born.

Individual Predictor Variables

Our main predictor of adolescent suicide attempts is Family Attachment and Support (Family Attachment). This variable captured adolescents' perception of whether their family provides them with adequate emotional and social support. In particular, family attachment and support is an average of the scaled responses to six items such as "I know my family will always be there for me" and "my family tell me they think I am valuable" (Earls et al. 1995; Maimon, Browning, and Brooks-Gunn 2010).

In addition to the primary predictor, Family Attachment, we also controlled for a number of individual-level covariates that were hypothesized by Durkheim and others to influence the probability of suicide attempts (Maimon, Browning, and Brooks-Gunn 2010). Variables included physical features (e.g., age, sex, race, and ethnicity), characteristics of family and household (e.g., number of siblings, number of parents in home, and mother's education), and measures related to one's mental health status (e.g., depression, emotionality, impulsivity, and sociability). The complete list of covariates and their precise descriptions are given in Table 2.

Outcome Variable: Adolescent Suicide Attempts

Our outcome variable, Adolescent Suicide Attempts, comes from respondents' responses on the second wave of the Longitudinal Cohorts Study to the question "Have you ever attempted suicide?" (Earls et al. 1995; Maimon, Browning,

and Brooks-Gunn 2010). 4.3% of the 1,052 respondents we included in our study responded, "Yes" to this question, whereas the other 96.7% responded otherwise.

Analytical Framework

Before fitting statistical models we explored the robustness of the variables used to describe neighborhood social processes. In particular, we evaluated the validity of collective efficacy and other measures of neighborhood social processes by calculating their correlation to a separate, independently-derived measure of the neighborhood environment, neighborhood SES acquired through the 2000 Census (Cagney et al. 2009). We then evaluated and maximized robustness of collective efficacy by undergoing a factor analysis. After examining reliability and validity, and creating two new collective efficacy variables from the factor analysis, we commenced with estimating statistical models. First we examine the relationship between family attachment and support on adolescent suicide attempts, while controlling for a number of resident and neighborhood –level variables of possible relation to suicide etiology. Then we evaluate the modification of this individual-level association between family attachment and suicide attempts by the community-level variable, collective efficacy. We repeated the previous model with our three other Collective Efficacy variables.

Factor Analysis

Since factor analysis is a widely used technique to merge correlated variables into a reduced number of variables, we use factor analysis outcomes as alternative measures of 'collective efficacy' to test consistency across different measures. The PHDCN community survey has five questions each to measure social cohesion, social control, and social capital. Although theoretically collective efficacy is a joint mechanism of social cohesion and social control, Maimon et al. (2010) constructed collective efficacy scale through combining social cohesion and social capital. Therefore we test both combinations: 1) social cohesion and social control and 2) social cohesion and social capital. Through factor analysis, we merge these two pairs

into two new variables. As same as all other variables, all four Collective Efficacy variables are grand mean centered before being used in any models.

Statistical Models

Following the methods of Maimon et al., we use logistic hierarchical linear modeling for all models in our study. As discussed by Maimon et al. and many others, hierarchical linear models yield unbiased estimates and accurate standard errors in multilevel settings. In such clustered settings where the data takes on a multi-level structure, outcome observations are often correlated and variance is usually heteroscedastic. Our study calls for models such as these based on both quantitative and substantive grounds as we wish to be protected from biased standard errors, and our theoretical framework is based on understanding cross-level relationships, while controlling for both individual and neighborhood –level covariates. The general form of the logistic regression setup is $Y \sim Bernoulli\ (\pi_i)$, where $\pi_i = \frac{1}{1+e^{-X\beta}}$. This was extended to the multilevel context by specifying a model for each level. Level 1 relates individual-level covariates to the log odds of a suicide attempt, and level-2 macro model relates a measure of neighborhood social process (NSP) to level-1 parameters. Merging these two sub models yields our study's combined model: $\log\left(\frac{SuicAttmpt_{ij}}{1-SuicAttmpt_{ij}}\right) = \beta_0 + \beta_1 FamAttach_{ij} + \beta_q X_{qij} + \beta_2 NSP_j + \beta_{qn} X_{qnj} + \beta_3 NSP * FamAttach_{ij} + \mu_{0j} + \mu_{1j} + \varepsilon_{oij}$. In this combined setup, β_1 is the main effect of interest to the study, estimating the effect of Family Attachment and Support on suicide attempts. B_3 is the main interaction effect of interest, representing the modification of the Family Attachment – Suicide Attempts relationship by NSP (Neighborhood Social Process). We use NSP to represent each of the neighborhood social processes (e.g., collective efficacy and social cohesion) explored in our study. B_2 denotes their independent effect on adolescent suicide attempts, which was also examined for every NSP, but was not of primary interest in this study. Each NSP was iteratively input to the above model and evaluated for the presence of an interaction effect. X_q and X_{qn} represent vectors of individual and neighborhood –level covariates, respectively. The last three terms represent

neighborhood and individual –level residuals. In particular, μ_0 denotes between-neighborhood variation in intercepts, μ_1 refers to between-neighborhood variation in slopes, and ε_{0ij} captures the within-neighborhood, between-individual variance. The structure of the above model also assumes constant variance between residents, within neighborhoods – that is, individual- level homoscedasticity is assumed.

Results: Replication & Beyond

Overview of Replication Results

Our sample of 1,052 adolescents, living within 78 neighborhood clusters, was 51% females, 44% Hispanic, 37% Black, and had a mean age of 13.5 years old. About half (54%) lived in two-parent households, while half did not. Most respondents' mothers had a high school diploma or more (57%). The average length of residence in one's current household was close to 7 years. Of all the households within the 78 neighborhoods in which the 1,052 young residents lived, nearly 20% were below the poverty line and slightly over 20% were occupied by foreign-born individuals.

Supporting the work of Maimon et al. and others, results from our multilevel logistic regression analyses found that probabilities of suicide attempts were greatest among adolescents who were older, female, Black, and Latino. These results were consistent across models that controlled for a number of other factors, including measures of mental health, substance use, factors related to household/family structure, and neighborhood contextual features. For example, females had around a 4 times greater odds of attempting suicide compared to males, while holding everything else in the models constant. Again holding other variables constant, and while controlling for neighborhood clustering, the odds of attempted suicide ranged from around 4 to 6 times greater odds in Black adolescents compared to non-Black adolescents. Further results for specific modeling setups and additional groups are presented in the first few tables of Appendix A.

Depression was strongly associated with an increased probability of attempted suicide across every model that included mental health measures. Impulsivity was associated with an increased risk in some models, but not others.

On the other hand, family attachment and support was strongly associated with a decreased probability of adolescent suicide attempts.

Family Attachment and Support was found to be strongly protective of adolescent suicide attempts in all models. In particular, a one-unit increase on the Family Attachment and Support scale was associated with a reduced probability of suicide attempts by over 40%, in all models including this variable. This result is consistent with that of Maimon et al. who reported a protective effect of around 35% for the same variable (Maimon, Browning, and Brooks-Gunn 2010). Again mirroring the results of Maimon et al., collective efficacy was not itself significant in any models, but did have a consistent, significant interaction effect of the Family Attachment and Support – Suicide Attempts relationship. The parameter estimate of -1.6 indicates a sizable interaction, such that as neighborhood Collective Efficacy increases, the protective effect of individual Family Attachment and Support also increases in magnitude. This issue will be further explored in the presentation of our results from additional interaction effects models.

Validity

Information on psychometric validity for measures of neighborhood social processes is presented in Table 5 and Figure 1. As discussed in the Analytical Design, we utilized correlations of neighborhood social process measures to an externally derived measure of neighborhood SES in order to gauge some degree of validity among our neighborhood social process variables. From Table 5, we can see that, as hypothesized, a moderate, negative association is observed between Census-derived SES and the variables we used to capture the underlying social constructs of Social Cohesion, Social Capital, Informal Social Control, and Collective Efficacy (however defined). From Figure 1, we can further see that this relationship is consistent throughout most values, though somewhat tapering off beyond a neighborhood SES of 50. In summary, these results provide evidence of construct validity for our social processes measures.

Interaction Effects from Factor Analysis-derived Measures of Collective Efficacy

To evaluate and maximize the reliability of our key measures of neighborhood social processes, we conducted a factor analysis. The relationships among suicide attempts, family attachment, and collective efficacy measures based on factor analysis remain by and large consistent with the models that used other measurement techniques. In the analysis including the factor analysis outcome from social cohesion and social control questionnaires, family attachment is negatively associated with suicide attempts ($p<0.05$). Collective efficacy measure itself is not significant, while the interaction between collective efficacy and family attachment is significant in the negative direction ($p<0.05$). This is in line with the result of the original article that interaction with collective efficacy makes non-trivial differences in the influence of family attachment on the probability of suicide attempts. The next model which includes the factor analysis outcome from social cohesion and social control questionnaires also exhibits similar results. The differences in this model are that collective efficacy measure itself is significant at the 0.05 level and the level of significance of the interaction decreases to the 0.1 level. Within neighborhoods with higher collective efficacy, increase of family attachment is likely to have more effects in decrease of probability of suicide attempts.

Roles of Family Structure

For each group, a logit model without neighborhood level variables and a full multilevel model including the interaction between family attachment and collective efficacy are tested. (footnote: collective efficacy 1 variable) In both logit and multilevel model for the group with two parents, family attachment remains significant, although the level of significance changes from 0.05 to 0.1. Collective efficacy and interaction are not significant. In contrast, family attachment is not significant in either model of the group where one or more parents are absent. Instead, collective efficacy appears to have significant relationship with suicide attempts at the 0.1 level.

Discussion

This research re-examines and expands upon the findings of Maimon, Browning, and Brooks-Gunn(2010) regarding the relationship between adolescent suicide attempts and family and neighborhood level mechanisms that may prevent youths from such deviant behaviors. Following the original article, we base our study on Durkheim's theory of suicide and a stream of research that has focused on social mechanisms affecting suicide. In particular, we pay attention to potential gaps between the concept of 'collective efficacy' and operational measurement of this concept.

Overall consistency among different measures of collective efficacy

The original article constructed the scale of collective efficacy through three-level rating scale analysis, which involved multilevel estimation. Comparing the results drawn from this original scale of collective efficacy with four alternative measures, we find that the interaction between collective efficacy and family attachment is by and large consistent across the models, although the model that uses collective efficacy 2 (a standardized average of social cohesion and social control questionnaires) is an exception. This finding is in line with previous studies that found collective efficacy has effects to some extent on individual level behaviors even in rather private area (Browning 2002; Browning et al. 2005). More specifically, this provides evidence supporting the hypothesis that neighborhood-level effects are linked with suicidal behaviors through interaction with family level characteristics.

Social capital vs social control

However, the result implies that it may be social capital that has more explanatory power about adolescent suicide attempts rather than social control, even though it is the latter which is theorized to comprise collective efficacy. Models that used Collective Efficacy 2(the merged scale of social cohesion and social control) were not statistically significant in either case - itself or interaction with family attachment. On the other hand, Collective Efficacy 1 (the scale incorporating social capital) shows significant interaction with family attachment and thus is linked to suicide attempts. The comparison of the two models with factor analysis

outcomes also suggests more explanatory power of social capital. Collective Efficacy FA1 (the factor outcome drawn from social cohesion and social capital) itself is significant as well as its interaction with family attachment, while Collective Efficacy FA2 is only significant in the interaction term. Although there is a recent trend that emphasizes 'expectations of action,' which is the fine line that distinguishes social control from social capital (Portes and Sensenbrenner 1993; Sampson 2012), our finding suggests that social capital may be a more appropriate concept to explain prevention of suicide attempts. Otherwise, the result may indicate that the two concepts are not really distinguishable from each other.

Implication from family structure analysis

The last analysis which compares two groups based on family structure implies differences in the way family and neighborhood level effects are linked to suicide attempts. The finding that family attachment is a significant variable only for those from families with two parents may be explained by higher capacity of 'indirect control' in those families with two parents. (Hirschi 1969) In other words, the children from families where one or more parents are absent may have difficulties in getting enough actual supports from parents and family that reduce suicidal behaviors, although they express abstract feeling of attachment to family in their survey responses. In contrast, for these children, neighborhood level effects may compensate the lack of supports from family to some degree, as collective efficacy itself exhibits significant negative association with suicide attempts. Although this implication is yet to be confirmed, potential dynamic mechanisms among family structure, neighborhood effects, and suicide behavior are worth to be explored further.

Conclusion

While we were able to achieve statistically significant interaction effects with both configurations of collective efficacy using factor analysis, the form with the strongest and most consistent effect was that of social cohesion combined with social capital. Further, we extended on the findings of Maimon et al. by revealing that it is really social capital that is driving the interaction effect of collective

efficacy. Thus, there must be something about social capital that the other neighborhood social processes don't posses, that makes is useful for further strengthening the protective effect of family attachment and support on the probability of adolescent suicide attempts. It could be an "expectation of action", or maybe the role of networks that makes social capital an important modifier of the family attachment – suicide relationship. However, the reality is that these concepts are very complicated and much bigger than any measure that can be derived from five simple questions. Therefore, we recommend future studies continue to take a multilevel approach to the investigation of suicide etiology, and in particular, that more attention is given to the precise ways in which social capital plays a role in this. Nonetheless, we think one thing is clear from our study – i.e., that neighborhood social processes, as Durkheim suggested, are a critical feature in the pathology of suicide.

Tables & Figures

Table 1. Adolescents' Suicide Attempts Regressed on Individual- and Neighborhood-level Predictors and Different Measures of Collective Efficacy

	Model 1 (n=990) Collective Efficacy estimated By Maimon et al. (2010)		**Model 2** (n=1052) Collective Efficacy 1 Standardized Average of Social Cohesion and Capital		**Model** 3 (n=1052) Collective Efficacy 2 Standardized Average of Social Cohesion and Control	
	Coefficient (SE)	**Odds Ratio**	**Coefficient (SE)**	**Odds Ratio**	**Coefficient (SE)**	**Odds Ratio**
Intercept	-4.11*** (0.300)	0.16	-4.3084***(0.3099)	0.01	-4.2700***(0.3045)	0.01
Female	1.30**(0.392)	3.67	1.5336**(0.4724)	4.64	1.5483**(0.4716)	4.70
Age	0.428**(0.135)	1.53	0.4005**(0.1390)	1.49	0.3968**(0.1387)	1.49
Black	1.70*(0.841)	5.49	0.8018(0.5732)	2.23	0.7433(0.5703)	2.10
Latino	1.24*(0.488)	3.45	1.2085*(0.5714)	3.35	1.1676*(0.5623)	3.21
Two-parent household	0.183(0.323)	1.20	0.0207(0.3738)	1.02	0.0355(0.3724)	1.04
Mother's education	0.219*(0.125)	1.24	0.1572(0.1483)	1.17	0.1442(0.1480)	1.16
Number of Siblings	-0.080(0.105)	0.923	-0.1388(0.1296)	0.87	-0.1379(0.1290)	0.87
Length of family residence	-0.070*(0.036)	0.932	-0.0282(0.0312)	0.97	-0.0330(0.0310)	0.97
Depression	0.133***(0.030)	1.14	0.1394***(0.0312)	1.15	0.1350***(0.1817)	1.14
Emotionality	-0.000(0.149)	0.999	-0.0028(0.1823)	1.00	-0.0272(0.3105)	0.97
Impulsivity	-0.179(0.324)	0.836	0.0051(0.3129)	1.01	0.0310(0.2092)	1.03
Sociability	-0.079(0.205)	0.923	-0.0898(0.2087)	0.91	-0.0748(0.1837)	0.93
Substance abuse	0.205(0.204)	1.23	0.2072(0.1851)	1.23	0.1952(0.1837)	1.22
Exposure to suicidal behavior	0.076(0.446)	1.08	0.1381(0.4939)	1.15	0.1528(0.4925)	1.17
Family attachment and support	-0.439*(0.171)	0.644	-0.5222*(0.2474)	0.59	-0.5354(0.2471)	0.59
Neighborhood level measures						
Concentrated Poverty	-0.192(0.247)	0.824	-0.0132(0.0163)	1.23	-0.0159(0.0191)	0.98
Immigrant concentration	0.032(0.284)	1.03	-0.0359*(0.0179)	0.96	-0.0351(0.0179)	0.97
Residential stability	-0.093(0.212)	0.910	-	-	-	-
Collective efficacy	0.005(0.165)	1.00	-1.8443(1.1986)	0.99	-1.5149(1.3575)	0.22
Collective efficacy x Family attachment and support	-0.186*(0.100)	0.829	-1.6082^{+}(0.9405)	0.96	-0.9361(1.0099)	0.39

Table 2. Factor Loading Table

Factor Analysis of Social Cohesion and Social Capital Scales			**Factor Analysis of Social Cohesion and Social Control Scales**		
Mechanism	**Questionnaire**	**Loading**	**Mechanism**	**Questionnaire**	**Loading**
Social Cohesion	Q11B This is a close-knit neighborhood	0.6739125	Social Cohesion	Q11B This is a close-knit neighborhood	0.6275705
	Q11E People are willing to help neighbors	0.7517748		Q11E People are willing to help neighbors	0.6288591
	Q11F (Reverse coded) People don't get along	0.4498603		Q11F (Reverse coded) People don't get along	0.4070671
	Q11K (Reverse coded) People in neighborhood do not share same values	0.4227025		Q11K (Reverse coded) People in neighborhood do not share same values	0.4012417
	Q11M People in neighborhood can be trusted	0.6878954		Q11M People in neighborhood can be trusted	0.6449188
Social Capital	Q11D Children look up to adults in neighborhoods	0.6532886	Social Control	Q12A Neighbors do sth: kids skipping school	0.7182379
	Q11G Adult watch out for children	0.7205105		Q12B Neighbors do sth: kids defacing building	0.7474613
	Q11N Parents know their children's friends	0.6285088		Q12C Neighbors scold child not showing respect	0.6539070
	Q11P Adults know who local children are	0.5652597		Q12E Neighbors break up fight in front of house	0.6333892
	Q11T Parents generally know each other	0.6073662		Q12F Neighbors organize keep local fire station	0.5782728

Table 3. Adolescents' Suicide Attempts Regressed on Individual- and Neighborhood-level Predictors and Collective Efficacy Estimated by Factor Analysis

	Model 4 (n=999) Collective Efficacy FA1 Factor Analysis of Social Cohesion and Capital			**Model 5** (n=999) Collective Efficacy FA2 Factor Analysis of Social Cohesion and Control		
	Coefficient	**SE**	**Odds Ratio**	**Coefficient**	**SE**	**Odds Ratio**
Intercept	-4.3321***	0.3238	0.01	-4.2819***	0.3155	0.01
Female	1.4996**	0.4770	4.48	1.4637**	0.4761	4.32
Age	0.3868**	0.1413	1.47	0.3990**	0.1417	1.49
Black	0.7072	0.5912	2.03	0.7632	0.5857	2.15
Hispanic	1.2631*	0.5769	3.54	1.3269*	0.5770	3.77
Two-parent household	0.1437	0.3841	1.15	0.1326	0.3863	1.14
Mother's education	0.1217	0.1516	1.13	0.1282	0.1520	1.14
Number of Siblings	-0.1916	0.1342	0.83	-0.1705	0.1350	0.84
Length of family residence	-0.0579	0.0365	0.94	-0.0585	0.0360	0.94
Depression	0.1307***	0.0318	1.14	0.1331***	0.0318	1.14
Emotionality	-0.1028	0.1870	0.90	-0.0916	0.1853	0.91
Impulsivity	0.1527	0.3154	1.16	0.1474	0.3180	1.16
Sociability	-0.0863	0.2139	0.92	-0.0851	0.2145	0.92
Substance abuse	0.1948	0.1929	1.22	0.1735	0.1902	1.19
Exposure to suicidal behavior	-0.0693	0.5229	0.93	-0.0726	0.5231	0.93
Family attachment and support	-0.5837*	0.2520	0.56	-0.5377*	0.2514	0.58
Neighborhood level measures						
Concentrated Poverty	-0.0032	0.0141	1.00	-0.0023	0.0142	1.00
Immigrant concentration	-0.0407*	0.0183	0.96	-0.0359^{+}	0.0184	0.96
Collective efficacy	-1.4258*	0.6580	0.24	-0.7566	0.5066	0.47
Collective efficacy x Family attachment and support	-1.2434^{+}	0.6580	0.29	-1.0189*	0.4824	0.36

Table 4. Adolescents' Suicide Attempts Regressed on Individual- and Neighborhood-level Predictors: Subset by Family Structure

	Model 6 (n=571) Logit, Two Parent Family			**Model 7** (n=571) Multilevel, Two Parent Family			**Model 8** (n=481) Logit, Non-Two Parent Family			**Model 9** (n=481) Multilevel, Non-Two Parent Family		
	Coefficient	**SE**	**Odds Ratio**	**Coefficient**	**SE**	**Odds Ratio**	**Coefficient**	**SE**	**Odds Ratio**	**Coeff**	**SE**	**Odds Ratio**
Intercept	-4.0292***	0.3807	0.02	-4.1551***	0.4062	0.02	-4.6218***	0.5519	0.01	-6.1471***	1.4162	0.00
Female	1.3925*	0.6673	4.02	1.3599*	0.6728	3.90	1.5992*	0.6675	4.95	1.9493*	0.7928	7.02
Age	0.2634	0.1719	1.30	0.2632	0.1748	1.30	0.6370*	0.2548	1.89	0.7026*	0.2997	2.02
Black	1.4814*	0.7346	4.40	1.4134	0.9010	4.11	0.6331	0.8218	1.88	0.0534	1.0779	1.05
Hispanic	1.0142	0.7025	2.76	1.5927*	0.8088	4.92	0.4579	0.8503	1.58	0.7508	1.1035	2.12
Mother's education	0.1702	0.1997	1.19	0.1490	0.2037	1.16	0.2320	0.2256	1.26	0.2783	0.2738	1.32
Number of Siblings	-0.2326	0.1958	0.79	-0.1934	0.1989	0.82	-0.0740	0.1757	0.93	-0.1464	0.2291	0.86
Length of family residence	-0.0441	0.0482	0.96	-0.0354	0.0507	0.97	-0.0226	0.0414	0.98	0.0064	0.0517	1.01
Depression	0.1346**	0.0465	1.14	0.1482**	0.0483	1.16	0.1592***	0.0440	1.17	0.2093**	0.0665	1.23
Emotionality	-0.1485	0.2651	0.86	-0.0948	0.2793	0.91	0.1381	0.2796	1.15	0.1012	0.3325	1.11
Impulsivity	0.1510	0.4436	1.16	0.0560	0.4614	1.06	0.0776	0.4683	1.08	0.1075	0.5689	1.11
Sociability	-0.0915	0.2894	0.91	-0.1049	0.2902	0.90	0.0328	0.3268	1.03	-0.0894	0.3950	0.91
Substance abuse	-0.1506	0.3117	0.86	-0.2449	0.3275	0.78	0.3624	0.2403	1.44	0.6555^{+}	0.3733	1.93
Exposure to suicidal behavior	-0.5600	0.8738	0.57	-0.3353	0.8927	0.72	0.4200	0.6633	1.52	0.2281	0.8298	1.26
Family attachment and support	-0.8150*	0.3594	0.44	-0.6924^{+}	0.3722	0.50	-0.3945	0.3544	0.67	-0.7562	0.6789	0.47
Neighborhood level measures												
Concentrated Poverty	-	-	-	-0.0087	0.0239	0.99	-	-	-	-0.0260	0.0337	0.97
Immigrant concentration	-	-	-	-0.0309	0.0256	0.97	-	-	-	-0.0637	0.0442	0.94
Collective efficacy	-	-	-	-0.3385	1.6948	0.71	-	-	-	-5.3570^{+}	3.0996	0.00
Collective efficacy x Family attachment	-	-	-	-1.6692	1.3764	0.19	-	-	-	-3.4324	2.1678	0.03

Table 5. Validation of Neighborhood Social Process Measures through Correlations with Externally-measured Neighborhood SES

Neighborhood Social Process	Correlation
Collective Efficacy	-0.4572552
Collective Efficacy2	-0.6126144
Social Cohesion	-0.5567167
Social Capital	-0.3183469
Social Control	-0.584908

Figure 1. Correlation of Collective Efficacy with Independently derived measure of Neighborhood SES

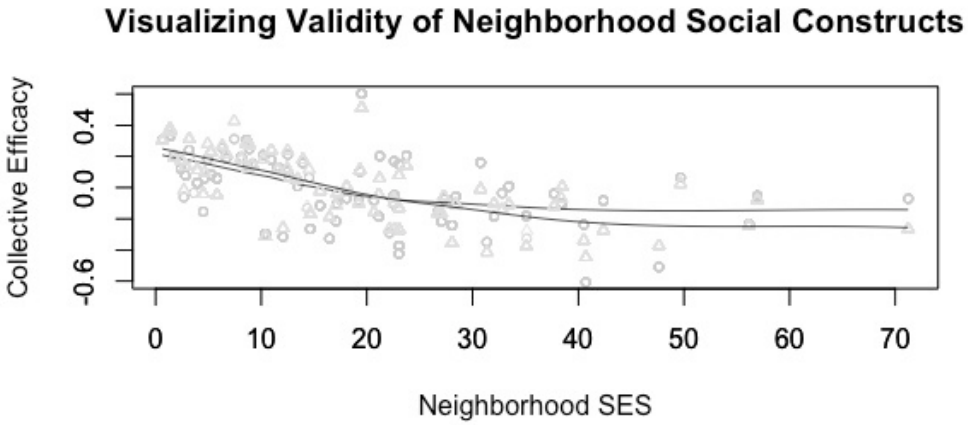
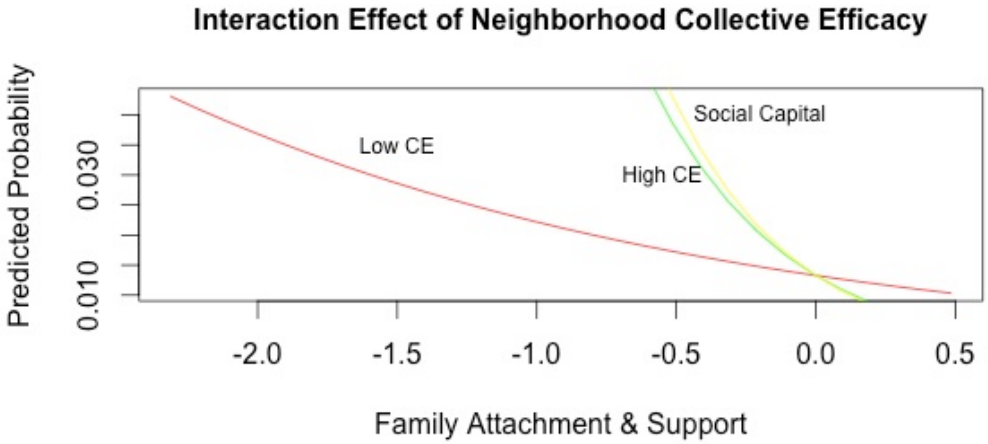


Figure 2. Visual display of Interaction Effects



Appendix A. Replication of Results obtained by Maimon et al.

Table 1. Definitions, Means and Standard Deviation of Measure Included in Analysis (N=1039)

Variable	Definition	Mean	SD
Individual-level measures			
Female	Dummy variable indicating respondent is female (l = female)	0.51	0.50
Age	Measures respondent's age (in years) at the time of the initial in-home survey (wave l)	13.50	1.52
Hispanic	Dummy variable indicating respondent is of Hispanic descent (l = Hispanic)	0.44	0.37
Black	Dummy variable indicating respondent is of African American descent (l = black)	0.37	0.48
Two-parent household	Dummy variable indicating whether respondent lives with two married parents (l = lives with two married parents)	0.54	0.50
Mother's education	Indicates the respondent's mother's highest education (less than high school = l ; some high school = 2; finished high school = 3, more than high school = 4, bachelor's degree or more = 5)	2.79	1.35
Number of siblings	Indicates the number of siblings under age 19 living within the same household	2.12	1.62
Length of family residence	Continuous measure indicating respondent's length of residence with family (in years) at current address	6.87	7.40
Depression	A 16-item scale measuring the extent of respondent's depressive behaviors based on the widely used Child Behavior Check list (Achenbach 1991). Respondents were asked for their level of agreement with statements such as, "I feel lonely"; "I am too fearful or anxious"; "I feel worthless or inferior"; "I cry a lot"; "I feel that no one loves me"; and, "I feel depressed." Response score ranges from 0 (not true) to 2 (very or often true). This scale is the sum of item responses.	6.03	4.63
Emotionality	A five-item scale measuring the respondent's level of emotionality (Buss and Plomin 1984). Using a score ranging from l (uncharacteristic) to 5 (characteristic), respondents' parents were asked to indicate how statements such as, "often fusses and cries"; "tends to be somewhat emotional"; and, "sometimes does crazy things to be different" characterize their child's behaviors. The scale is the average of item responses.	2.70	1.08
Impulsivity	This 20-item scale taps individual predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions (Buss and Plomin 1984). Respondents' parents were asked to indicate how statements such as, "often acts on spur of the moment"; "seeks new and exciting	2.65	0.61

	experiences"; and "tends to hop from one interest to another" characterize their child's behaviors. Scores for this scale range from I to 5. The scale is the average of item responses.		
Sociability	This measure is the mean of a nine-item scale capturing the extent of respondent's social inclinations and skills (Buss and Plomin 1984). Respondents' parents were asked to indicate how statements such as, "likes to be with people" and "makes friends easily" characterize their child. Responses range from I (uncharacteristic) to 5 (characteristic). The scale is the average of item responses.	3.65	0.79
Substance abuse	This measure taps respondents' dependence on alcohol and drugs. Respondents were asked to report if they smoked cigarettes, got drunk, and smoked marijuana during the last 12 months. Response categories are dichotomous (0 = no; I = yes). This scale is the sum of these three items.	0.57	0.91
Exposure to suicidal behaviors (w2)	A dichotomous variable indicating whether any of the respondent's family members or friends have ever attempted suicide (I =affirmative response; 0 otherwise).	0.09	0.29
Family attachment and support	Measures the extent to which respondents' family members provide .00 1.00 and support emotional and social support (Browning et al 2005). This six-item scale is composed of the following items: "I know my family will always be there for me"; "sometimes I'm not sure I can rely on family" (reverse-coded); "my family tell me they think I am valuable"; "my family has confidence in me"; "my family helps me find solutions to problems"; and, "I know family will always stand by me." Response scores are I (not true), 2 (somewhat true), and 3 (very true). The scale is a standardized average of the item responses.	0.01	0.61
Neighborhood measures			
Concentrated poverty	This measure is the first principal component of the percentages -.02 .91 poverty of residents below the poverty line, receiving public assistance, unemployed, and households headed by a female (Sampson et al. 1997).	19.62	14.51
Immigrant concentration	This measure is composed of the percentages of Latino and foreign- .36 1.04 concentration born individuals living within the neighborhood (Sampson et al. 1997).	20.60	15.10
Residential stability	This measure is composed of the percentages of residents living in the -.25 .99 same house as in 1985 and the housing occupied by owners (Sampson et al I997).	0.20	0.14
Collective efficacy	See the method and data section.	0.00	0.22

Table 2. Adolescents' Number of Suicide Attempts Regressed on Individual-level Predictors (N=1039)

	Model 1		Model 2		Model 3	
	Coefficient	**SE**	**Coefficient**	**SE**	**Coefficient**	**SE**
Intercept	-3.871	0.265	-4.139	0.287	-4.19	0.293
Female	1.941	0.448	1.539	0.466	1.52	0.468
Age	0.542	0.123	0.414	0.135	0.397	0.136
Black	0.498	0.462	0.932	0.51	1.047	0.511
Hispanic	0.822	0.469	0.845	0.511	0.842	0.511
Two Parents	-0.076	0.332	-0.037	0.363	0.016	0.365
Mother's Education	0.148	0.131	0.128	0.142	0.147	0.144
Number of Siblings	-0.102	0.112	-0.129	0.124	-0.134	0.126
Length of Residence	-0.047	0.028	-0.029	0.03	-0.031	0.03
Depression			0.155	0.029	0.136	0.031
Emotionality			0.006	0.176	-0.007	0.177
Impulsivity			0.142	0.304	0.066	0.309
Sociability			-0.032	0.206	-0.063	0.207
Substance Abuse			0.261	0.174	0.197	0.18
Family Attachment					-0.531	0.24
Suicide Exposure					0.167	0.485

*p<.05, **p<.01, ***p<.001

Table 3. Adolescents' Suicide Attempts Regressed on Collective Efficacy, and other Predictors.

	Model 4		Model 5		Model 6	
	Coefficient	**SE**	**Coefficient**	**SE**	**Coefficient**	**SE**
Intercept	-4.253	0.303	-4.261	0.303	-4.308	0.31
Female	1.557	0.47	1.569***	0.47	1.534***	0.472
Age	0.4***	0.138	0.396***	0.138	0.401***	0.139
Black	0.77***	0.553	0.69	0.562	0.802	0.573
Hispanic	1.164*	0.543	1.072*	0.551	1.207**	0.571
Two Parents	0.02	0.368	0.055	0.371	0.021	0.374
Mother's Education	0.135	0.148	0.136	0.147	0.157	0.148
Number of Siblings	-0.134	0.128	-0.135	0.129	-0.139	0.13
Length of Residence	-0.037	0.031	-0.036	0.031	-0.028	0.031
Depression	0.135***	0.031	0.135	0.031	0.139***	0.031
Emotionality	-0.035	0.18	-0.042	0.181	-0.003	0.182
Impulsivity	0.063	0.308	0.073	0.309	0.005	0.313
Sociability	-0.063	0.209	-0.069	0.209	-0.09	0.209
Substance Abuse	0.182	0.18	0.194	0.182	0.207	0.185
Family Attachment	-0.536**	0.24	-0.548*	0.242	-0.522**	0.494
Suicide Exposure	0.12	0.49	0.108	0.491	0.138	0.016
Concentrated Poverty	-0.005	0.013	-0.012	0.016	-0.013	0.018
Concentration Foreign-born	-0.03*	0.017	-0.036*	0.018	-0.036**	0.247
Collective Efficacy			-0.941	1.085	-1.844	1.199
Family Attachment x Collective Efficacy					-1.608*	0.941

*p<.05, **p<.01, ***p<.001

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