

Original research

## Long-term suicidogenic effect of being mostly alone as a child in a Stockholm birth cohort – restating the role of social isolation in suicide

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**Abstract:** This study sets out to analyze the effect of social isolation at age 12-13 on suicide in early and middle adulthood, adjusting for early life stress and exploring for possible moderation effects among different indicators of perceived burdensomeness and acquired capability for suicide during emerging adulthood. The data are drawn from the Stockholm Birth Cohort Study (n = 9502), in which one can follow individuals from birth (1953) to the age of 55 (2008), and analyzed through penalized maximum likelihood logistic regressions. Those who had rated themselves as being mostly alone as 12–13-year-olds (1966) were found to be approximately two and a half times as likely to commit suicide between 1981 and 2008 as those who had rated themselves as being mostly with other people (OR = 2.38), irrespective of well-established suicidogenic risk factors measured both prior (e.g., prenatal stress, social welfare reciprocity and family rupture) and subsequent (e.g., unemployment, mental disorder and parasuicide) to the measurement of social isolation. The perception of being mostly alone as a child should be treated as a major adverse social condition in its own right, with the potential to explain even distal outcomes across the life span. Further, it is suggested that the framework of social recognition can be used to provide a different nuance to our understanding of the suicidogenic effect of social isolation.

**Keywords:** Loneliness; social recognition; suicidal behavior; life course; social exclusion, Sweden

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Social isolation is currently being proposed as probably the strongest and most reliable predictor of suicide attempts and lethal suicidal behavior among samples of varying age, nationality and clinical severity (Van Orden & Joiner, 2013; Van Orden et al., 2010). Numerous empirical studies have demonstrated associations between suicide and various dimensions of social isolation, such as loneliness, social withdrawal, living alone and having few social supports, losing a spouse through death or divorce, cultural isolation, solitude in old age etc (Trout, 1980; Van Orden et al., 2010).

In contrast, marriage, children, and a greater number of friends or family members are associated with a lower risk for engaging in this type of behavior (Van Orden et al., 2010). The psycho-social tradition studying social isolation and suicide has its origins in the more than hundred-year-old seminal work of the French sociologist Emile Durkheim, *Le Suicide* (Rojas & Stenberg, 2010; Trout, 1980), and has over the years succeeded in developing a distinct and pervasive conceptualization of the suicidogenic effect of thwarted social belongingness (Rojas, 2014). However, Van Orden and colleagues (2010), through their interpersonal theory of suicide, have recently noted that the conceptualization of thwarted social belongingness is not sufficient to

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understand the suicidal process, since it is unable to account for the actual point at which social isolation becomes suicidogenic. Instead, they argue, the relationship in question is conditioned by a state of burdensomeness and an acquired capability for suicide (Van Orden et al., 2010). Although their theory is still being widely tested across diverse samples and age groups, the interpersonal theory of suicide has already contributed to substantial advances in the scientific and clinical understanding of suicide and related conditions (Chu et al., 2017), and is deemed to have promising heuristic value (Stewart, Eaddy, Horton, Hughes, & Kennard, 2017).

The aim of the present study is to apply this contemporary conceptual debate to a life-span context. The study analyzes the effect of self-rated loneliness in childhood on suicide in early and middle adulthood, adjusting for the possible moderating effects of different indicators of burdensomeness and acquired capability for suicide during emerging adulthood, making use of a unique longitudinal study of a Stockholm cohort born in 1953 (Stenberg & Vågerö, 2006; Stenberg et al., 2007).

#### *A life-course approach - two main assumptions*

Remarkably few sociologists have attempted to locate the sociological foundations of suicide in childhood (Rojas & Stenberg, 2010; Stack, 1982; Wray, Colen, & Pescosolido, 2011). This is particularly remarkable given that Durkheim (Durkheim, 2002/1897), one of the founding fathers of the discipline, explicitly stated more than one hundred years ago that children are also affected by the social factors that drive individuals to commit suicide, such as lack of social integration, and that these detrimental social influences may have delayed effects as “the collective force impelling men to kill themselves (...) only gradually penetrates them” (Durkheim, 2002/1897, p.289). However, and although this is in line with one of the main assumptions of the life-course approach, i.e. that prior life history has strong impacts on later life outcomes (cf., Mayer, 2009), there are at least two different mechanisms through which a lack of social integration in childhood could be related to suicide later in life that may be inferred from Durkheim’s statement.

i) Lack of social integration in childhood and suicide in adulthood are related to each other in a direct manner. This mechanism would be in line with what the life-course literature usually refers to as the social imprint hypothesis, that is, the assumption that adverse social conditions during

childhood make individuals more vulnerable to risk exposure and stress in adulthood, independently of any indirect or direct effects on ill health or the life career (Bäckman & Nilsson, 2011; Bäckman & Palme, 1998; Rojas, 2014).

ii) Lack of social integration in childhood and suicide in adulthood are related to each other in a non-direct manner. This mechanism would be in line with what the life-course literature usually refers to as the cumulative disadvantage hypothesis, that is, the assumption that adverse social conditions during childhood are related to distal detrimental outcomes through a chain of adverse life events across the life span (Bäckman & Nilsson, 2011; Kuh, Ben-Shlomo, Lynch, Hallqvist, & Power, 2003; Mayer, 2009; Rojas, 2014).

The notion that childhood risk factors may be related to diverse, distal social, economic, health and behavioral outcomes, either in a direct or indirect manner, constitutes a distinct and well-established assumption within the life-course literature (cf., Bäckman & Nilsson, 2011; Kuh et al., 2003; Mayer, 2009). However, the way in which early life conditions, social isolation included, affect the risk for suicide in early and middle adulthood remains an open empirical question (Danziger, Silverwood, & Koupil, 2011; Mayer, 2009; Rojas, 2014). Overall, life-span research on suicide is sparse, and most life-course models focus on adolescents and young adults, thus neglecting the important processes that continue into later life (Crowell, Derbidge, & Beauchaine, 2014). Part of the explanation is that it takes time to obtain data from prospective longitudinal studies that cover the human life span from the cradle to midlife (Danziger et al., 2011; Mayer, 2009).

#### *Childhood social isolation and suicide in adulthood – articulating the relation*

The main critique presented by Van Orden and colleagues (2010, p. 11) takes the form of two interrelated questions, which the tradition linking social isolation to suicide has not been able to answer endogenously, namely: how is it that thwarted social belongingness sometimes leads to pro-social behavior and at other times to acts of suicide? Or more specifically, at what point does thwarted social belongingness lead to suicidal thoughts?

Van Orden and colleagues (2010, p. 11) acknowledge the empirical results presented in previous studies, that severely thwarted belongingness, that is, perceiving that meaningful and mutually supportive connections are

completely absent, is related to suicide, but they cannot see how an unmet need to belong constitutes the specific interpersonal need involved in the desire for suicide. Thwarted belongingness has been shown, for example, to produce increased attention to stimuli relevant to belongingness and increased motivation to connect with others (Van Orden et al., 2010). Furthermore, research from their own laboratory group suggests that suicidal ideation is only found among those experiencing thwarted social belongingness when this is experienced concurrently with perceptions of burdensomeness, that is, beliefs that the self is so flawed as to be a burden on others (Van Orden & Joiner, 2013; Van Orden et al., 2010).

Perceptions of burdensomeness on others are suggested to develop from negative life events, such as unemployment, family conflicts and incarceration. Moreover, according to Van Orden and colleagues (2010), to die by suicide, individuals must diminish their natural fear of death. Thinking that one is incapable of suicide is an important protective factor. A history of self-harm or other painful and provocative experiences are suggested to be key ways through which individuals lower their restraints against committing suicide. In short, Van Orden and colleagues (2010) argue that for a suicide to occur due to social isolation, perceptions of burdensomeness and an acquired capability for suicide must also be present, ultimately arguing for a three-way interaction between these three conceptual constructs.

From a life-course perspective, and given that Van Orden & colleagues (2010) are exclusively concerned with prolonged thwarted social belongingness ("chronic loneliness"), a process that might start at a very early stage of the life span, one could argue that exposure to negative life events and experiences throughout the life course (e.g., unemployment, and self-harm, respectively) ultimately moderates any relationship between childhood social isolation and suicide in adulthood. Such a hypothesized moderator effect is in line with the accumulation model within the life course literature (Kuh et al., 2003), which researchers have tended to test through the use of multiplicative models as a means of exploring for "cumulative disadvantage" processes (DiPrete & Eirich, 2006).

The available evidence in this respect is inconclusive. This is of course related to the fact that Van Orden & colleagues (2010) interpersonal theory on suicide has hitherto not been tested using longitudinal data covering childhood social isolation and suicide in adulthood (Chu et al., 2017). Having said this, several recent prospective

cohort studies by Rojas (2014) have shown that lethal/attempted suicidal behavior in adolescence and young adulthood can be traced back to perceptions of being mostly alone at age 12-13 (Rojas, 2012, 2013, 2014; Rojas & Stenberg, 2010). Following Bourdieu's (2000) reformulation of Durkheim's social integration proposition, namely that the propensity to commit suicide varies inversely with the degree of social recognition, Rojas (2014) has argued that social isolation (as an expression of a lack of social recognition) in childhood might in itself be detrimental to the individual's subsequent suicide risk. However, since none of Rojas's studies consider suicidogenic risk factors that might occur between the time of the exposure to social isolation in childhood and the follow-up period for suicide later in the life span, he has been unable to empirically disentangle the degree to which the suicidogenic effect of self-rated loneliness in childhood is direct or indirect (that is, conditioned by other negative life events across the life course) (cf., Rojas, 2014).

#### *Objective and research questions*

The objective of the present study is to explore the relationship between social isolation and suicide from a life-course perspective. More specifically, and following the literature referred to above, I ask whether self-rated loneliness in childhood is related to suicide in early and middle adulthood, and if so, whether the relationship in question interacts with experiences of perceived burdensomeness and acquired capability for suicide during emerging adulthood.

#### **Method**

##### *Study Population*

The data are drawn from the Stockholm Birth Cohort Study (SBC), created in 2004/2005 by a probability matching of two previously anonymized datasets: the Stockholm Metropolitan Study and the Swedish Work and Mortality Database. The Stockholm Metropolitan Study includes all children born in 1953 who were living in the Greater Stockholm metropolitan area in 1963 (N = 15,117). The Swedish Work and Mortality Database in turn comprises all individuals in the Swedish population who were alive and resident in Sweden in 1980 and/or 1990. The matching procedure, was based on an algorithm that compared the Stockholm Metropolitan Study and the Swedish Work and Mortality Database on the basis of a set of variables that were included in both datasets, and resulted in 14, 294 (7,305 men and 6,989 women) matched observations (for further details about SBC please see Stenberg & Vågerö, 2006; Stenberg et al., 2007).

The life situation of these individuals has been repeatedly assessed over time using standardized interviews and surveys and data from public registers. The main sources of information of the study at hand are a school survey conducted in 1966, maternity delivery records (1953), municipal files on means-tested social assistance (1953-1965), the Hospital Discharge Register (1981), the National Census (1980), the National Crime Register (1980) and the Cause of Death Register (1981-2008). However, since the delivery records and data for social assistance are available only for Stockholm this study is restricted to those in the Stockholm Birth Cohort study who were registered in the metropolitan area at birth and living in the Greater Stockholm metropolitan area in 1963. The final sample size, also due to missing data (mainly in the 1966 school survey), amounted to 9,502 individuals with full data for all variables (see Table A1, Appendix A for further descriptive statistics). In order to include as many suicide cases as possible, to facilitate the inclusion of both women and men in the analysis, this study makes use of all the available mortality data for the follow-up period of the Stockholm Birth Cohort study, i.e. from 1981 to 2008. Thus the study is focused on suicide between the ages of 28 and 55. This age span is very much in line with what is usually understood as early and middle adulthood suicidality (Maris, Berman, & Silverman, 2000; Stillion & McDowell, 1996). Furthermore, according to the conception of adult development during the start of the available follow-up period (Levinson, 1986), the age of 28 was thought to constitute an important developmental break point from emerging adulthood.

#### *Analytical strategy*

Binary outcomes are generally studied by means of logistic regression. However, by comparison with linear regression, logistic regression models are not invariant to the unconditional mean of the dependent variable. As a result, logistic regression is particularly sensitive to situations in which the event of interest is rare (King & Zeng, 2001). Sparse-data bias can occur in both small and large samples, resulting in inflated odds ratio estimates and disproportionately wide confidence intervals (cf., Devika, Jeyaseelan, & Sebastian, 2016). Because the event of interest in this study is rare, in the sense that the proportion of suicides in the data is lower than 5% (cf, King & Zeng, 2001), the relationship between the focal/moderator/control variables and suicide has been estimated by means of logistic regressions that use penalized maximum likelihood estimations (firthlogit), as proposed by Firth (1993), instead of the commonly used

maximum likelihood estimations. Stated simply, the firthlogit technique uses Firth's method to impose a bias term on the standard likelihood function that is sensitive to a small number of events, ultimately reducing the estimates towards zero (Devika et al., 2016; Firth, 1993; Gim & Ko, 2017; Heinze & Schemper, 2002; Hilbe, 2009). It is worth noting that scholars are currently recommending the use of penalized likelihood estimations rather than conventional maximum likelihood estimations for logistic regression, irrespective of the sample size (Devika et al., 2016). The firthlogit technique is available as a subroutine in STATA (Coveney, 2008; Hilbe, 2009; StataCorp, 2015), and has been used to deal with situations in which rare events are endemic to the data both in relatively small ( $N = 73$ ) and in large ( $N = 763,347$ ) study populations (cf., Devika et al. 2016 and Rojas and Stenberg 2016, respectively).

In order to assess the degree to which perceptions of burdensomeness and an acquired capability for suicide moderate the relationship between social isolation and suicide, the plan is to include both two-way and three-way interaction terms in the models. However, since a three-way interaction is ultimately a two-way interaction that varies across levels of a third variable (Jaccard, 2001), three-way interaction terms will only be included if some of the two-way interaction terms turn out to be statistically significant.

Social isolation, measured at age 12-13 (1966), is the focal variable in the analysis and will therefore be the first variable to be related to suicide in early and middle adulthood (1981-2008). Controls for possible bias in this relationship will then be introduced in the form of diverse indicators of early life stress measured at an even earlier stage of the life span (1953-1965). All moderator variables are measured as close as possible to the initial year (1981) of the follow-up period for suicide, which is during the final years of emerging adulthood, and these will therefore be introduced in the final part of the analysis.

#### *Dependent variable: Suicide*

During the study period, the Swedish Cause of Death Register has employed three different revisions of the International Classification of Diseases (ICD), the 8th (1981-1986), 9th (1987-1996) and 10th (1997-2008). Suicide is defined as an external cause of death that, for the period 1981-1996 (i.e., in accordance with ICD-8 and ICD-9), has been coded as either suicide and self-inflicted injury (E950-E959) or an injury where it is undetermined whether it was accidentally or purposely inflicted (E980-E989), and that for the period 1997-2008 (i.e., in accordance with ICD-10),

has been coded as either intentional self-harm (X60-X84) or an event of undetermined intent (Y10-Y34) (cf., Rojas & Stenberg, 2010, 2016).

*Focal variable: social isolation*

Social isolation is measured in the form of self-rated loneliness. More specifically, the measure used here is the child having responded "I am mostly alone" to the question "With whom do you spend most of your time?" in the 1966 School Survey. This measure has been used in earlier life-span studies on childhood disadvantage and interpersonal violence and suicidal behavior in adolescence and young adulthood (cf., Rojas, 2012, 2013, 2014).

The individual's understanding of loneliness varies with developmental changes of both a psychological and social nature (Parkhurst & Hopmeyer, 1999). For example, it has been suggested that although children as young as five years of age have an understanding of loneliness, it is of a rather rudimentary nature since they cannot yet appreciate that one can be 'lonely in a crowd', or even when with significant others (cf., Asher & Paquette, 2003). Of relevance for the present study is the fact that elementary school children are known to describe their sense of loneliness in terms of aloneness. In other words, a child's subjective appraisal, or feeling that he/she lacks a connection with others, which in this case takes the form of a subjective estimation of being mostly alone (as opposed to being mostly with other children or adults), simultaneously encompasses the notion of both loneliness and social isolation, at least at this stage of the life span (cf., Burgess, Ladd, Kochenderfer, Lambert, & Birch, 1999; Parkhurst & Hopmeyer, 1999; Rojas, 2014). Furthermore, the single Swedish word "ensam", which is also the word used in the response alternative provided to the child in the 1966 School Survey ("I am mostly 'ensam'"), "refers to both being alone and feeling lonely" (Tornstam, 1990, p. 259).

*Moderator variables: perceived burdensomeness and acquired capability for suicide*

The moderator variables have been measured in accordance with the analytical strategy described above. Three different indicators are used to capture perceptions of burdensomeness, namely employment status, marital status and criminality (cf., Van Orden et al., 2010). Employment status is defined as being registered as employed, not employed or a student in the 1980 census. Marital status is also measured using the 1980 census and is defined as being married, unmarried or divorced/widowed. Criminality is measured using

the National Crime Register and is defined as being registered for a crime in 1980. Acquired capability for suicide is in turn measured using two different indicators: i) history of mental disorder or parasuicide and ii) other painful and provocative experiences (cf., Van Orden et al., 2010). The first indicator is defined as being recorded in the Swedish inpatient care register as having been discharged at least once in 1981 with either a mental disorder as a main diagnosis (ICD-8: 290-315) or an e-code for parasuicide (ICD-8: E950-E959; E980-E989). The second indicator is defined as having been discharged at least once during 1981 with an accident or other external cause of injury registered in the same inpatient care register, (ICD-8: E800-E949; E960-E979; E990-E999), parasuicide excluded.

It is worth noting that unemployment, family conflicts, mental disorders and past suicide attempts are, in addition to social isolation, among the most consistent and robust risk factors for suicide (Van Orden et al., 2010).

*Control variables – early life stress*

Early life experiences of stress are currently considered one of the most powerful psychosocial influences on health in modern society, suicidal behaviour included (Wilkinson, 2005). The individual's emotional development (e.g. personal insecurity) is assumed to be highly dependent on early life stressors such as prenatal maternal stress and postnatal social and family problems in the family of origin. In this study, prenatal maternal stress is measured using birthweight and a proxy for having been single during pregnancy, that is, the mother living alone at the child's birth (cf., Wilkinson, 2005). Family rupture, as an indicator of family problems, is defined as the father or mother no longer living in the household or the child having new parents, and is measured via a comparison between the Register of Population and Income in 1964 and information from the Occupational Data Register of 1953 (cf., Rojas, 2012). Social welfare reciprocity, as a form of social problem, is defined as "Short-term/sporadic" and "long-term/recurrent" social welfare reciprocity and coded as all those who grew up in a family which received means-tested benefits in at least 1-2 years and 3 or more years respectively, between 1953 and 1965 (cf., Rojas & Stenberg, 2010). This study also controls for gender (women/men).

**Results**

The results from the penalized logistic regression analysis are presented in Table 1. In Model 1, one can see that social isolation during childhood is significantly related to early and middle adulthood

Table 1. Penalized maximum likelihood logistic regression of childhood social isolation and early and middle adulthood suicide in the Stockholm Birth Cohort 1981-2008.

Variable	Model 1 Crude OR (95% CI)	Model 2 Adjusted OR (95% CI)	Model 3 Adjusted OR (95% CI)	Model 4 Adjusted OR (95% CI)
<b>Focal Variable (childhood)</b>				
Social isolation (1966)				
Mostly alone	2.47 (1.15-5.30)*	2.70 (1.25-5.83)*	2.36 (1.08-5.16)*	2.38 (1.09-5.20)*
Mostly with other people <sup>a</sup>	1.00	1.00	1.00	1.00
<b>Control variables (early life)</b>				
Prenatal maternal stress (1953)				
Single during pregnancy		1.07 (0.46- 2.50)	1.03 (0.44- 2.41)	1.09 (0.46-2.56)
Other <sup>a</sup>		1.00	1.00	1.00
Birth weight (1953)				
45 – max hg		0.61 (0.12-3.12)	0.65 (0.13-3.33)	0.67 (0.13-3.43)
1-24 hg		2.37 (0.90-6.28)	2.57 (0.97-6.82)	2.66 (1.00- 7.05)
25-44 hg <sup>a</sup>		1.00	1.00	1.00
Social problem (1953-1965)				
Social welfare reciprocity				
3 or more years		2.14 (1.09-4.19)*	1.64. (0.83-3.25)	1.54 (0.77-3.08)
1-2 years		0.76 (0.25-2.28)	0.68 (0.22-2.03)	0.63 (0.21-1.90)
0 years <sup>a</sup>		1.00	1.00	1.00
Family problem (1953-1964)				
Family rupture				
		1.16 (0.49-2.76)	1.29 (0.55-3.06)	1.35 (0.57-3.20)
Other family constellations <sup>a</sup>		1.00	1.00	1.00
Gender				
Male		2.15 (1.28- 3.61)*	2.32 (1.33-4.04)*	2.21 (1.27-3.84)*
Female <sup>a</sup>		1.00	1.00	1.00
<b>Moderator variables (emerging adulthood)</b>				
<i>Perceptions of burdensomeness (1980)</i>				
Employment status				
Not employed			4.06 (2.16-7.62)*	3.46 (1.79-6.69)*
Student			2.35 (1.07-5.17)*	2.29 (1.04-5.05)*
Employed <sup>a</sup>			1.00	1.00
Marital status				
Unmarried			1.76 (0.91- 3.43)	1.68 (0.86-3.27)
Divorced/widowed			3.61 (1.18-10.98)*	3.39 (1.10-10.45)*
Married <sup>a</sup>			1.00	1.00
Criminality				
Convicted of a crime			3.99 (1.72-9.25)*	3.21 (1.31-7.87)*
Other <sup>a</sup>			1.00	1.00
<i>Acquired capability for suicide (1981)</i>				
Parasuicide and/or mental disorder				
				4.10 (1.40- 12.07)*
Other <sup>a</sup>				1.00
Accident or other external cause of injury (parasuicide excluded)				
Other <sup>a</sup>				2.83 (0.67- 11.94)
				1.00

<sup>a</sup> Reference category

\*Statistically significant (at the 5 % level)

suicide, with a corrected OR of 2.47. In other words, children who experienced themselves as being mostly alone were approximately two and a half times as likely to commit suicide as those who rated themselves as being mostly with other people. As can be seen in Model 2, this relationship is somewhat strengthened when adjusted for gender and early life stressors (cf. OR = 2.47 with OR = 2.70). However, the effect of self-rated loneliness does not vary with any of the newly introduced variables; none of the multiplicative terms used to check for possible interaction effects were statistically significant.

When perceptions of burdensomeness, measured using three different indicators, are included in the analysis, the effect of social isolation on suicide remains significant but decreases somewhat in strength, from an OR of 2.70 to one of 2.36 (see Model 3). This relationship is not moderated by perceptions of burdensomeness, since none of the multiplicative terms introduced in the model to check for interactions between each of the indicators of burdensomeness and social isolation showed themselves to be significant.

In the final model, two additional variables are introduced into the analysis as two separate indicators of acquired capability for suicide. The effect of social isolation remains practically the same, culminating in an odds ratio of 2.38, and continues to be statistically significant. The relationship between social isolation and suicide is not moderated by the newly introduced variables in this case either. Hence, no further analysis using three-way-interaction terms between social isolation, perceptions of burdensomeness and acquired capability for suicide, was pursued.

### Discussion

Reducing the risk of suicide is an important public health issue (WHO, 2014). In fact, in a 2007 bill: "En förnyad folkhälsopolitik" (Proposition, 2007/08:110) the Swedish government adopted a zero vision for suicide, stating that no one should find themselves in a situation where committing suicide is perceived as the only solution. Nevertheless, approximately 1,500 persons still take their own lives each year in Sweden (Rojas, 2014). A crucial element in reducing suicide, besides monitoring its prevalence and trends, and the development, implementation and evaluation of effective strategies and interventions, is to identify the associated risk and protective factors, that is, to conduct research to find out why suicidal behavior occurs and whom it affects (WHO, 2014). The current study has set out to deepen our understanding of the suicidogenic effects of social isolation, one of the strongest and most reliable

predictors of suicide, by applying a recent conceptual reformulation of the relationship between social isolation and suicide to a life-span context. The results suggest that suicide in early and middle adulthood (age 28-55 years) can be traced back to perceptions of being mostly alone at age 12-13, irrespective of other well-established suicidogenic risk factors measured both prior and subsequent to the measurement of social isolation. This effect has previously been found for lethal/attempted suicidal behavior in adolescence and young adulthood (Rojas, 2012, 2013, 2014; Rojas & Stenberg, 2010), but this is to the best of my knowledge the first time that this can also be said to hold true, in a large-scale, prospective sense, for suicide later in the life span (cf., Danziger et al., 2011; Rojas, 2014).

These results differ from those of recent comparable cohort studies (e.g., Danziger et al., 2011), which show that suicide in adults and in the elderly may be influenced by a different combination of factors from those that influence suicide in adolescence and young adulthood, with early life risk factors such as fetal growth being displaced in importance by suicidogenic risk factors that arise in adult life, e.g., marital status (Danziger et al., 2011). This is also in line with part of the theoretical assumptions outlined at the outset of this study, which stated that any relationship between childhood isolation and suicide in early and middle adulthood would be conditioned by negative life events, such as unemployment and divorce, or by painful and provocative life experiences, such as inpatient care for parasuicide or mental disorders, later in the life span. However, as we have seen, the data failed to confirm this pattern. Instead, social isolation in childhood showed itself to be related to suicide in early and middle adulthood above and beyond any effects produced by disadvantageous life experiences of this kind during emerging adulthood. Nor did experiencing prenatal maternal stress, social problems or family rupture in the family of origin, prior to the time of the experience of social isolation, change the nature or the significance of this statistical relationship.

By considering several stages of the life span, this study has been able to actually test a key assumption of the cumulative disadvantage hypothesis, namely that although the imprint of early life may be substantial, even for understanding outcomes such as premature mortality, there are many ways to modify (for better or for worse) the deleterious chain of events that results from early life inequalities (cf., Ferraro & Shippee, 2009). The cumulative disadvantage hypothesis has been found to be well suited to

understanding how a person's position in relation to the threshold for a particular life standard (e.g., adulthood poverty) is related to different levels of resources at earlier stages of the life span (Bäckman & Nilsson, 2011). However, as we have seen, this mechanism does not seem to be the one at work here. The social imprint hypothesis, also an important notion within life-course theory, appears instead to be more applicable in this case, since it assumes that people who have experienced adverse social conditions during childhood are, independently of any indirect or direct effects on ill health or their life career, more vulnerable to risk exposure and stress in adulthood, provided the adverse social conditions in question are sufficiently severe (Bäckman & Nilsson, 2011; Bäckman & Palme, 1998).

Previous studies based on the same measure of self-rated loneliness as the one used in this study have argued that a complete lack of social recognition, that is, being made invisible or neglected, which is the essence of loneliness, is in itself a sufficiently severe detrimental early life condition that may have long-lasting suicidogenic effects (cf., Rojas, 2012, 2013, 2014; Rojas & Stenberg, 2010). After all, in its most concrete and rudimentary form, being considered, expected and solicited are all basic prerequisites for feeling significant to others, and, therefore for being important in oneself, feelings which protect the individual against steadily questioning the sense of her/his existence (Bourdieu, 2000; Rojas, 2014). This notion of social isolation as being mainly a question of social acceptance, where being excluded from important social relations is seen as a threat to our sense of purpose, is also found in the most recent neuroscientific and psychological literature on loneliness (cf. Cacioppo & Patrick, 2008).

*Nuancing the suicidogenic effect of social isolation: the pain of not being socially recognized*

Although Van Orden & colleagues' (2010) theory of social isolation and suicide is not explicitly formulated within a life-course framework, and thus cannot be argued to have been falsified here, the fact remains that childhood social isolation appears to have a lasting suicidogenic effect across the life course, irrespective of later exposure to perceptions of burdensomeness or an acquired capability for suicide. Hence, if, on the one hand, one agrees with Van Orden & colleagues (2010) that the tradition of social isolation and suicide has been unable to satisfactorily answer why it is that thwarted social belongingness sometimes leads to pro-social behavior and at other times to the suicidal act, and on the other hand one assumes

that social isolation is in itself related to suicide (as suggested by the results presented here), the answer to this question may lie in a different understanding of social isolation.

Following the French sociologist Pierre Bourdieu's (2000) reformulation of Durkheim's social integration proposition, Rojas (2014) has recently argued that the relationship between social isolation and suicide can be re-conceptualized in terms of a lack of social recognition. Within this framework, the fact that the pain of loneliness is primarily directed towards enhancing the individual's endeavors to belong must be viewed in relation to the way in which human beings' identities are formed. The individual's personal identity is based on an implicit bargain in which self-regulation is exchanged for social recognition, since it is social recognition that imbues life and death with meaning for the individual. This is also why we are willing to renounce immediate gratification, self-interest and other goals in the pursuit of long-term relational outcomes, just as we would for food and water.

In short, the question of at what point the pain of loneliness becomes suicidogenic must include the notion of fairness, that is, the condition under which the result of the implicit bargain between our bodies and social recognition is no longer deemed acceptable. According to the social recognition framework (Rojas, 2014), the pain resulting from loneliness goes from being bearable to intolerable when it is experienced in conjunction with the perception that one's understanding of oneself is not being recognized or accepted (cf. Honneth, 2002, 2003). This is also why the suicidal act can be seen as an act of resistance. However, this interpersonal, cognitive, affective state of unfulfilled recognition is not to be regarded as being separate from the concept of social isolation. On the contrary, social isolation, when perceived as absolute and unyielding, is by definition a state in which the individual is being rendered invisible by his/her fellow human beings and is thus ultimately being deprived of the possibility of receiving any type of social recognition whatsoever, which disturbs the very foundation of the bargain on which our social identity is based (Rojas, 2014).

**Limitations**

Three main methodological limitations should be borne in mind when interpreting the results of this study. Firstly, as with all life-course cohorts, the effects of early life factors on the subsequent suicide risk noted here may not be generalizable to other birth cohorts. Besides possible cohort effects, period effects may also limit the

generalizability of the results. The study population grew up during a period of changing social patterns with regard to social relations and social roles, which expressed themselves not only in rising suicide rates but also in rising rates of homicide, manslaughter and other types of criminality, especially youth criminality, and in rising alcohol and drug consumption (Lindén, 1993). However, the available age, period and cohort analyses of suicide rates in Sweden during this period do not provide any clear evidence of a specific cohort or period effect (Allebeck, Brandt, Nordstrom, & Åsgård, 1996; Chauvel, Leist, & Ponomarenko, 2016).

Secondly, loneliness has a negative connotation and carries a significant social stigma (de Jong Gierveld, Van Tilburg, & Dykstra, 2006; Lau & Gruen, 1992). The use of direct single-item questions with an explicit reference to loneliness, that is, containing the word “lonely” or “loneliness”, is therefore widely criticized for having a bias towards underestimating the problem, especially among men. Multi-item loneliness scales that contain no explicit reference to loneliness (e.g. the UCLA Loneliness Scale (Russel, Peplau, & Cutrona, 1980)) are seen by some as a more appropriate instrument for measuring this phenomenon (de Jong Gierveld et al., 2006). Having said this, these two forms of children’s loneliness before the age of 12-13. However, even if we assume that the etiology of suicidal behavior in early and middle adulthood starts at an even earlier stage of the life span, loneliness and interpersonal isolation in middle childhood may very well be an important mediating factor in its own right, and one which needs to be taken into account in order to fully understand this type of behavior later in life (cf, Fresán et al., 2004; Johnson et al., 2002; Rojas, 2014).

### Conclusion

Suicide in early and middle adulthood is related to rating oneself as being mostly alone at age 12-13. This detrimental impact of childhood social isolation is independent of other consistent and robust suicidogenic risk factors measured both at an earlier - i.e., prenatal stress, social welfare reciprocity and family rupture - and later stage of the life span - i.e., unemployment, divorce, mental disorder and parasuicide. Thus the perception of being mostly alone as a child should be treated as a major adverse social condition in its own right, and as having the potential to explain even distal outcomes across the life span. Having said this, further studies are needed to confirm these findings.

measurement have been shown to be significantly correlated with each other (cf., Stack, 1998), which suggests that findings about loneliness are by and large the same, irrespective of whether one uses a direct or an indirect approach (Rojas 2014). Furthermore, developed loneliness scales have in their turn been criticized for not actually taking into account the experience of loneliness (cf., Kirova, 2003). Hence, although the self-rated measure of loneliness in the current study makes an explicit allusion to the concept of loneliness (i.e. containing a word that refers to both being alone and feeling lonely [ensam]) it is presented as one of a number of alternative answers (—I am mostly alone [ensam]) to the main question —With whom do you spend most of your time? It may thus be viewed as a reasonable compromise between the direct and indirect approaches, as discussed above (Rojas 2014).

Thirdly, the self-rated measure of loneliness used in this study is cross sectional in nature and is aimed at capturing the child’s involvement with others in the present or recent past (Rojas, 2014). That is, although one can speculate about the degree to which the measure has the potential to capture a process of social isolation that has started even earlier in the lifespan, this study can strictly speaking not say anything about these

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### Appendix A

Table A1. Distribution of dependent and focal/moderator/control variables included in the final model

Variables (%)	Respondents (n=9,502)
<b>Dependent Variable</b>	
Suicide	0.68
<b>Focal Variable (childhood)</b>	
Social isolation (1966)	
Mostly alone	4.98
<b>Control variables (early life)</b>	
Prenatal maternal stress (1953)	
Single during pregnancy	7.96
Birth weight (1953)	
1-24 hg	3.01
25-44 hg	93.61
45- hg	3.38
Social problem (1953-1965)	
Social welfare reciprocity	
3 or more years	9.45
1-2 years	7.44
0 years	83.11
Family problem (1953-1964)	
Family rupture	7.26
Gender	
Women	49.94
<b>Moderator variables (emerging adulthood)</b>	
<i>Perceptions of burdensomeness (1980)</i>	
Employment status	
Not employed	8.73
Student	6.09
Employed	85.18
Marital status	
Unmarried	65.84
Divorced/widowed	3.19
Married	30.97
Criminality	
Convicted of a crime	1.63
<i>Acquired capability for suicide (1981)</i>	
Parasuicide and/or mental disorder	0.74
Accident or other external cause of injury (parasuicide excluded)	0.87