Published in final edited form as:
*Suicide Life Threat Behav*. 2013 August ; 43(4): 439–459. doi:10.1111/sltb.12029.

# Adolescent suicidal trajectories through young adulthood: Prospective assessment of religiosity and psychosocial factors among a population-based sample in the United States

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## Introduction

Growing evidence indicates that participation in religiosity and spirituality leads to improved health outcomes (Smith, 2003; Silbereisen & Lerner, 2007; Szafarski et al., 2006). Accordingly, this evidence has heightened interests in youth programming and assessment of religious records in routine clinical encounters (Eichelman, 2007; Hackney & Sanders, 2003). In the United States (U.S.) much of the population surveyed over the years report religion is important to their lives and a substantial majority indicates being affiliated with one or more religious groups (Gallup Pool, 2009). However, in spite of high moral objections to suicidal behaviors among many religious groups (Dervic et al., 2006; Lizardi et al., 2008), suicidal behaviors among adolescents in the United States have become an intractable social menace (Pompili, 2010). Suicide among adolescents is the third leading cause of mortality among the age group 15–24, and further suicidal behaviors (suicidal thoughts, suicide planning and suicide attempts) in this age group are strong correlates of completed suicide (Kessler et al., 2005).

Significant gender differences in suicidal behaviors have been observed to indicate that boys are more likely to die by suicide and to experience severe medical outcomes for suspected suicide attempt, while girls experience higher suicidal thoughts and attempts (Lewinsohn, Rhode, Seeley & Baldwin, 2001; Spiller, Appana & Brock, 2010). Suicidal behaviors also show considerable disparities among individuals over time. A number of studies have identified specific suicidal trajectories or subgroups with risks that vary across different social contexts over time (Prinstein et al., 2008). There is thus a need to identify youth at risk as a way of preventing future suicides.

Multiple studies have shown that not all adolescents with suicidal risks become suicidal or even develop mental health sequelae in early or late adulthood (Joiner, 2002; Prinstein et al., 2008; Rueter, Holm, McGeorge & Conger, 2008). This is consistent with the observation that suicidal behaviors in adolescence often occur as fleeting thoughts associated with the stage of development, but changes as the individual enters adulthood (Kjøller & Helweg-Larsen, 2000; Tarrier et al., 2006). Likewise, it is well established there other subgroups of adolescents who experience suicidal thoughts and continue on a persistent suicidal pathway

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in adulthood, yet others experience neither these behaviors in adolescence nor in adulthood (Rueter et al., 2008; Prinstein et al., 2008; Steinhausen, Bösiger, Metzke, 2006). In that situation, suicidality from adolescence to early adulthood may have different antecedent causative factors associated with each stage of development. These findings have yet to be replicated with a large population-based sample. It is instructive to note that individuals with persistent suicidal thoughts over time accrue courage for mental rehearsal of suicide attempts or completed suicide (Joiner, 2002).

Although early suicidal behaviors are known to affect later suicide attempt or ideation, there are other important baseline risks or protective factors. These include religiosity, social support from the social contexts and personality characteristics (self-esteem), each of which has not been consistent in providing a significant understanding for later suicidal behavior trajectories. Many of these studies are also limited by their overreliance on growth curve modeling which assumes homogeneity of response and average growth trajectories, even though some previous studies have suggested heterogeneity in the pattern of adolescent suicidal behaviors and antecedent suicidal risks (Brame, Nagin, & Tremblay, 2001; Jung & Wickrama, 2007). Covariate effects have also been considered to be the same on all individuals with different suicidality. Finally, it is unclear when and how persistence of these thoughts progresses to suicidal attempts and possibly completed suicide during transition to young adulthood. Thus, there is a compelling need to gain greater insights of early developments of suicidal behaviors in order to guide preventive interventions with families, individuals or groups at higher risks of suicidality using comparable population-based evidence on developmental course from adolescence to adulthood.

Furthermore, some studies have shown that effects of psychosocial factors such as religiosity or spirituality set some individuals on certain trajectories involving reduced depression and suicidal behaviors (Eliassen, Taylor, Lloyd, 2005; Petts, 2009). Investigations of adolescent religiosity or spirituality indicate that this effect is marked by patterns of change and stability in religious activity behaviors in a manner to alter the course of suicidal behaviors over time. Religiosity effects on these transitions occur indirectly through provision of social resources and directly by modifying influences on behaviors, norms and values at different stages of adolescent development (Dew et al., 2010). These findings are consistent with the adult literature on positive impact of religiosity or spirituality on health and suicidal behaviors (Kessler et al., 2005). Several lines of research evidence are consistent with the explanation that higher religiosity or spirituality is inversely associated with suicidal behaviors at different stages of life. First, numerous studies have found religiosity and suicidal behaviors are more common among adolescents with no religious affiliation or low spirituality compared with those with high religiosity or spirituality (Cotton et al., 2006; Simonson, 2008). For example, Simonson (2008) noted that college students who feel hopeless and are contemplating suicide were less religious than those students who had never regarded suicide as an option in addressing stressful situations. This to him was an indirect affirmation of Durkheim's theory (Durkheim, 1951) that religion protects against suicide through the provision of network integration and regulation of social behaviors. In this regard, the social structure and web of relationships readily provide avenues for routing social resources and in enhancing individual members' conformity to acceptable social norms and behaviors. Participation in religious activities thus provides a

source of solidarity and an enhanced sense of belongingness for group members. Specific benefits for group members include integration in a system of social networks and provision of material, instrumental or emotional support that potentially buffers stressors linked to suicidal ideation and behaviors. Others speculate that such support received or perceived to be available from a religious network uniquely provide enduring positive impacts on future health behaviors and health outcomes (Ellison & Levin, 1998). In particular, individuals with strong social network resources and access are more likely to avoid violent suicidal behaviors and to improve health outcomes. Additional benefits accrued from these relationships relate to behavior monitoring and provision of advice in conformity with societal norms. Recent analyses also suggest that a religious affiliation with the greatest attendance by members has the largest protective influence on individuals' suicidal behaviors (Pescosolido & Georgianna, 1989; Williams & Sternthal, 2007). Higher religiosity and engaged social network also provides hope and builds trust for members (Markstrom, 1999). Likewise, Dervic et al. (2004) observes that individuals with no religious affiliations have a greater tendency for attempted suicide and more first-degree relatives attempting suicide than those individuals who are religiously affiliated. Second, the exercise of social control of health behaviors also occurs when religious members conform to social norms or are persuaded to obligate responsibilities of significant others in the network. Third, Rasic et al. (2009) confirmed the link between religiosity and suicide by noting that those who regarded themselves as being somewhat spiritual were significantly less likely to attempt suicide than those who did not consider themselves in that manner. Overall, controlling for social support in these studies led to a significant reduction in the effect of religiosity on suicidal behaviors. Fourth, Cotton et al. (2006) identified family and school connectedness to be related to adolescent risk behavior but social connections with a community of faith were found to be more important for reducing suicidal and other risky behaviors. In addition, investigators have also noted that adolescents with greater levels of social connectedness are less likely to indulge in high risk behavior even in the absence of perceived availability of social support. However, the extent to which social relationships modify other suicidal antecedent risk factors to predict an individual's suicidal trajectory in adolescence and in early or emerging adulthood over time is not well understood. Finally, existing research is inconclusive on the extent to which suicidal trajectories are modified by religiosity and psychosocial supports over time among the genders (Mazza & Reynolds, 1998; Williams & Sternthal, 2007). Importantly, investigators of these studies have emphasized the need for future studies to assess the effects of social support from different sources in determining suicidal behaviors during adolescence and in early adulthood (Galambos et al., 2004). Given the important roles of religion or spirituality as determinants of numerous health outcomes, evaluating effects on suicidal behaviors at distinct stages of adolescent development could provide increased avenues for reducing suicidality.

Past studies of adolescent suicidal trajectories have often focused mostly on childhood to early adolescents, that is, 10–14 years of age (Prinstein et al., 2008; Rueter, Holm, McGeorge, & Conger, 2008), used clinical samples or assessed only specific aspects of suicidality (Brezo, Barker, Paris, Hebert, Vitaro, Tremblay & Turecki, 2008) but the extent to which these trajectories are modified by known antecedent risks is unclear. The current study expands on existing knowledge by including religiosity and several known predictors

among different subgroups assessed at four different waves (time periods) from adolescence to young adulthood (20–34 years) using national datasets to determine whether certain suicidal patterns are more associated with negative psychosocial consequences than others. The aims of this study were to identify distinct trajectories of suicidal behaviors from adolescence to young adulthood, and to determine if we could predict a subgroup membership with religiosity and other contextual variables. Consistent with previous studies, we hypothesized that respondents with less active participation in religious activities or with limited social supports from the environmental contexts will be more prone to suicidal behaviors and that these effects would be greater on young adolescents compared with young adulthood (20–34 years).

## Methods

The National Longitudinal Study of Adolescent Health (Add Health survey) is one of the most comprehensive national surveys assessing features of social environment and individual characteristics affect changes in adolescents' health risks and behaviors over time and through early adulthood. Details of the study design and description are found in prior publication (Bearman, Jo, and Udry, 1997). Starting in 1994 with a representative sample of high school students in grades 7–12 in 134 schools nationwide, the survey followed a select sample for further in-home interviews in 1995 (Wave I, aged 11–19 years), 1996 (Wave II, 12–20 years), 2001–2002 (Wave III, aged 18–26 years) and 2007–2008 (Wave IV, aged 24–32 years). At Waves I and II (almost one year apart), students responded to a series of questions on health, sexual behaviors, friendships and social networks, romantic relationships, self esteem, suicidal behaviors, expectations for the future and other contextual factors that could potentially impact on their lives. On most sensitive topics, respondents listened to prerecorded questions and entered their responses directly onto a laptop computer. In Wave III, when adolescents were 18–26 years, the focus of the questions was more on experiences and decisions related to health and social outcomes. In Wave IV respondents were 24–32 years old and assuming adult roles and responsibilities. Respective response rates from the original participants were 78.9%, 88.2%, 77.4%, and 80.3 for Waves I, II, III and IV. Present analyses were based on 9421 participants for whom there were complete information across all four waves of data collection. The weighted sample used in this analysis thus consists of ≈ 53% females and 47% males; and the racial composition was: 68% White, 14% Black, ≈ 11% Hispanic, ≈ 6% others in different racial groups. Analyses included complex survey design features of the study to account for clustering, stratification and differential sampling weights applied. The Institutional Review Board of the University of Northern Colorado, Greeley approved this study.

### Measures

**Suicidal behaviors—**Specific question item on suicidal ideation at each wave was "During the past 12 months, have you ever seriously thought about committing suicide?" Likewise the suicide attempt question was, "During the past 12 months, how many times have you actually attempted suicide?" with response counts as none, once, twice, 3 or 4, >5. In the first stage of the analysis, we used these responses to create suicidal ideation and suicide attempt variables across all four waves of data collection to assess separate

trajectories of suicide ideation and suicide attempt behaviors among respondents. In the second stage of the analysis, we used this same information to construct mutually exclusive measures of suicidal behaviors for each developmental interval as: respondents exhibiting suicidal behaviors across all waves of data collection (8.90%); Suicidal behaviors only in adolescence (11.52%); Suicidal behaviors only in young adulthood (6.31%); and no suicidal behavior across all four waves (69.45%). That is, this stage involved the assessment of changes in suicidal behaviors across Waves I (11–19) and II (age range 12–20); Waves III (18–26) and IV (24–32) and suicidal behaviors across all four waves.

**Religiosity—**Wave I religiosity was measured with items reflecting frequency of religious attendance, prayers and importance of the religious faith. *Importance of religion*: This item assesses the importance of religion in the daily lives of adolescents. The question was "How important is religion to you" Response options indicating "very important" and "fairly important" were combined as important and "fairly unimportant" and "not important at all" were constructed as unimportant. Spirituality was measured with the number of times an adolescent prays. The variable was categorized as *highly spiritual* (prays at least once a day), *moderately spiritual* (prays at least once a week or a month and less), and *non-spiritual* (never prays) consistent with previous studies (Nonnemaker, McNeely & Blum, 2003). Religious service attendance frequency was categorized as *frequent attenders* (adolescents attending church activities at least once a week); *infrequent attenders* (attends a religious service once or twice a month) and *non-attenders* (never attends any religious gathering). These measures reflect the multidimensional construct of religiosity variable. We avoided a composite measure since it often leads to loss of information (D'Onofrio et al., 1999; Dew, Daniel, Armstrong, Goldston, Triplett & Koenig, 2008).

General social support was measured on a 5-point scale assessing the extent to which adolescent felt availability of care and support from adults, teachers, parents, peers and friends. Support satisfaction was rated on a scale ranging from 1 (not at all) to 5 (very much) with a reliability measure of Cronbach's coefficient $\alpha$=0.96. Support from parents was separately assessed and thus reflects perceived availability of support from mother or father (Cronbach's coefficient $\alpha$ for mother's and father's support were 0.85 and 0.87 respectively). A summary score was created for both support categories, and in the analysis stage we categorized these scores into quartile values with higher quartiles indicating higher support. Self esteem was assessed with 6 items from the Rosenberg Self Esteem (RSE) scale (Gray-Little, Williams & Hancock, 1997) and consists of items indicating personal qualities, accepting oneself and being accepted by others on a 5-point scale (Cronbach coefficient $\alpha$=84). A summary index was also created, with higher scores indicating lower self esteem.

Wave I depressive disorders were based on a modified version of the Center for Epidemiologic Studies Depression Scale (CES-D), a widely used measure for depressive symptomatology (Radloff, 1977). Each item asks respondent about his or her feeling in the past week (19 items, $\alpha$=.87 such as "You were bothered by things that usually don't bother you"). In the scale used for this study, four items were reverse coded (according to the original CES-D guidelines-Huba et al., 1995) and all items summed on a 4-point scale ranging from 0 (never or rarely) to 3 (most of the time or all of the time) for analyses, yielding an overall score ranging from 0 to 57. A cutoff point of 24 was used to define

depressive disorders among the adolescent population, consistent with earlier studies (Chabrol, Chouicha & Duconge, 2002; Zuckerbrot & Jensen, 2006). However, in the analysis stratified by gender, cut off points of 22 and 24 were used to define major depressive disorders for boys and girls respectively in keeping with the *Diagnostic and Statistical Manual for Mental Health, Third edition (APA, 1985*).

## Statistical Analysis

We first examined the cross-sectional relationships among our primary variables across four waves of data collection using Rao Scott chi square for weighted data before assessing suicidal trajectories. A trajectory model patterns of change over time in the outcome variables (suicidal ideation and suicide attempt), and further identify subgroups in the sample that follow distinct patterns of behavior across different time periods (Tremblay, Nagin, Séguin, Zoccolillo, Zelazo, Boivin et al., 2004). We used the SAS program (SAS institute, Cary, NC) 'Proc Traj' (Jones, Nagin& Roeder, 2001) to identify distinct trajectories of suicidal ideation and suicidal attempts (Jones & Nagin, 2007). The procedure is a semi-parametric growth mixture model that groups distinct individuals belonging to different developmental trajectories in a sample, using posterior probability to assess group membership on outcome variables (Nagin & Tremblay, 1999). In this analysis, we treated the dependent variables (suicide ideation and suicide attempt at each time period) as a logit function predicted by mean age at each survey period. We initially identified a separate trajectory class for each outcome variable, and then evaluated associations with main covariates. Each outcome variable was set to a cubic polynomial (intercepts, slopes and quadratic trends) to model a link with the mean ages of survey respondents (independent variables). Maximum Bayesian Information Criterion (BIC) was used to determine number of trajectories and the best model fit. In our case, best convergence was achieved with the cubic polynomial. To assess the influence of risk and protective factors associated with suicidal trajectories over time, we analyzed a trajectory of groups with baseline predictors hypothesized to be associated with suicidal behaviors at different mean ages (survey waves). We applied appropriate Add Health longitudinal sampling design weights to all models to account for sampling probability of respondents. We reviewed all variables excluded from the models critically before making a decision on the final model based on BIC (Nagin & Tremblay, 2001).

Next, we examined a pattern of suicidal behaviors associated with religiosity and other psychosocial factors across the life course from adolescence to young adulthood. Our purposes were to adjust for potential confounders, and to gain more insights on the pattern of risks associated with life course developments of suicidal behaviors. In this analysis, we used Generalized Estimating Equations (GEE) with logit link function to model the estimated association between suicidal behavior trajectories across different waves (in adolescence and in young adulthood) and religiosity variables, controlling for background characteristics (age, gender and race) using a comparison group of the never suicidal for each developmental category. These analyses were conducted using SAS and SAS Callable SUDAAN. First, we assessed the effect of religiosity variables on suicidal behaviors during adolescence and in young adulthood. Second, we examined the mediating effects of each variable in explaining suicidal behaviors across different time periods. Finally, we included

all predictors to determine the unique contribution of each variable, while controlling for the association of independent effects of each variable on suicidal behaviors. Estimates of odds ratios, *P*-values and confidence intervals were estimated. In addition, all model regression analyses were stratified by gender and adjusted for baseline adolescent characteristics including CES-D, general support and parental supports.

## Results

At Wave I, 53% of the respondents were females, and males constituted almost 47% of the sample. Table 1 presents key variables used in the study for boys and girls over the four waves of data collection. Generally, prevalence of suicide ideation or suicide attempt decreased with age over time. There were statistically significant gender differences in suicidal behaviors between boys and girls in waves I and II, but in young adulthood these differences were not statistically significant. At Wave I (baseline), females compared to males were more likely to have favorable opinions of and to participate actively in religious activity. Baseline social support appeared to be patterned along gender, in that boys reported more paternal supports while girls received more maternal supports. Overall, girls also reported higher general support compared to boys. Baseline CES-D scores were higher among girls, however boys reported higher self-esteem.

### Trajectories of suicidal behaviors

Using the BIC, we determined the initial model fit for suicidal ideation and suicidal attempt trajectories (Table 2). We attained convergence of three class-model fit for suicide ideation, and one class-model fit for suicide attempt. In assessing the suitability of these models, we examined the curves of each trajectory and evaluated the percent probabilities of class membership for each trajectory. Percent class memberships were as follows: suicidal ideation (31.3%, 58.0%, and 10.8%) and suicide attempt (100%). Figure 1 presents the 3-model expected and predicted suicide ideation trajectory. Of the three trajectories of suicide ideation categories, there were two groups of low divergent early suicide ideator groups, with one (31.3%) starting out with a slight increase in ideation between Waves I and II, and continuing on a path of increases in suicidal ideation till young adulthood, while the other groups (58.0%) showed a sharp decline in suicidal ideation between Waves I and II, but continued on a trajectory of further decline till young adulthood. The early high suicide ideators (10.8%) started out with a relatively high prevalence of suicide ideation, but showed a decline between Waves I and III, then a marginal rise in ideation in young adulthood. This group showed suicidal ideation for most or across all waves of data collection. The trajectory for suicide attempt is a model with a cubic trend (Figure 2) showing the best fit. The pattern shows relatively high suicide attempts prevalence in adolescence but was followed by a steady decline in attempt behaviors across the waves in late adolescence, and by young adulthood, attempt behaviors had fallen precipitously.

### Gender patterns of suicidal trajectories

Boys reporting early high suicide ideation include 8% of the sample who started with a high level of suicidal thoughts, increasing slightly over time in young adulthood (Wave III), and then showed a moderate decline during early or emerging adulthood (Fig. 3). This group

exhibited the highest level of suicidal ideation among boys. The largest group accounted for 63.4% of the population, self-reported suicidal ideation at a relatively low level in Wave I, maintained lower levels of suicidal ideation in early adulthood, then showed a slight increase in emerging adulthood. Lower levels of suicide ideation groups (28%) include individuals who had the lowest suicide ideation in adolescence, but for whom suicidal thoughts increased in a linear fashion throughout the study period till emerging adulthood. Female respondents reported the highest level of suicidal ideation in adolescence (11%), but this effect decreased gradually in late adolescence, and thereafter increased to a highest level of reporting in young adulthood (Fig. 4). A second group of female suicide ideators had a trajectory that started off at a relatively high level of reporting but decreased to their lowest level by young adulthood. A third group (24%) started with the smallest self-reporting of suicide ideation in adolescence, and gradually increased reporting of ideation in an almost near linear fashion throughout emerging adulthood.

Figures 5 and 6 present a cluster of trajectory for suicide attempt among survey respondents. Whereas suicide attempts for girls' start and were maintained at a relatively high level of reporting, followed by a gradual decline in young adulthood, reporting for boys begins at relatively lower levels and shows a steady decline till young adulthood, and thereafter declines in emerging adulthood. Further analysis showed that over time, as reporting of religious importance increases, the likelihood of suicidal ideation and suicide attempts decreases for males and females, but the decline was sharper for females.

## Predictors of suicidal behaviors trajectories from adolescence to emerging adulthood

We fit multinomial logistic regression to determine predictors of suicidal behaviors (being ideator or attempts) across the different life courses of the study (from adolescence to young adulthood) with non-suicidal groups serving as the reference category (Tables 3 and 4). Adolescents reporting religion as important or attending church (compared to non-church attendance adolescents or adolescents reporting religion as unimportant) were less likely to be suicidal. Likewise, adolescents who were suicidal were more likely to be females, reported low social support, low self-esteem and high depressive symptoms. Inclusion of all variables (Model 2) to assess the degree of confounding showed that the observed effects of religiosity on suicidal behaviors were neither statistically significant in adolescence nor in young adulthood. In the full model, earlier reporting of high depressive symptoms was associated with suicidal behaviors in adolescence and young adulthood. However, among psychosocial factors, social supports from a family, environmental contexts as well as high self-esteem, were significantly associated with reduced risk of suicidal behaviors in adolescents and young adulthood.

We run a series of multinomial regression models separately for boys and girls. In these models, we controlled for race, age and year of data collection (Model 1). Results showed non-suicidal adolescent boys (compared with suicidal adolescents) were more likely to be regularly attending church activities (Table 4). Adolescent boys reporting earlier high depressive symptoms, low support from the family, social contexts as well as low self-esteem were more likely to exhibit suicidal thoughts or attempts. However, the protective effects of religiosity were not evident among young adult males in reducing suicidal

behaviors. In the final model (Model 2) containing all variables, reporting of earlier depressive symptoms was the single most consistent factor in predicting suicidal behaviors in adolescence and young adulthood among male respondents. High general social support from the environmental contexts and high self-esteem were both statistically significant in predicting less likelihood of suicidal behaviors in adolescence and in early or emerging adulthood. Among females, girls who were attending church activities regularly or at least once a month, almost a year earlier were less likely to be suicidal in adolescence, but not in young adulthood.

## Discussion

This longitudinal study contributes to understanding of relationships between suicidal behaviors, religiosity and other psychosocial factors over the life stages from adolescence to young adulthood. First, using semi-parametric growth mixture models, the study identified three distinct trajectories of suicidal ideation and suicide attempt patterns across a broad mean age range from 11 to 32 years. Second, we examined a broad spectrum of suicidal trajectories associated with gender from adolescence to young adulthood. Third, we assessed the influence of religiosity and other psychosocial factors in adolescence and in young adulthood. Fourth, we controlled for important background factors (gender, race, age and survey periods) related to trajectories of suicidal behaviors from adolescence to young adulthood. The finding that suicidal behaviors increased during adolescence but showed significant declines in early or emerging adulthood extends the work of previous investigations (Prinstein et al., 2008 and Rueter et al., 2008) by applying a new statistical method to assess changes in suicidal ideation and suicide attempts across the developmental stages studied. Reduced suicidal behaviors in young adulthood might be related to acquisition of more improved psychosocial competencies to overcome social and developmental challenges occurring prior and during adolescence. Likewise, religious activity participation declined as adolescents entered into young adulthood; a finding consistent with previous studies (Arnett & Jensen, 2002) and is attributed to the young person’s independence from parental religious influences and development of independent identities and thoughts on life’s pathways. Whereas suicidal attempts trajectories for males declined gradually during adolescence, suicide attempts for females did not show significant declines in young adulthood. However, a gender pattern of suicidal ideation also indicates that a significant proportion of females continued to exhibit suicidality even in emerging adulthood.

The findings also indicate heterogeneity in suicide ideation and to some extent suicide attempt trajectories in adolescence and in young adulthood. This might suggest that assessing changes in suicidal behaviors over the developmental stages from adolescence to young adulthood appropriately reveals more meaningful information that is not found by ordinarily examining absolute levels of suicidality at a point in time. Furthermore, our trajectories extend over a relatively longer period than has been used in previous studies (Joiner, 2002; Petts, 2010; Prinstein et al., 2008; Ruetter et al., 2008) assessing suicidal behaviors and religious trajectories over the period from adolescence to young adulthood studied here. Nonetheless, the trajectories of suicidal behaviors found in this study correspond broadly with the trajectories found in previous studies, except that some slight

differences identified might be related to the population samples used and measurement periods assessed. Results from this analysis also indicate that suicidal ideation and suicide attempt in adolescence does not necessarily presage escalated suicidality in emerging adulthood. This pattern perhaps explains the difficulty in predicting completed suicides using a given set of covariates, as noted by numerous investigators (Joiner, 2002; Petts, 2010; Prinstein et al., 2008). The early high suicidal ideation groups who exhibited a high suicidality in adolescence had reduced suicide ideation, but showed a slight increase in young adulthood. However, suicide attempt groups showed high attempt rates in late adolescence and reversed their trajectory during young adulthood, and further showed a precipitous decline in suicide attempt behaviors in young adulthood. Male and female suicide attempt trajectories exhibited similar patterns, except that rates of declines in suicide attempts were completely different. Thus, the trajectory analysis shows that an important window of opportunity for preventing an escalation of suicidality exists during the early adolescent period (10–14 years), an opportunity that should be emphasized in the interventions on teen suicide prevention.

For individual risk and protective factors predicting suicidal behaviors across different stages of human development, the analysis showed that over time, depressive symptoms were consistently associated with suicidal behaviors across the periods studied for both males and females and religiosity was protective against suicidal behaviors particularly in early adolescence (10–14 years). The protective effects of religiosity were more prominent among adolescents and to some extent young females, but these effects were not statistically significant in young adulthood. The importance of religiosity was not statistically significant across different stages for both males and females. Consistent with most studies, a greater number of females were more likely to report depressive symptoms, but the odds ratio for suicidal behaviors was higher among males compared to females (Fergusson et al., 2005; Galambos, Leadbeater, Barker, 2004). From a developmental perspective, depressive symptoms showed greater effects (as shown by odds ratios) on suicidal behaviors during adolescence than in young adulthood, and some investigators have suggested that males' aggressive suicidal behaviors might be related to greater effects of depressive symptomatology (Dumais, Lesage, Alda, et al. (2005; Veenema et al., 2006). That is, whereas females' reports higher prevalence of depressive disorders, a depressive diagnosis for males greatly increases the odds of suicidality compared with females. However, a population-based longitudinal study by Fergusson et al. (2005) did not find any significant differences between males and females on effect of depressive symptomatology on later suicidal behaviors. Future studies assessing mechanisms underlying modifying effects of depressive symptoms on suicidal behaviors by gender are clearly needed. Further analysis also showed that church attendance inversely modifies the effect of depressive symptomatology on suicidal behaviors. Persons with depressive symptoms who participate in church activities are more protected from suicidal behaviors compared to individuals with depressive symptoms who do not participate in any church activities. On the one hand, depressive symptomatology is often characterized by persistent negative self-evaluation, loneliness, difficulty in making decisions, and loss of hope or purpose for living. Hopelessness is one of the most consistent predictors of completed suicides (Mann et al., 1999; Mazza & Reynolds, 1999). On the other hand, religious participation provides a

meaningful framework for the individual to create healthier cognitive appraisal of an omniscient superior being who could be relied on in times of distress (Molock et al., 2006). In such situations, individuals' active participation in religious activities enhances hope and meaning as well as enabling cognitive development of greater optimism towards the future. Nonetheless, in the multivariable analysis, the protective effect of religiosity against suicidal behaviors was limited mainly to adolescent groups, but not in early or emerging adulthood. Some investigators have shown that emerging adults have highly diverse religious views that reflect a unique understanding of religious and non-religious beliefs, including those associated with popular cultures of the time (Arnett & Jensen, 2002). These beliefs are often distinct from the earlier religious socialization to the extent that most young or emerging adults even question the relevance of religious institutions to their existential lives. Nonetheless, subsequent changes in life events (marriage, childbearing) among some young adults might result in later religious activity participation. It is unclear whether these changing patterns of religiosity enhance or are irrelevant to young adults' suicidal behaviors. Future studies need to examine secular trends and factors of modernization in reducing or enhancing religious service participation and how these effects modify suicidal behaviors among a cohort of adolescents emerging into young adulthood.

The relationship between social support and numerous health outcomes including depressive symptomatology and suicidal behaviors has been extensively discussed in the literature (Mazza & Reynolds, 1998; Uchino, Carlisle, Birmingham & Vaughn, 2010). In our analysis, social support received in early adolescence was a consistent predictor of reduced suicidal behaviors among adolescents and young adults even when major covariates were controlled. These findings support previous investigations suggesting that 'a long arm of childhood support (Hayward & Gorman 2004; pp 103–104)' has an enduring impact on improved future health outcomes (Wight, Boticello, Aneshensel, 2006; Umberson, Crosnoe, Reczek, 2010). It is generally well recognized that social support reduces suicidal behaviors through a number of biological pathways linked to buffering reactivity to stressors and/or as coping resources during distress. Availability of these resources likely assists adolescents and young adults to navigate the challenges associated with developmental transitions towards improved social adjustments. Having a strong sense of support available enables the individual to overcome imminent obstacles, as beliefs in these support systems strengthen resiliency in situations of adversity (Mooney, Laursen & Adams, 2007). In particular, being a member of a religious group is known to increase receipt or perceived availability of social support. Adolescent social support from religious affiliation or from family and social networks may provide solidarity and a sense of belonging to a caring group. However, social support received specifically from fathers was more protective of suicidal behaviors among females, but not among male respondents. This aligns with studies by Piko et al., (2000) which suggested that low levels of support from fathers were a consistent predictor of adolescent drug use, however mother's support did not have any effects on drug use. Generally, supports from fathers might indicate obligatory resources associated with kinship relationship, and might be different from voluntary support sources gained from peers, friends and other environmental contexts contingent on social exchanges. Although fathers' supportive role to adolescents occurs more rarely than mothers, however, when this happens

a lasting impression appears to be created in the life of an adolescent that may extend to improvements in future health outcomes.

Findings of the current investigation have several limitations. First, religion is a multifaceted construct involving behavioral and functional aspects, and it is possible that these different dimensions relevant to reducing adolescent suicidal behaviors or improving health outcomes were not included in the existing instruments (Ellison & Levin, 1998). Results of the study are based on a limited set of questions available from the Add Health data and this likely limits the impact of our findings. Future studies should be developed according to the multidimensional nature of the spirituality and religiosity constructs. Questionnaire items on religious affiliation were not consistent across different waves, and therefore a number of respondents belonging to different religious affiliations might have been missed in the analysis. Second, predictors used in the study, including religiosity, self-esteem, maternal and paternal supports were assumed to be stable over time. Patterns of changes occurring in these predictors were not considered in determining suicidal behaviors. In particular, dynamics of these predictors across the life course might alter the trajectory of suicidal behaviors assessed in this study. Assessing variation in these predictors across different life stages should engage the attention of future researchers in determining the path of suicidal trajectories among adolescents transitioning to adulthood. Third, suicidal ideation or attempts like depressive symptoms might have shorter time cyclical intervals than the length of time used in this study. In that situation, the study might have missed a considerable number of events due to the relatively longer time between assessments. Finally, a trajectory associated with suicidal behaviors assessed in the multivariable analysis did not distinguish suicidal ideation from suicidal attempt. However, given that suicide attempt indicates the most severe form of suicidal behavior (Nkansah-Amankra, Diedhiou, Walker, Agbanu, & Clark, 2010; Verona, Sachs-Ericsson, Joiner, 2004) our use of suicidal behavior was justified since identifying individuals with severe manifestations of suicide would plausibly prevent other forms of suicide. Additionally, we did not have access to data on adolescents who might have died by suicide over the period of the study. Availability of these data would have provided relatively stronger relationships among suicidal ideation and suicide attempts as well as a propensity for completed suicide over time among this population. The strength of the study is the use of group-based trajectory analyses. For example, in this study if we had assessed an average trajectory, the conclusion would have been suicidal ideation shows high levels in adolescence, but declines in young adulthood. It would not have been possible to observe these patterns for girls and boys. Those conclusions would have been inaccurate and missed an important subgroup of adolescents showing suicidal ideation and other suicidal behaviors at different life stages from adolescence to young adulthood. In addition, these analyses provide the opportunity to identify baseline characteristics influencing the course of suicidal behaviors over time.

Our findings have implications for suicide prevention and youth development. Some of the current approaches to youth development emphasize involvement in organized social activities particularly from religious contexts. In this regard, two major explanations are proposed for understanding the role of religiosity and psychosocial resources improving youth development or reducing suicidal behaviors. These are asset building and social control. Asset building perspectives view religious activity participation or the importance

of religion to the individual as an external social asset that supports guides and builds specific psychosocial competencies such as self-esteem. These moral virtues may yield competent life skills which ultimately lead to social change for individuals and the broader communities (Cheung & Yeung, 2011). Social control theory indicates that social forces prevent individuals from engaging in behaviors inconsistent with prevailing social norms, particularly those with consequent ignominy. Key constructs of attachment, commitment, involvement, and beliefs embedded in social control theory are closely related to influence of religiosity and spirituality on suicidal behaviors.

In conclusion, our findings suggest that suicide ideation and suicide attempt trajectories among adolescents emerging into adulthood exhibits different behavioral patterns that could inform suicide prevention programs. The findings of the study further indicate that suicidal behaviors (suicidal ideation and suicide attempt) decreased during transition to young adulthood, despite increases in suicidal ideation and suicide attempts among some subgroups. Religious based programming aimed at improving competencies to reduce suicidal behaviors may have their most relevance among early adolescents, but based on our results this has not been demonstrated in the older age groups of young adults.

## Acknowledgments

Support for this research was provided by the University of Northern Colorado Provost grant for faculty research and publications. This research uses data from AddHealth, a project originally designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516–2524 (addhealth@unc.edu). No direct support was received from grant P01-HD31921 for this analysis.

I am also grateful to other anonymous reviewers of this paper.

We also wish to thank all anonymous reviewers of the manuscript for their thoughtful comments and insightful reviews.

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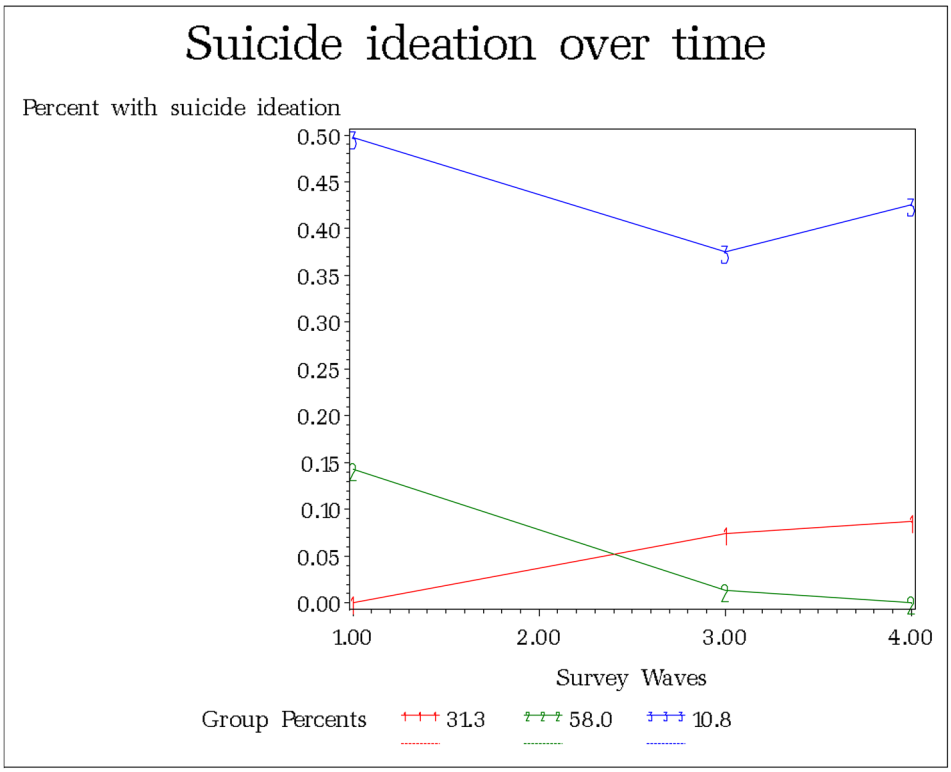


**Figure 1.**

Model predicted suicidal ideation trajectories from adolescence to early and emerging adulthood with survey weights included for adjustment. Numbered lines represent the predicted trajectories. Respective mean ages of respondents at different waves of data collection were as follows: Wave I (15.3,SD=1.6), Wave II (16.2, SD=1.6), Wave III (21.6, SD=1.6), Wave IV (28.1, SD=1.6)

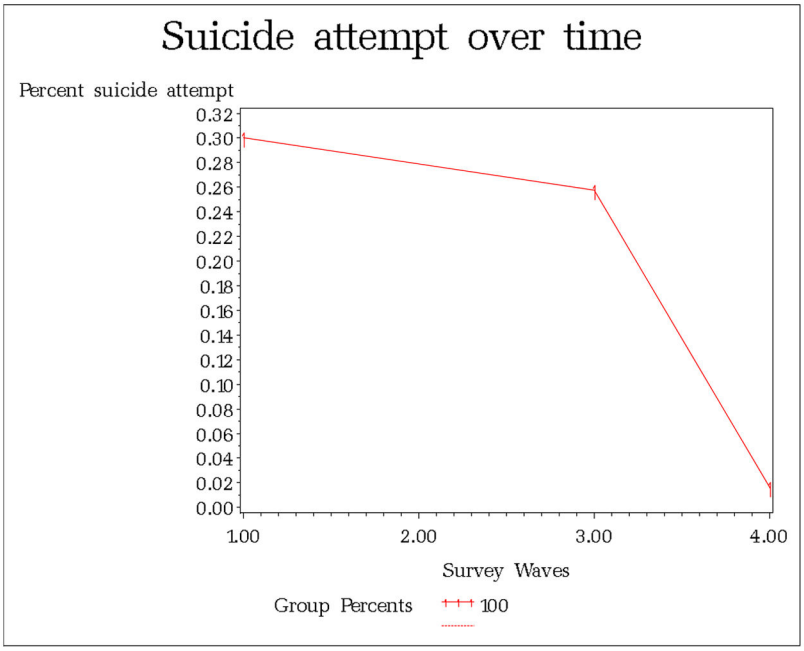


**Figure 2.**

Model predicted suicide attempt trajectories from adolescence to early and emerging adulthood with survey weights included for adjustment. Numbered lines represent the predicted trajectories. Respective mean ages of respondents at different waves of data collection were as follows: Wave I (15.3, SD=1.6), Wave II (16.2, SD=1.6), Wave III (21.6, SD=1.6), Wave IV (28.1, SD=1.6)

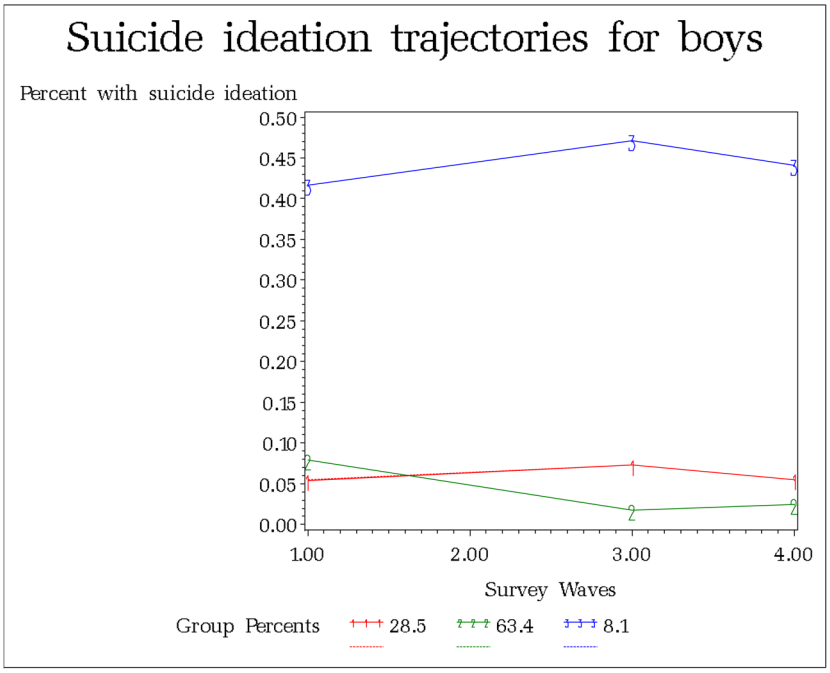


**Figure 3.**

Model predicted suicide ideation trajectories for males from adolescence to early and emerging adulthood with survey weights included for adjustment. Numbered lines represent the predicted group trajectories. Respective mean ages of respondents at different waves of data collection were as follows: Wave I (15.3, SD=1.6), Wave II (16.2, SD=1.6), Wave III (21.6, SD=1.6), Wave IV (28.1, SD=1.6)

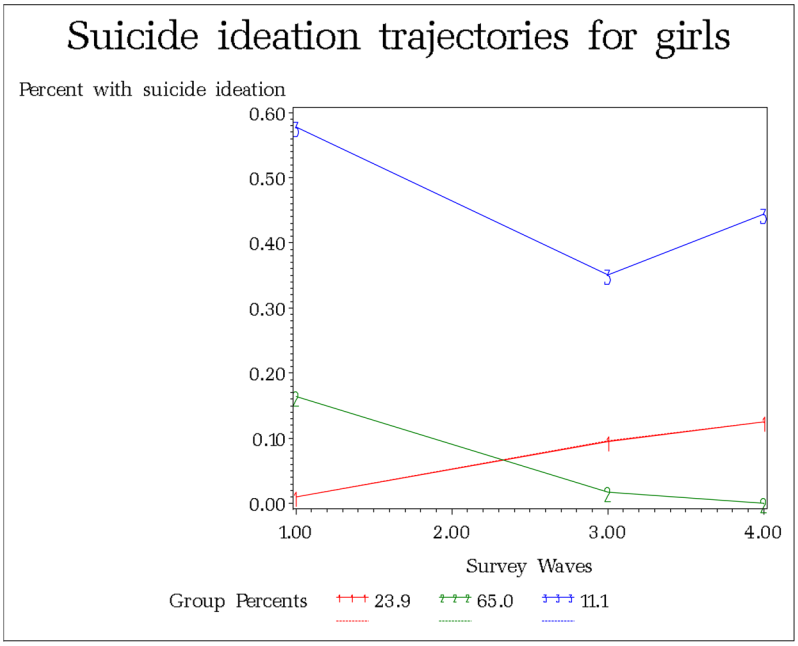


**Figure 4.**

Model predicted suicide ideation trajectories for females from adolescence to early and emerging adulthood with survey weights included for adjustment. Numbered lines represent the predicted group trajectories. Respective mean ages of respondents at different waves of data collection were as follows: Wave I (15.3, SD=1.6), Wave II (16.2, SD=1.6), Wave III (21.6, SD=1.6), Wave IV (28.1, SD=1.6)

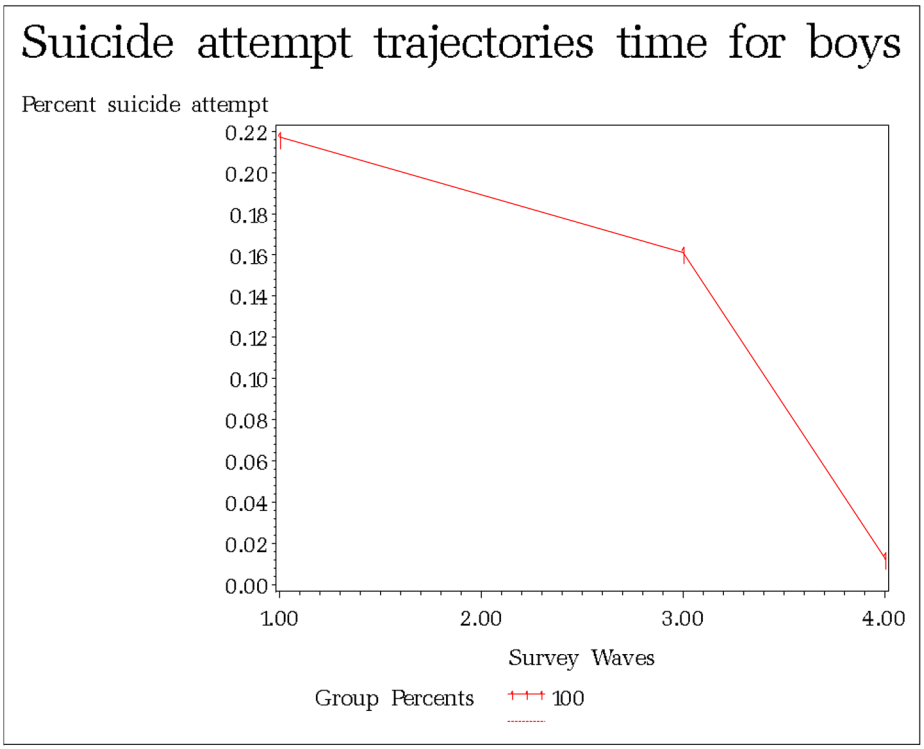


**Figure 5.**

Model predicted suicide attempt trajectories for males from adolescence to early and emerging adulthood with survey weights included for adjustment. Numbered lines represent the predicted group trajectories. Respective mean ages of respondents at different waves of data collection were as follows: Wave I (15.3, SD=1.6), Wave II (16.2, SD=1.6), Wave III (21.6, SD=1.6), Wave IV (28.1, SD=1.6)

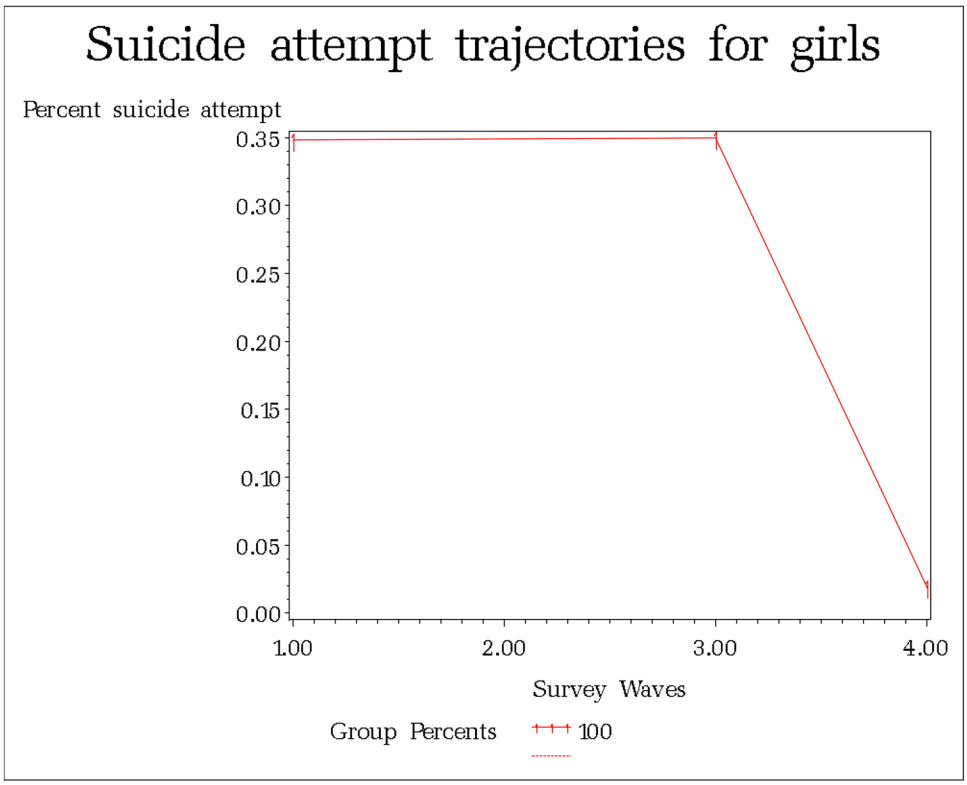


**Figure 6.**

Model predicted suicide attempt trajectories for females from adolescence to adulthood with survey weights included for adjustment. The numbered line represents the predicted group trajectories. Respective mean ages of respondents at different waves of data collection were as follows: Wave I (15.3, SD=1.6), Wave II (16.2, SD=1.6), Wave III (21.6, SD=1.6), Wave IV (28.1, SD=1.6)

## Table 1

Descriptive statistics of key study variables among adolescents participating in the National Longitudinal Study of Adolescents in the United States, (Add Health survey),1995–2008

| Variables | Total (n) | Boys Percent§ | Girls Percent§ |
|---|---|---|---|
| Suicide Ideation | | | |
| Wave I | 1276 | 4.7 | 9.1 |
| Wave II | 1047 | 4.0 | 8.2 |
| Wave III | 594 | 3.5 | 3.8 |
| Wave IV | 633 | 3.4 | 3.8 |
| Suicide attempt | | | |
| Wave I | 366 | 6.9 | 23.1 |
| Wave II | 319 | 7.4 | 23.7 |
| Wave III | 94 | 5.1 | 13.2 |
| Wave IV | 136 | 0.7 | 1.0 |
| **Baseline religiosity** | | | |
| Religious importance | 7334 | 40.2 | 48.8 |
| Not important | 825 | 5.9 | 5.1 |
| Highly spiritual | 6030 | 31.3 | 41.3 |
| Moderately spiritual | 1547 | 10.2 | 9.5 |
| Non-spiritual | 580 | 4.6 | 3.0 |
| Frequent church attenders | 3823 | 20.4 | 25.6 |
| Infrequent church attenders | 3385 | 18.9 | 22.4 |
| Non church attenders | 948 | 6.7 | 6.0 |
| **Baseline parental support** | | | |
| High paternal support | 5066 | 38.1 | 36.4 |
| Low paternal support | 1797 | 9.7 | 15.8 |
| High maternal support | 2222 | 11.3 | 12.0 |
| Low maternal support | 6766 | 35.3 | 41.5 |
| Other baseline support | | | |
| High general support | 4711 | 22.6 | 28.2 |
| Low general support | 4684 | 24.2 | 25.0 |
| **Baseline psychological status** | | | |
| CES-D scores | | | |
| High CES-D scores | 560 | 1.5 | 4.1 |
| Low CES-D scores | 8763 | 45.4 | 49.0 |
| Self esteem | | | |
| High self esteem (lower 2 quartiles) | 4535 | 25.9 | 22.8 |
| Low self esteem (upper 2 quartiles) | 4868 ) | 21.0 | 30.4 |

CES-D is the Center for Epidemiologic Studies of Depression Scale

P-value test for linear trend for all groups <.0001. The trend for all groups was statistically significant.

§Represents weighted per cent distribution.

*Suicide Life Threat Behav*. Author manuscript; available in PMC 2014 August 21.

**Table 2**

Bayesian Information criterion (BIC) values estimated from different iteration of trajectory for best model fit for Add Health survey[§], 1994–2008

| Outcome variables | Model | No. of groups | BIC | Per cent group prevalence (%) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 |
| Suicide ideation | | | | | | | | |
| | 1 | 1 | −8060 | 100 | - | - | - | - |
| | 2 | 2 | −7989 | 75.0 | 25.0 | - | - | - |
| | **3** | **3** | **−7906** | **20.5** | **66.0** | **13.5** | **-** | **-** |
| | 4 | 4 | −7931 | 22.5 | 38.1 | 29.4 | 10.0 | - |
| | 5 | 5 | −7956 | 18.1 | 23.0 | 20.8 | 28.8 | 9.2 |
| Suicide attempt | | | | | | | | |
| | **1** | **1** | **−1789** | **100** | - | - | - | - |
| | 2 | 2 | −1800 | 92.6 | 7.4 | - | - | - |
| | 3 | 3 | −1823 | 37.6 | 57.0 | 5.4 | - | - |
| | 4 | 4 | −1846 | 50.8 | 11.5 | 20.7 | 17.0 | - |
| | 5 | 5 | −1868 | 30.6 | 22.7 | 13.3 | 24.0 | 9.5 |

The trajectory model estimates of a negative BIC values. Highlighted figures suggest the best model fit selected for analysis. Model fit was determined with the smallest absolute values of BIC.

[§]Models are weighted to account for oversampling of minority racial groups and for other Add Health design characteristics

**Table 3**

Adjusted odds ratios[a] (OR's) for being suicidal across different wave of data collection among adolescents participating in Longitudinal Study Adolescent Health Survey across different time periods, 1995–2008

| Characteristic | Suicidal behaviors across life course (OR, 95% CI) [§] | | | |
|---|---|---|---|---|
| | Adolescence | | Early and emerging Adulthood | |
| | Model 1[†] | Model 2[‡] | Model 1[†] | Model 2[‡] |
| Importance of religion | | | | |
| No | 1.0 | 1.0 | 1.0 | 1.0 |
| Yes | **0.72 (0.54, 0.96)** | 0.80 (0.57, 1.12) | 0.86 (0.60, 1.22) | 0.86 (0.58, 1.29) |
| Church attendance | | | | |
| Never | 1.0 | 1.0 | 1.0 | 1.0 |
| Regular attenders | **0.64 (0.48, 0.85)** | 0.76(0.54, 1.07) | 0.72 (0.50, 1.03) | 0.85 (0.56, 1.28) |
| Irregular attenders | **0.76 (0.59, 0.99)** | 0.88 (0.63, 1.23) | 0.79 (0.56, 1.11) | 0.86 (0.57, 1.28) |
| Gender | | | | |
| Males | 1.0 | 1.0 | 1.0 | 1.0 |
| Females | **2.10 (1.77, 2.50)** | **1.70 (1.37, 2.10)** | 1.15 (0.94, 1.40) | 1.08 (0.84, 1.38) |
| CES-D score | | | | |
| Low | | 1.0 | 1.0 | 1.0 |
| High | -- | **6.31 (4.37, 9.11)** | -- | **2.89 (1.74, 4.81)** |
| Social support | | | | |
| Father's support | | | | |
| Low support (Reference) | -- | 1.0 | -- | 1.0 |
| High | -- | **0.69 (0.55, 0.86)** | -- | **0.69 (0.53, 0.91)** |
| General support | | | | |
| Low support | -- | 1.0 | -- | 1.0 |
| High support | -- | **0.62 (0.50, 0.78)** | -- | **0.60 (0.46, 0.77)** |
| Self esteem | | | | |
| Low self-esteem | -- | 1.0 | -- | 1.0 |
| High self-esteem | -- | **0.62 (0.50, 0.78)** | -- | **0.60 (0.46, 0.77)** |

Note: OR=Odds Ratio; CI=confidence intervals; CES-D= the Center for Epidemiologic Studies Depression Scale Adolescent changes in suicidal behaviors include respondents from waves I and II; and adulthood describe changes in suicidal behaviors among respondents from waves III and IV.

[†] Model 1 was adjusted for race, gender, spirituality and age (all measured in Wave I).

[‡] Model 2 includes Model 1 + CES-D scores, general social support, paternal support, self esteem

Spirituality variable was not statistically significant in Model 1, and its inclusion in Model 2 did not improve model fit.

[§] In this context, life course describes different data collection waves in adolescence and in early and emerging adulthood. Multinomial outcome categories of suicidal behaviors: Changes in suicidal behaviors in adolescence (Waves I and II), Changes in suicidal behaviors in emerging adulthood (Waves III and IV), Reference category is non-suicidal behaviors across all four waves of data collection. The reference category is omitted from the Table.

Bolded indicates statistically significant effects

**Table 4**

Models predicting suicidal behaviors among adolescents participating in Longitudinal Study Adolescent Health Survey according to gender across the life course perspective

| Characteristic | Suicidal behaviors across the life course (OR, 95% CI) [§] | | | |
|---|---|---|---|---|
| | Adolescence | | Early and emerging adulthood | |
| | Model 1 | Model 2 | Model 1 | Model 2 |
| **Boys** | | | | |
| Importance of religion | | | | |
| No | 1.0 | 1.0 | 1.0 | 1.0 |
| Yes | 0.75 (0.53, 1.07) | 0.80 (0.50, 1.28) | 0.75 (0.47, 1.20) | 0.64 (0.36, 1.13) |
| Church attendance | | | | |
| Never | 1.0 | 1.0 | 1.0 | 1.0 |
| Regular attenders | **0.69 (0.48, 0.97)** | 0.88 (0.58, 1.34) | 0.82 (0.52, 1.30) | 0.85 (0.47, 1.57) |
| Irregular attenders | 0.87 (0.63, 1.21) | 1.14 (0.75, 1.72) | 0.87 (0.63, 1.21) | 0.92 (0.52, 1.65) |
| CES-D scores | | | | |
| High | -- | **7.53 (4.86, 11.68)** | -- | **3.23 (1.75, 5.94)** |
| Father's support (lower quartiles) | -- | 0.78 (0.60, 1.03) | -- | 0.79 (0.56, 1.11) |
| General support (lower quartiles) | -- | **0.49 (0.38, 0.64)** | -- | **0.52 (0.37, 0.72)** |
| Self-esteem | -- | **0.57 (0.44, 0.75)** | -- | **0.57 (0.40, 0.82)** |
| **Girls** | | | | |
| Importance of religion | | | | |
| No | Reference | Reference | Reference | Reference |
| Yes | 0.68 (0.42, 1.09) | 0.81 (0.48, 1.38) | 0.96 (0.56, 1.62) | 0.99 (0.56, 1.76) |
| Church attendance | | | | |
| Never | Reference | Reference | Reference | Reference |
| Regular attenders | **0.58 (0.36, 0.93)** | 0.69 (0.41, 1.16) | 0.74 (0.43, 1.25) | 0.81 (0.45, 1.46) |
| Irregular attenders | **0.62 (0.40, 0.95)** | 0.66 (0.40, 1.10) | 0.77 (0.47, 1.25) | 0.77 (0.44, 1.34) |
| CES-D scores | | | | |
| High | | **4.72 (2.39, 9.34)** | | **2.68 (1.08, 6.67)** |
| Father's support (lower quartiles) | | **0.56 (0.38, 0.82)** | | **0.60 (0.39, 0.91)** |
| General support (lower quartiles | | 0.87 (0.60, 1.25) | | **0.68 (0.47, 0.98)** |

| Characteristic | Suicidal behaviors across the life course (OR, 95% CI) [§] | | | |
|---|---|---|---|---|
| | Adolescence | | Early and emerging adulthood | |
| | Model 1 | Model 2 | Model 1 | Model 2 |
| Self-esteem | | **0.62 (0.44, 0.87)** | | 0.97 (0.68, 1.38) |

Note: OR=Odds Ratio; CI=95% confidence intervals; CES-D=the Center for Epidemiologic Studies Depression Scale Adolescence here includes all respondents in waves I and II; whereas adulthood describes respondents from waves III and IV.

[a]Each predictor was adjusted for race, spirituality, religious affiliation (all measured in Wave I), age and year of survey.

[§]Life course here describes different data collections in adolescence and in early and emerging adulthood. Multinomial logistic regression outcome categories of suicidal behaviors: Changes in suicidal behaviors (Waves I and II), Changes in suicidal behaviors in emerging adulthood (Waves III and IV), Reference category is non-suicidal behaviors across all four waves of data collection. The reference category is omitted from the Table.

Bolded indicates statistically significant effects