



# The spreading of suicidal behavior: The contextual effect of community household poverty on adolescent suicidal behavior and the mediating role of suicide suggestion<sup>☆</sup>

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## ABSTRACT

Despite the longstanding interest of social researchers in the social factors that influence suicide and suicidal behavior, multilevel research on this topic has been limited. Using nested survey data on 5331 Icelandic adolescents (born in 1990 and 1991) in 83 school-communities, the current study examines the contextual effect of community household poverty on adolescent suicidal behavior (suicide ideation and suicide attempt). The findings show that the concentration of household poverty in the school-community has a significant, contextual effect on adolescent suicidal behavior. Furthermore, we test an “epidemic” explanation for this effect, examining the mediating role of suicide suggestion (contact with suicidal others). We find that suicide suggestion mediates a substantial part of the contextual effect of community household poverty on suicide attempt, while mediation is modest in the case of suicide ideation. The findings indicate that community household poverty increases the risk of adolescent suicidal behavior in part because communities in which household poverty is common entail a higher risk for adolescents of associating with suicidal others. The study demonstrates how the concentration of individual problems can have macrolevel implications, creating social mechanisms that cannot be reduced to the circumstances or characteristics of individuals.

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## Introduction

In recent years, social researchers have paid considerable attention to the study of contextual effects. A contextual effect is the effect of an aggregate-level characteristic on an individual outcome (behavior, attitude, well-being), while controlling for the same characteristic measured as an individual-level construct (Bryk & Raudenbush, 1992).

As contextual effects allow for an empirical distinction between individual-level and group-level mechanisms, research on contextual effects constitutes a powerful way to demonstrate the notion that the structural and cultural characteristics of groups and places have consequences for people’s lives and that the mechanisms involved cannot be reduced to the circumstances or the characteristics of individuals. A widespread interest in such higher level social processes has prompted social researchers to examine the contextual effects of aggregate-level characteristics on a number of topics, including delinquency and crime (Bernburg & Thorlindsson, 2007; Gottfredson, McNeil, & Gottfredson, 1991; Sampson, Raudenbush, & Earls, 1997), victimization (Smith & Jarjoura, 1989), gender attitudes (Moore & Vanneman, 2003), academic performance (Sun, 1999), and illness and poor well-being (Pickett

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& Pearl, 2001; Weich, Twigg, Holt, Lewis, & Jones, 2003; Wright, Botticello, & Aneshensel, 2006).

Multilevel research on suicide and suicidal behavior has been limited, however, which is surprising given the longstanding interest of social researchers in studying the impact of social factors on suicide and suicidal behavior. The lack of multilevel research on this topic is also unfortunate because a large part of the research on social factors and suicide is based on aggregate-level data only (e.g. Breult, 1986; Durkheim, 1897/1951; Platt, 1984; Rehkopf & Buka, 2006; Stack, 1985). In such research it is usually an open question whether the effects of ecological characteristics on suicide rates reflect contextual effects or compositional effects, that is, whether the effect reflects a higher level, “emergent” process or whether it is the summation of the effects of individual-level risk factors on suicide or suicidal behavior (Martikainen, Mäki, & Blomgren, 2004).

The current study examines the contextual effect of community household poverty on adolescent suicidal behavior (suicide ideation and suicide attempt). We use population based survey data on Icelandic adolescents to construct measures on both the community-level and the individual-level. While the individual-level effect of economic disadvantage on suicide and suicidal behavior in adults and adolescents has been well-documented across national contexts (Agerbo, Nordentoft, & Mortensen, 2002; Ayton, Rasool, & Cottrell, 2003; Groholt, Ekeberg, Wichstrom, & Haldorsen, 2000; Martikainen, Mäkelä, Koskinen, & Valkonen, 2001; Qin, Agerbo, & Mortensen, 2003; Schmidtke, Bille-Brahe, DeLeo, & Kerkhof, 1996; Strand & Kunst, 2006), only a handful of studies have examined the contextual effect of area or community economic disadvantage on suicide (Agerbo, Sterne, & Gunnell, 2006; Cubbin, LeClere, & Smith, 2000; Martikainen et al., 2004) and the findings are mixed.

Importantly, the current study examines not only *whether* community context matters but also *why* it matters. While the mechanisms that create the individual-level effect of poverty on suicidal behavior are easily understood given what is known about the detrimental effect of household poverty on family processes, including parenting and parent-child attachment (McLoyd, 1990; Sampson & Laub, 1994), it is not obvious why household poverty should influence suicidal behavior among *other* adolescents in the community. Put differently, why should adolescents that belong to communities where poverty is common have a higher risk of suicidal behavior than adolescents that belong to communities where poverty is rare, after controlling for the individual-level effect of household poverty on suicidal behavior? Empirical answers to these types of questions are often missing in multilevel social research (Jencks & Mayer, 1990; Sampson, Morenoff, & Gannon-Rowley, 2002).

We propose an “epidemic” explanation (see Jencks & Mayer, 1990). Epidemic theories usually highlight the role of social contagion through personal contact in explaining the effects of community context on adolescent problem behavior (e.g. Cattarello, 2000). Specifically, we suggest that suicide suggestion (association with suicidal others)

may create a contextual effect of community household poverty on adolescent suicidal behavior. The notion that suicidal behavior is contagious, spreading by processes of suggestion and imitation (Tarde, 1903/1962), has received considerable support in research (Baller & Richardson, 2002; Farberow, Galagher, Gilewsky, & Thompson, 1987; Phillips, 1974; Stack, 1987). In particular, association with suicidal others has been shown to be a risk factor for adolescent suicidal behavior (Bearman & Moody, 2004; Bjarnason & Thorlindsson, 1994; Thorlindsson & Bjarnason, 1998). Such findings suggest that adolescent suicidal behavior may spread through personal contacts. Accordingly, we argue that, insofar that household poverty has an individual-level effect on adolescent suicidal behavior (perhaps because of the effects of household poverty on disrupted family processes), adolescents that live in communities where household poverty is common may be at an increased risk of coming into contact with suicidal others (peers, neighbors). In turn, association with suicidal others may increase the risk of suicidal ideation and suicide attempt. Simply put, one reason why community household poverty may have a contextual effect on adolescent suicidal behavior is that such behavior spreads by personal contact. Accordingly, we hypothesize that suicide suggestion (association with suicidal others) should mediate the contextual effect of community household poverty on adolescent suicidal behavior. Mediation processes are rarely examined in multilevel work on suicide and suicidal behavior, and we are not aware of any multilevel studies that have examined the mediating role of suicide suggestion.

Below, we define the community boundary by using public schools. Duncan and Raudenbush (1999:39) have argued that schools and neighborhood settings are important extra-familial contexts for studying school-age children, including adolescents. The schools in Iceland constitute a particularly meaningful unit of analysis for studying community effects on adolescent behavior (Bernburg & Thorlindsson, 2007; Bernburg, Thorlindsson, & Sigfusdottir, *in press*). The great majority of Icelandic adolescents attend small, neighborhood-based, public schools that are operated by the county governments. Children and adolescents are selected into the schools based on neighborhood residence, regardless of their backgrounds. Most of the students in a given school comprise most of the adolescents living in the local neighborhood, and hence personal contacts among adolescents are dense within the school-community. In short, the schools comprise small, local communities in which adolescent social participation and neighborhood residence are tightly coupled. Thus, the adolescents are dependent on the school-community for peer companionship, status achievement, and leisure activity.

## Methods

### Data

The data come from a national, population survey of Icelandic adolescents. The full sample consisted of all

students born in 1990 and 1991 (15 and 16 years old), attending the compulsory ninth and tenth grade of the secondary school. Anonymous questionnaires were administered to all students present in class on one day in March 2006. Questionnaires were administered with sealed envelopes by teachers and research assistants. A total of 129 schools (96 percent of all the schools in Iceland) participated in the survey. Valid answers were obtained from 7430 respondents, about 84 percent of the population of the two cohorts. No attempts were made to reach students that were absent on the day of the survey.<sup>1</sup> To ensure a sufficient number of respondents in each school-community, schools with less than 20 respondents, all located in rural areas, were excluded from the analysis (46 schools). Also, we excluded 1002 respondents who did not attend their local neighborhood school. The final analysis includes 5331 respondents (51 percent female) in 83 public schools. On average, the school-level data is based on about 71 respondents from each school, with a standard deviation of about 48. The largest school had 286 respondents; the smallest had 21 respondents (eleven schools had less than 40 respondents, including six schools with 20–29 respondents).

#### Dependent variables

Measurement instruments for suicidal behavior are taken from Thorlindsson and Bjarnason (1998). *Suicide attempt* is coded “1” if the respondent answers “yes” to one of two questions about having attempted suicide (“Have you ever attempted suicide?” and “Did you attempt suicide during the current school year?”) and “0” otherwise.<sup>2</sup> *Suicide ideation* is coded “1” if the respondent answers “yes” to one of two questions about having thought about suicide (“Has the thought of committing suicide ever crossed your mind?”; “Have you ever thought seriously about committing suicide?”) and “0” otherwise. All of these were dichotomous survey questions (no, yes).

*Suicide suggestion* is a cumulative scale comprised of five dichotomous questions (No = 0, Yes = 1): “Has someone told you that she or he was thinking of committing suicide?”, “Has someone you know or someone you are acquainted with ever attempted suicide?”, “Has someone you know or someone you are acquainted with ever committed suicide?”, “Have you ever had a good friend or someone really close who attempted suicide?”, and “Have

you ever had a good friend or someone really close who committed suicide?” A positive answer to all five questions yields 5 points, or maximum contact with suicidal others. Appendix A reports descriptive statistics for the individual items comprising this scale.

#### Household poverty

Four items tackle economic hardship at home and inability of parents to pay for basic necessities (Bernburg et al., in press): “Your parents’ financial status is bad”, “Your parents cannot afford to own and operate a car”, “Your parents hardly have enough money to pay for basic necessities (e.g. food, housing, phone)”, and “Your parents cannot afford the type of leisure activity that you would most prefer to practice (e.g. music or sports)”. The response categories ranged from one (almost never) to five (almost always). We combined the scales into an index by using the mean score on the four items (Cronbach’s  $\alpha = .77$ ) and then we standardized the scores (Appendix B reports descriptive statistics for the measurement instruments). A supplementary study of measurement validity indicates a strong association between the current measure of economic deprivation and parents’ self-reported economic deprivation.<sup>3</sup>

#### Community (Level 2) household poverty

The concentration of household poverty in the school-community is measured with the school mean on the household poverty index described above. The mean values were standardized. Thus, this measure tackles the concentration of household poverty among same-aged peers in the school-community. Given that the study is focused on contextual effects that are driven by social contagion via personal association, this measure is more appropriate than, say, a measure tackling the economic status among the general population of community residents. The survey data contains a large part of the adolescent population in each school-community, and hence we are confident that this measure represents quite well the concentration of poverty among same-aged peers in the school-community. In support of this assumption, we find a strong, negative correlation between the current, self-report measure of community household poverty and a population measure of the mean income of all households

<sup>1</sup> Although the sample attrition rate is low, we were concerned that absence from school on the day of the survey could bias the findings (a concern raised by an anonymous reviewer). In particular, schools in which household poverty is common may have a higher attrition rate. A supplementary analysis indicates that such bias is not present. We find no significant effect of the school attrition rate (number of registered students divided by the number of respondents used in the current analysis) on community household poverty (Pearson’s  $r = .05$ ;  $p = .631$ ;  $N = 83$ ). Moreover, controlling for the school attrition rate does not change the results.

<sup>2</sup> We have replicated the current analysis by using only the former question to measure suicide attempt (which produces an attempt rate of 7.1 percent instead of 7.4). The results are substantively the same as those reported in the current paper.

<sup>3</sup> A pilot survey of 90 adolescents and their parents was conducted in a single school in Reykjavik to examine the association between the current measure of household poverty and parents’ self-report of household poverty (an index combining seven items about inability to pay for necessities, including car, leisure, housing, and food). Due to skewness in the items, we categorized the items into quartiles. The Gamma coefficient for the association between the items was .68, and a calculated odds ratio shows that moving from the lowest through the highest value on the parental report measure increases the odds of being in the highest quartile on the current measure of economic deprivation by a factor of 46. Moreover, our data ( $N = 5,491$ ) reveals good construct validity for the current measure of household poverty. Thus, this measure is strongly related to known risk factors of adult poverty in Iceland, including single-parent households (especially if the single-parent is female), non-college educated parents (especially if the father has no college education), immigrant status, parents’ unemployment (especially if the father is unemployed), and rural location.

with children that reside within the geographical boundaries of the school-community.<sup>4</sup>

### Control variables

#### Level 1 control variables

Duncan and Raudenbush (1999) have pointed out the need to adjust for parental variables when estimating school or neighborhood contextual effects, because of bias that may arise from nonrandom parental selection of context. Such a bias is a potential problem for the current analysis, as social ties to parents are known to influence adolescent suicidal behavior (Bearman & Moody, 2004; Thorlindsson & Bjarnason, 1998). Below, we control for *parental support*, *parental conflict/fighting*, *parental social networks*, and *family disruption*. Parental support is the mean score on six, four-point Likert items about how difficult or easy it is to receive support from parents, that is, warmth and caring, conversations about private issues, advice, and help with practical matters (Cronbach's  $\alpha = .86$ ). The scores were standardized. Parental conflict/fighting is coded "1" if the respondent indicates having witnessed an argument or a physical fight between his or her parents during the last 12 months. Parental social networks are measured with the mean score on four, five-point Likert items (Bernburg & Thorlindsson, 2007): "My parents know my friends' parents", "My parents often talk to my friends' parents", "My parents sometimes meet my friends' parents to talk together", "My parents know my friends" (Cronbach's  $\alpha = .82$ ). The scores were standardized. Family disruption is coded "1" if the respondent indicates not living with both parents and "0" otherwise. Another known risk factor for suicidal behavior is *residential mobility* (Haynie, South, & Bose, 2006), coded "1" if respondents indicate having moved to a new neighborhood/community during the past 12 months, and "0" otherwise. *Immigrant status* is coded "1" if respondents indicate that both parents are not born in Iceland and "0" otherwise. Finally, *sex* is coded "1" for females and "0" for males.

#### Level 2 control variables

Based on the research on community context and youth antisocial behavior (Bernburg & Thorlindsson, 2007; Gottfredson et al., 1991), we control for a few measures

of community social and structural composition, that is, *residential mobility* (the school proportion of respondents that has moved to another community during the past 12 months), prevalence of *intact families*, (the school proportion of respondents not living in a two parent households), *immigrant concentration* (the school proportion of respondents indicating that both parents are born in another country). These variables were all standardized. Finally, *rural location* is coded "1" for communities that are located in rural areas and "0" otherwise.

### Statistical analysis

We use hierarchical regression models, which is the appropriate statistical tool for analyzing nested, multilevel data (Bryk & Raudenbush, 1992). The analysis is conducted in HLM 5 (Raudenbush, Bryk, & Cheong, 2001). Logit hierarchical regression is used for the dichotomous dependent variables, that is, suicide attempt and suicide ideation. Poisson hierarchical regression is used for suicide suggestion, which is a continuous variable that exhibits a substantial positive skew (Skewness = 1.24). In the following analysis, the independent variables are grand-mean centered and all Level 1 effects are allowed to vary randomly among Level 2 units.

### Results

Descriptive statistics are reported in Table 1. About seven percent of the respondents report having attempted suicide, while about 27 percent report having had thoughts about suicide (suicide ideation). Moreover, the results in Appendix A indicate that a substantial minority of the respondents has had some contact with suicidal behavior. About 22 percent of the respondents indicate that a good friend or someone close has attempted suicide, and about seven percent indicate that a good friend or someone close has committed suicide.

The current analysis is predicated on the assumption that there is a meaningful between-community (Level 2) variation in suicidal behavior, after the within-community (Level 1) variation in suicidal behavior has been partialled out. Intercept-only models (not shown in table) indicate that such variation exists. Thus, the Level 2 variance component is significant for suicide attempt ( $\chi^2 = 127.5$ ;  $p = .001$ ), suicide ideation ( $\chi^2 = 127.2$ ;  $p = .001$ ), and suicide suggestion ( $\chi^2 = 261.7$ ;  $p < .001$ ). The intra-class coefficient ( $\rho$ ) for suicide attempt, suicide ideation, and suicide suggestion is .10, .04, and .03, respectively, (for calculations of this coefficient in models with a categorical dependent variable, see Guo & Zhao, 2000:451). Thus, although most of the total variance in suicidal behavior and suicidal suggestion is between-individuals variance—which is typically, the case in neighborhood studies on adolescents (Bernburg & Thorlindsson, 2007; Bryk & Raudenbush, 1992; Osgood & Andersson, 2004)—a significant part of the variance is between communities. Furthermore, the community variances in suicide attempt, suicide ideation, and suicide suggestion are significant ( $p = .01$ ,  $p = .01$ , and  $p < .001$ , respectively), even after controlling for individual-level compositional factors, that is, female gender, household

<sup>4</sup> Statistics Iceland (<http://www.statice.is>) collects the tax records of all persons in Iceland, by address and family type. Upon request, these data have been aggregated by the geographical boundaries of the 83 school-communities (data based on tax records for the year 2005). We correlated the current community-level measure of household poverty with the natural logarithm of mean income of all households with children in the geographical school-community. The correlations are strong ( $r = -.61$  in the urban, Reykjavik area, and  $r = -.74$  in rural areas), thus supporting the validity of our poverty measure. Furthermore, we have re-estimated all the models reported in Table 2, replacing the survey-based measure of community household poverty with the population measure of mean household income. For the most part, the results are substantially similar to those reported in the current paper. Household income has a significant, contextual effect on suicide attempt and suicide suggestion, and the former effect is largely mediated by suicide suggestion. However, the effect of mean income on suicidal ideation is statistically insignificant.



**Table 1**

Descriptive statistics for community-level (Level 2) and individual-level (Level 1) variables.

|  | Mean    | Standard deviation | Minimum value | Maximum value |
|--|---------|--------------------|---------------|---------------|
| <b>Community-level variables (N = 83)</b>    |         |                    |               |               |
| <i>Continuous variables</i>                  |         |                    |               |               |
| Household poverty (Z-score)                  | .00     | 1.0                | -1.60         | 3.62          |
| Household poverty (Raw score)                | 1.35    | .11                | 1.18          | 1.74          |
| Residential mobility (Z-score)               | .00     | 1.0                | -1.41         | 5.32          |
| Residential mobility (Raw score)             | .08     | .06                | 0             | .40           |
| Intact families (Z-score)                    | .00     | 1.0                | -2.89         | 2.04          |
| Intact families (Raw score)                  | .71     | .10                | .44           | .91           |
| Immigrant concentration (Z-score)            | .00     | 1.0                | -.71          | 4.24          |
| Immigrant concentration (Raw score)          | .02     | .02                | 0             | .12           |
| <i>Dichotomous variables (0, 1)</i>          |         |                    |               |               |
| Rural location                               | Percent | 22.9               |               |               |
| <b>Individual-level variables (N = 5331)</b> |         |                    |               |               |
| <i>Continuous variables</i>                  |         |                    |               |               |
| Household poverty (Z-score)                  | .00     | 1.0                | -.57          | 6.40          |
| Household poverty (Raw score)                | 1.31    | .55                | 0             | 5             |
| Parental social networks (Z-score)           | .00     | 1.0                | -2.39         | 1.98          |
| Parental social networks (Raw score)         | 2.65    | .69                | 1             | 4             |
| Parental social support (Z-score)            | .00     | 1.0                | -4.27         | .95           |
| Parental social support (Raw score)          | 3.47    | .57                | 1             | 4             |
| Suicide suggestion (Raw score)               | 1.09    | 1.37               | 0             | 5             |
| <i>Dichotomous variables (0, 1)</i>          |         |                    |               |               |
| Suicide ideation                             | Percent | 27.1               |               |               |
| Suicide attempt                              | 7.4     |                    |               |               |
| Female                                       | 50.6    |                    |               |               |
| Moved in past year                           | 8.2     |                    |               |               |
| Live with both parents                       | 71.9    |                    |               |               |
| Immigrant                                    | 1.6     |                    |               |               |
| Parental conflict/fighting                   | 11.6    |                    |               |               |

poverty, residential mobility, immigrant status, and household structure.

Moreover, the analysis is viable only if there are meaningful differences in the level of household poverty among the communities. An intercept-only model for household poverty reports a significant Level 2 variance component ( $\chi^2 = 165.7$ ;  $p < .001$ ). To illustrate the range in community household poverty, the school percent of respondents saying that their parents' financial situation is "sometimes", "often", or "almost always" bad ranges between three percent and forty-five percent, with an average of 17 percent (see Appendix B).<sup>5</sup>

The current theoretical model implies that suicide suggestion (association with suicidal others) should

mediate the contextual effect of community household poverty on adolescent suicidal behavior. This model implies an analysis of "2 → 1 → 1" mediated effect, that is, a Level 2 independent variable influences a Level 1 dependent variable through a Level 1 mediator variable (Krull & MacKinnon, 2001). As shown in Fig. 1, community household poverty should have a contextual effect on suicide behavior, prior to controlling for suicide suggestion (path "A" should be positive and significant). Second, the contextual effect of community household poverty on suicidal behavior should be reduced when controlling for the individual-level effect of suicide suggestion on suicidal behavior (path "A" should be reduced when controlling for suggestion, and path "a" should be significant and positive). Finally, community household poverty should have a contextual effect on suicide suggestion (path "B" should be significant and positive).

The results in Table 2 lend support to the model depicted in Fig. 1. First, Model 1 and Model 3 show that community household poverty has a significant and positive, contextual effect on suicide attempt and suicide ideation, prior to controlling for suggestion (Path "A" in Fig. 1). The contextual effects are substantial, which evident by the fact that these effects emerge as statistically significant in our sample of only 83 communities. In addition, the individual-level findings show that household poverty, female gender, residential mobility, and parental conflict are significantly associated with increased risk of both suicide attempt and suicide ideation, while parental support and parental social networks are significantly associated with a decreased risk of these outcomes.

In Models 2 and 4, suicide suggestion is added to the equation. As predicted, suicide suggestion has a significant, positive effect on both suicide attempt and suicide ideation (path "a" in Fig. 1). The effects are quite strong. Thus, for every standard deviation increase in suicide suggestion (see Table 1), the odds of a suicide attempt increase by 60 percent and the odds of suicide ideation increase by 54 percent. Moreover, consistent with the mediation argument, the contextual effects of community household poverty on suicidal behavior are reduced when suicide suggestion has been added to the models. The reduction in the effect, however, is more pronounced for suicide attempt. Thus, suicide suggestion accounts for about 50 percent of the total, contextual effect of community household poverty on suicide attempt (the unstandardized effect is reduced from .12 in Model 1 to .06 in Model 2), while it accounts for about 10 percent of the contextual effect of community household poverty on suicide ideation (which is reduced from .10 in Model 3 to .09 in Model 4).

It is noteworthy that controlling for suicide suggestion produces a substantial reduction in the effects of female gender on suicide attempt and suicide ideation. Also, controlling for suicide suggestion reduces the effects of the parental variables on suicide attempt, although such reduction is more modest for suicide ideation.

Finally, in Model 5, we regress suicide suggestion on the independent variables. Again consistent with the mediation model, community household poverty has a significant and positive, contextual effect on suicide suggestion (path "B" in Fig. 1). The individual-level findings show that household

<sup>5</sup> The maximum difference in mean income (households with children) among these units is a factor of 1.6 (based on tax records for the year 2005, provided by Statistics Iceland).

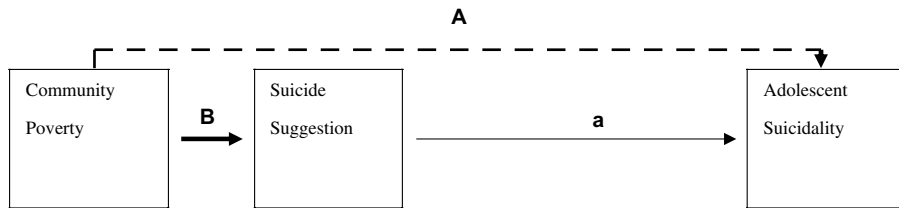


Fig. 1. Hypotheses. Note: bolded arrows represent contextual effects, the non-bolded arrow represents an individual-level effect.

poverty, female gender, residential mobility, and parental conflict have significant, positive effects on suicide suggestion, while parental support and parental social networks have significant, negative effects on suicide suggestion.

**Discussion**

The aim of the current study is to examine the contextual effect of community household poverty on adolescent suicidal behavior, focusing on the role of suicide suggestion in creating such a contextual effect. Thus, the study examines not only *whether* community household poverty influences suicidal behavior but also *why* such effects occur. The analysis is based on two research traditions, that is, the research on the effect of household poverty on children and adolescent poor well-being and deviance (Conger, Ge, Elder, Lorenz, & Simons, 1994; McLoyd, 1990; Sampson & Laub, 1994) and the research on the role of suicide suggestion in the spreading of suicidal behavior (Baller & Richardson, 2002; Bjarnason & Thorlindsson, 1994; Farberow et al.,

1987; Phillips, 1974; Stack, 1987; Thorlindsson & Bjarnason, 1998). When taken together, this research suggests that the individual-level effect of household poverty on adolescent suicidal behavior have macrolevel implications, namely, that adolescents living in communities where household poverty is common may have an increased risk of suicidal behavior, because they are at an increased risk of associating with suicidal others. The findings lend support to this argument, showing that community household poverty has a significant, contextual effect on suicidal behavior, and that suicide suggestion mediates a substantial part of this contextual effect, especially in the case of suicide attempt (but less so in the case of suicide ideation). The findings indicate that a part of the reason why community household poverty increases the risk of adolescent suicidal behavior (especially suicide attempt) is that there is a higher risk of associating with suicidal others in communities where household poverty is common.

Testing an “epidemic” model to explain community effects (Jencks & Mayer, 1990), the current study

**Table 2**  
Suicide attempt, suicide ideation, and suicide suggestion regressed on independent variables.

|                                    | Dependent variables    |            |                      |            |                         |            |                      |            |                          |               |
|------------------------------------|------------------------|------------|----------------------|------------|-------------------------|------------|----------------------|------------|--------------------------|---------------|
|                                    | Suicide attempt (0, 1) |            |                      |            | Suicide ideation (0, 1) |            |                      |            | Suicide suggestion (0–5) |               |
|                                    | Model 1 <sup>a</sup>   |            | Model 2 <sup>a</sup> |            | Model 3 <sup>a</sup>    |            | Model 4 <sup>a</sup> |            | Model 5 <sup>b</sup>     |               |
|                                    | Coefficient            | Odds ratio | Coefficient          | Odds ratio | Coefficient             | Odds ratio | Coefficient          | Odds ratio | Coefficient              | Relative rate |
| <i>Community-level variables</i>   |                        |            |                      |            |                         |            |                      |            |                          |               |
| Intercept                          | –2.54***               | —          | –2.61***             | —          | –1.09***                | —          | –1.15***             | —          | .05                      | —             |
| Household poverty (Z-score)        | .12**                  | 1.13       | .06*                 | 1.06       | .10*                    | 1.11       | .09*                 | 1.09       | .07*                     | 1.07          |
| Residential mobility (Z-score)     | .01                    | 1.01       | –.03                 | .97        | –.01                    | .99        | –.05                 | .95        | .04                      | 1.04          |
| Intact families (Z-score)          | .04                    | 1.04       | –.06                 | .94        | .08                     | 1.08       | .04                  | 1.04       | .12**                    | 1.13          |
| Immigrant concentration (Z-score)  | .02                    | 1.02       | .03                  | 1.03       | .02                     | 1.02       | .01                  | 1.01       | .01                      | 1.01          |
| Rural location (0, 1)              | .02                    | 1.02       | –.11                 | .90        | .07                     | 1.07       | –.02                 | .98        | .16*                     | 1.17          |
| <i>Individual-level</i>            |                        |            |                      |            |                         |            |                      |            |                          |               |
| Household poverty (Z-score)        | .21***                 | 1.23       | .22***               | 1.25       | .12**                   | 1.13       | .10**                | 1.11       | .05***                   | 1.05          |
| Female (0, 1)                      | .60***                 | 1.82       | .22**                | 1.25       | .72***                  | 2.05       | .48***               | 1.62       | .54***                   | 1.72          |
| Moved in past year (0, 1)          | .57***                 | 1.77       | .47***               | 1.60       | .32*                    | 1.38       | .24*                 | 1.27       | .20***                   | 1.22          |
| Live with both parents (0, 1)      | –.12                   | .89        | .06                  | 1.06       | –.28**                  | .76        | –.19**               | .83        | –.19***                  | .83           |
| Immigrant (0, 1)                   | .63**                  | 1.88       | .61***               | 1.84       | –.14                    | .87        | –.25                 | .78        | .00                      | 1.0           |
| Parental support (Z-score)         | –.30***                | .74        | –.20***              | .82        | –.40***                 | .67        | –.35***              | .70        | –.12***                  | .89           |
| Parental conflict/fighting (0, 1)  | .49***                 | 1.63       | .37**                | 1.45       | .59***                  | 1.80       | .52***               | 1.68       | .20***                   | 1.22          |
| Parental social networks (Z-score) | –.18***                | .84        | –.07*                | .93        | –.22***                 | .80        | –.20***              | .82        | –.06**                   | .94           |
| Suicide suggestion (0–5)           | —                      | —          | .47***               | 1.60       | —                       | —          | .43***               | 1.54       | —                        | —             |

Note: All the independent variables are grand-mean centered. Significant tests are based on robust standard errors. All individual-level slopes are allowed to vary randomly among the level 2 units (random effects not shown).

\*, *p* < .05 (two-tailed tests); \*\*, *p* < .01 (two-tailed tests); \*\*\*, *p* < .001 (two-tailed tests).

<sup>a</sup> Logit hierarchical regression.

<sup>b</sup> Poisson hierarchical regression.

demonstrates how the detrimental effects of individual problems, such as household poverty, may not be fully captured by using individual-level data only. In this sense, the study broadens the relevance of suggestion-imitation theory (Tarde, 1903/1962), calling on future research to examine whether the concentration of other individual-level circumstances that influence suicidal behavior may also have macrolevel implications, as their effects on suicidal behavior may spread in local communities or in other types of personal, or communal networks via suicide suggestion. Of course, it is still an open question whether adolescents are especially susceptible to imitative suicidal behavior. Also, certain adolescents, namely, those who have weak social ties, may be more likely to be affected by imitative mechanisms than others (Thorlindsson & Bernburg, 2004).

The current focus on mediation processes addresses an important limitation that has often been associated with research on contextual effects. While contextual effects are often found in multilevel research on various topics, the mechanisms that mediate the effects of group-level characteristics on individual outcomes are not examined very often (see reviews by Jencks & Mayer, 1990; Sampson et al., 2002; for exceptions, see Bernburg & Thorlindsson, 2007; Sampson et al., 1997; Warner, 2003). This “black box” approach often leaves contextual effects open for alternative explanations (Jencks & Mayer, 1990). Our study is among first to examine mediated effects in a multilevel study of suicidal behavior. But, while we find some evidence of mediation, suicide suggestion accounts for only a part of the contextual effect of community household poverty on suicidal behavior. Future research should consider other mechanisms that have been held to mediate the effects of community context on youth development, including normative consensus and social ties among community residents (Bernburg & Thorlindsson, 2007; Warner, 2003).

It is worth noting that the findings support previous individual-level research on adolescent suicidal behavior, including research highlighting the impact of suicide suggestion and weak social ties to parents (Bearman & Moody, 2004; Bjarnason & Thorlindsson, 1994; Thorlindsson & Bjarnason, 1998), residential mobility (Haynie et al., 2006), impoverishment (Ayton et al., 2003; Groholt et al., 2000; Strand & Kunst, 2006), and female gender (e.g. Waldrop et al. 2007).

In this regard, it is noteworthy that the effect of female gender on suicidal behavior is substantially reduced when controlling for suicide suggestion. Moreover, females are more likely to experience suicide suggestion. These results suggest that a part of the reason why females have a higher risk of suicide attempt and suicide ideation is that females experience more suicide suggestion. This interpretation is consistent with the main theme of this paper, namely, the notion that suicide suggestion is a spreading mechanism that exacerbates group differences in suicidal behavior. Females generally exhibit more suicidal behavior than males, and hence females have a higher risk of experiencing suicide suggestion when associating with their peers (because adolescents usually have same-sex friends). Thus, suicide suggestion may exacerbate gender differences in suicidal behavior.

Controlling for suicide suggestion also produces a drop in the effects of the parental variables on suicide attempt. This finding is consistent with a well-known finding in delinquency research, namely, that association with deviant peers mediates, in part, the effect of weak social bonds on adolescent deviant behavior (Elliott, Huizinga, & Ageton, 1985).

Importantly, we have omitted from the current analysis a host of risk-factors that have been found in individual-level research on adolescent suicidal behavior, including depression, low self-esteem, alcohol and substance use, victimization, and so on (e.g. Bearman & Moody, 2004; Bjarnason & Thorlindsson, 1994). The inclusion of such factors into our models is not straightforward, but requires theoretical considerations that are beyond the focus of this paper. Given the powerful role that peer influences play in adolescent attitudes and behavior (Akers, Krohn, Lanza-Kaduce, & Radosevich, 1979), many of the omitted risk-factors may constitute intervening processes in the relationship between suicide suggestion and suicidal behavior. Thus, experiencing a suicide attempt or a completed suicide by a friend may increase the likelihood of negative emotions and risky behavior (e.g. depressed mood or substance use), thereby increasing the odds of suicide ideation and suicide attempt. If this were the case, additional risk-factors should not be included in the current analysis until after the effect of suicide suggestion and its mediating role have been assessed. Furthermore, suicide suggestion and suicidal behavior may often be indicators of a more general pattern of adolescent conduct problems. Thus, contact with suicidal others may often entail association with deviant others (e.g. substance-using peers, delinquent peers), which is a risk factor for various conduct problems including substance use and victimization (Akers et al., 1979). Future research is needed to examine how other risk-factors fit into our conceptual framework.

It is noteworthy, given the observed effect of community household poverty on suicidal behavior in our data, that previous multilevel research has not found consistent support for the contextual effect of area or community disadvantage on suicide. While some studies have found area economic status to have no effect on adult suicide, once individual-level socio-economic status is controlled for (Agerbo et al., 2006), other studies lend support for this effect (Martikainen et al., 2004). In this regard, the current study differs from prior multilevel work in important respects. First, we use school-communities as the aggregate (Level 2) unit of analysis, while the prior studies have used much larger ecological settings. In our view, the school-community is an appropriate group-unit of analysis for studying of adolescent suicidal behavior (Duncan & Raudenbush, 1999). After all, we presume that the focal theoretical mechanism (suicide suggestion) operates through peer contact. Hence, contextual effects should exist only if peer contacts are more likely to occur within the units rather than between the units. Icelandic adolescents are highly dependent on the school-community for social contacts, and thus the Icelandic research setting provides a unique opportunity to examine the current argument. By contrast, it is not obvious that suicide suggestion among adolescents or adults should be expected to create similar contextual effects across larger units (see discussion by Rehkopf & Buka, 2006).

Second, our work differs from prior multilevel research in that we examine self-reported suicide attempts and suicide ideation rather than official records of completed suicides. Hence, the findings cannot be applied directly to completed suicides. But, although the relationship of suicide ideation and suicide attempts to completed suicides is not a simple one (Dorpat & Ripley, 1967), a past suicide attempt is a major risk factor for subsequent attempts and completed suicide (Hawton, 1987; Maris, 1992). In his seminal study of suicide, Durkheim (1897/1951:45) portrayed suicidal behavior as continuous series of intermediate events that entail mortal risks, but which stem from similar states of mind. Thus, the study of how social forces influence suicide should not be confined to lethal outcomes (Thorlindsson & Bjarnason, 1998). Furthermore, studying self-reported suicidal behavior complements the research on recorded suicide because it helps to overcome key methodological limitations associated with official records (Douglas, 1987; Thorlindsson & Bjarnason, 1998). Official records rarely include direct measures of key social variables such as contact with suicidal others, social support, and so on. Accordingly, research focusing on such constructs typically examines self-reported suicidal behavior rather than completed suicides (Bearman & Moody, 2004; Haynie et al., 2006; Thorlindsson & Bjarnason, 1998). Finally, as completed suicides are extremely rare, it would be impossible to conduct the type of analysis reported above by using completed suicide as the dependent variable. Given the small size of the school-communities, such a dependent variable would exhibit almost no variation.

A part of the current analysis has focused on individual-level mechanisms that ideally would be examined with longitudinal data. Specifically, we are not able to separate in time suicide suggestion and suicidal behavior. Another part of the analysis has focused on contextual effects, calling for a simultaneous analysis of individual-level and contextual factors. Although a cross-sectional research design is appropriate for this focus, we acknowledge that a longitudinal design would allow for an even more powerful test of our model. Following the general suggestion of Duncan and Raudenbush (1999), a longitudinal design would enable a test of whether the concentration of poverty in the school-community explains within-individual change in suicidal behavior during the time that the adolescent lives in that school-community, and whether a change in suicide suggestion mediates this effect. This test awaits future research.

Our findings have implications for sociological theories of suicide. In his seminal study of suicide, Durkheim (1897/1951) suggested that poverty may be considered a protection against suicide, because poverty places physical limits on expectations and goals, and is thus a source of regulation (p. 254). Durkheim cited data indicating that suicide rates tend to be low in poor countries and impoverished areas. Contemporary research tends to undermine Durkheim's claim (Rehkopf & Buka, 2006). Thus, although aggregate-level research is mixed on this point, a recent literature review has found that there is currently more evidence that favors a negative association over a positive association between socio-economic characteristics of geographic areas and suicide (Rehkopf & Buka, 2006). Moreover, as we have noted above, individual-level suicide

research tends to find a negative association between economic status and suicide and suicidal behavior.

Furthermore, Durkheim's claim is inconsistent with research that indicates that being poor in contemporary society is stressful and undermines well-being (Conger et al., 1994; McLoyd, 1990; Yngwe, Fritzell, Lundberg, Diderichsen, & Burström, 2003). With respect to youths in particular, research has shown that poverty-induced strain undermines effective parenting and parent-child attachment, and creates interpersonal conflicts, and hence increases youth conduct problems and poor well-being (Conger et al., 1994; Sampson & Laub, 1994). In this context, it is interesting that another major aspect of Durkheim's work, namely, his theory of egoistic suicide, argues that strong social ties provide meaning and social support, and hence prevent suicide (Thorlindsson & Bjarnason, 1998). In light of the research on the detrimental effect of poverty on family ties, this aspect of Durkheim's work is quite consistent with a positive effect of poverty on suicidal behavior.

Finally, Durkheim's claim is inconsistent with social theory emphasizing that contemporary society is characterized by values of universalism and democratic ideals that encourages people to compare themselves to affluent groups, regardless of social background, thereby promoting a sense of relative deprivation among the impoverished (Merton, 1968; Runciman, 1966; see recent studies by Bernburg et al., *in press*; Yngwe et al., 2003).

We should note that levels of poverty and economic inequality are quite modest in Iceland relative to other European countries (Statistics Iceland, 2007). In line with previous research in Iceland (Olafsdottir, 2007), our findings indicate that these characteristics do not necessarily buffer the harmful effects of poverty on well-being. To the contrary, in a social context such as Iceland, where poverty is relatively uncommon, impoverishment may be particularly likely to produce poor well-being, due to processes of social comparison and relative deprivation (Bernburg et al., *in press*).

## Conclusion

It is now widely recognized that individual health behaviors are influenced by the social environment and that social relationships can have powerful effects on health outcomes. Macrolevel research has related social and economic inequality and deprivation and social cohesion to health (Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997) while microlevel research has focused on social networks and the role of social support in well-being and health promotion (Vilhjalmsson, 1993). Our findings highlight the complexity involved in capturing the influence of the social environment. The findings indicate that the concentration of disadvantage in the local community have consequences for adolescents, regardless of whether or not they are exposed to such problems themselves. Thus, the findings support the notion of social emergence, namely, that the social characteristics of groups and ecological settings produce higher-level mechanisms that cannot be reduced to the individual level (Durkheim, 1895/1982; Sawyer, 2002). The notion of social emergence needs to be taken seriously in both prevention and health promotion work.



## Appendix A. Descriptive statistics for the measurement instruments comprising the suicide suggestion scale.

|   | No (%) | Yes (%) |
|---|--------|---------|
| "Has someone told you that she or he was thinking of committing suicide?"         | 70.9   | 29.1    |
| "Has someone you know or someone you are acquainted with ever attempted suicide?" | 66.5   | 33.5    |
| "Has someone you know or someone you are acquainted with ever committed suicide?" | 83.2   | 16.8    |
| "Have you ever had a good friend or someone really close who attempted suicide?"  | 77.8   | 22.2    |
| "Have you ever had a good friend or someone really close who committed suicide?"  | 92.6   | 7.4     |

## Appendix B. Descriptive statistics for the measurement instruments for household poverty: Level 1 and Level 2 relative frequencies.

|   | Level 1 descriptive results (%) (N = 5331) |        |           |       |               | Level 2 descriptive results. School percent of respondents that answer "sometimes", "often" or "almost always". (N = 83) |         |         |
|---|--|--------|-----------|-------|---------------|--|---------|---------|
|   | Almost Never                               | Rarely | Sometimes | Often | Almost always | Mean   | Minimum | Maximum |
| "Your parents' financial status is bad"   | 58   | 26     | 13        | 2     | 1             | 17   | 3       | 45      |
| "Your parents cannot afford to own a car"   | 89   | 7      | 2         | 1     | 2             | 4  | 0       | 12      |
| "Your parents hardly have enough money to pay for basic necessities (e.g. food, housing, phone)"                        | 88   | 5      | 3         | 1     | 3             | 7  | 0       | 22      |
| "Your parents cannot afford the type of leisure activity that you would most prefer to practice (e.g. music or sports)" | 86   | 8      | 4         | 1     | 2             | 7  | 0       | 22      |

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