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Accessibility
Association between social integration and suicide among women in the United States

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# These authors contributed equally to this work.

Abstract

Importance—Suicide is one of the top 10 leading causes of mortality among middle-aged women. Most work in the field emphasizes the psychiatric, psychological, or biological determinants of suicide.

Objective—to estimate the association between social integration and suicide mortality.

Design, Setting, and Participants—The Nurses’ Health Study, an ongoing nationwide prospective cohort study of nurses. Beginning in 1992, a population-based sample of 72,607 nurses 46 to 71 years of age were surveyed about their social relationships.

Exposures—Social integration was measured with a seven-item index that included marital status, social network size, frequency of contact, religious participation, and participation in other social groups.
Main outcomes and measures—The vital status of study participants was ascertained through June 1, 2010. The primary outcome of interest was suicide, defined as deaths classified with codes E950 to E959 from the International Classification of Diseases, Eighth Revision.

Results—The incidence of suicide decreased with increasing social integration. In a multivariable Cox proportional hazards regression model, the relative hazard of suicide was lowest among participants in the highest (adjusted hazard ratio [AHR], 0.23 [95% CI, 0.09 to 0.58]) and second-highest (AHR, 0.26 [CI, 0.09 to 0.74]) categories of social integration. Increasing or consistently high levels of social integration were associated with a protection against suicide. These findings were robust to sensitivity analyses that accounted for poor mental health and serious physical illness.

Conclusions and Relevance—Women who were socially well-integrated had a more than 3-fold lower risk for suicide over 18 years of follow-up.

Keywords

suicide; social determinants of health; social isolation

INTRODUCTION

Suicide is one of the top 10 leading causes of mortality among middle-aged women in the U.S. (1, 2). Over the past decade, suicide rates among middle-aged women in the U.S. have increased by more than 30%, exceeding even the relative increases observed among middle-aged men, the demographic group with the highest age-adjusted rate of suicide in the U.S. (3). These trends paralleled increases in suicide rates worldwide over the past decade (4), with current projections anticipating a continued increase in its contribution to the global mortality and disease burden (5).

With the exception of a growing literature based on data from the United Kingdom and Europe correlating changes in suicide rates with macroeconomic conditions during the recent economic crisis (6-9), most work in the field emphasizes the psychiatric, psychological, or biological determinants of suicide (10, 11). There is an historical tradition of concern about the social determinants of suicide, beginning with Durkheim, who postulated that suicide varies inversely with social integration (12). More recently, Joiner (13) and Van Orden et al. (14) elaborated an interpersonal theory of suicide consistent with Durkheim’s work in which the unmet “need to belong” (15) -- one facet of the higher-order construct of social integration -- is partly responsible for the development of passive suicidal ideation. Taken together, these conceptual models of suicide and suicidal behavior suggest a need for more research on its social determinants.

Using individual-level data from the U.S. Health Professionals Follow-up Study, we recently estimated the association between social integration and suicide among middle-aged men (16), but there were two important limitations of that study. First, the dataset lacked information about participants’ mental health status. Depressive disorders may compromise social relationships (17, 18), and it has been well established that the presence of a mood disorder is a strong risk factor for suicidal behavior (19, 20). Not accounting for
the potentially confounding influence of mental health status could therefore bias estimates of the relationship between social integration and suicide away from the null. Second, social relationships may exert different influences on the mental health of women compared to men. Social ties may be more draining than nurturing for women, given gendered patterning in role demands (21, 22) or empathic concern for others (23). Consistent with some of these lines of inquiry, for example, Kposowa (24) found that being married exerted a strongly protective influence against suicide among men but not among women.

In general, the “low base-rate problem” (25) (i.e., there are 36,000 suicides in the U.S., relative to a population exceeding 300 million with an average life expectancy of approximately 78 years) makes it difficult for researchers to study the social determinants of suicide prospectively. More in-depth analyses of social relationships and suicide among women have been limited by the lack of large, prospective studies that also contain detailed information about social relationships beyond the “married”/“not married” indicators that are typically available in national registries (26, 27). Consequently, most studies in this field have instead used proxy outcomes such as suicide attempts (28, 29), or have been based on populations enriched for psychiatric morbidity (e.g., persons under psychiatric care (30-33)). To address these important gaps in the literature, we used data from the U.S. Nurses’ Health Study to estimate the association between social integration and suicide among women over 18 years of follow-up.

METHODS

Study population

The Nurses’ Health Study is an ongoing prospective cohort study of women in the U.S. who were 30 to 55 years of age when the study was initiated in 1976 (34, 35). Of the 238,026 potentially eligible registered nurses who were contacted by mail at study initiation, 65,241 were excluded for having questionnaires that were returned as unforwardable and 372 died, leaving 121,701 (70.6%) who responded to the baseline questionnaire. Every two years, follow-up questionnaires are mailed to participants in order to obtain updated information on medical history, diet, lifestyle habits, and other health behaviors, with a response rate of at least 90% in each follow-up cycle. All participants provided written informed consent. The Nurses’ Health Study, and the analysis described here, was approved by the Partners Human Research Committee. Further details on the design and analysis of the Nurses’ Health Study can be obtained elsewhere (34, 35).

Mortality ascertainment

The primary outcome of interest was suicide mortality, assessed continuously during the course of the study until June 1, 2010. Deaths were identified using reports from next of kin and by searching state mortality files and the U.S. National Death Index, a method that has been shown to have 98% sensitivity and 100% specificity for ascertainment of deaths (36, 37). Physicians blinded to exposure status reviewed death certificates and hospital or pathology reports to classify individual causes of death. Deaths caused by self-inflicted injuries were classified according to the underlying causes listed on the death certificate. For the present study, we specifically examined deaths in the “Suicide and Self-Inflicted Injury”
cluster (codes E950-E959) of the World Health Organization International Classification of Diseases, Eighth Revision (ICD-8).

Exposure assessment

The primary exposure of interest was social integration, measured with a seven-item index that included questions about marital status, social network size, frequency of contact with social ties, and participation in religious or other social groups (38, 39). The responses to these seven items yield a total score from 1 to 12 that is typically analyzed as a four-level categorical variable (eTable 1). At baseline, the index demonstrated good internal consistency (Cronbach alpha=0.78). Additional psychometric analyses (40) and evidence of the construct validity of the social integration index (41, 42) have been described elsewhere. Because the index was not added to the Nurses’ Health Study survey instrument until 1992 (and then again in 1996), we considered 1992 as the baseline year in our analysis. At this time point, the participants in the Nurses’ Health Study were 46 to 71 years of age.

Statistical analysis

All statistical analyses were performed with the use of the SAS software package (version 9.2, SAS Institute). Each participant was followed up from the return of the 1992 questionnaire until either death or the end of follow-up (June 1, 2010), whichever occurred earlier. We plotted the cumulative incidence of suicide across different categories of social integration, using a test statistic based on the nonparametric maximum likelihood estimator of the subdistribution hazard to compare cumulative incidence across categories (43).

To estimate the association between social integration and suicide, we fit a multivariable Cox proportional hazards model to the data (44), using the independent increment model to handle time-updated variables efficiently (45). Under this data structure, a new data record was created for every questionnaire cycle at which a participant was at risk for suicide, with covariates set to their values at the time the questionnaire was returned. To adjust for potential confounding by age, calendar time, and any potential two-way interactions between these time scales, we stratified the analysis jointly by age in months at start of follow-up and calendar year of the questionnaire cycle. The time scale for the analysis was then measured in months since the start of the current questionnaire cycle. We also adjusted our estimates for the following time-updated covariates: employment status (46), family history of alcoholism, body mass index (47, 48), weekly physical activity (49), alcohol intake (50), caffeine intake (51-53), smoking status (54), and history of hypertension, diabetes mellitus, or hypercholesterolemia (55, 56). To test for linear trends across categories of exposure, we modeled the median values within each category of exposure.

To assess the extent to which different trajectories of social integration (57) may affect subsequent risk of suicide, we fit multivariable Cox proportional hazards regression models with participants classified into one of 5 different groups based on their levels of social integration in 1992 and 1996: (a) no change in social integration, remaining in the lowest category [I] in both 1992 and 1996; (b) decline in social integration from 1992 to 1996; (c) no change in social integration, remaining in an intermediate category [II or III] in both 1992 and 1996; (d) increase in social integration from 1992 to 1996; or (e) no change in
social integration, remaining in the highest category [IV] in both 1992 and 1996. In this analysis of social integration trajectories, 1996 was specified as the baseline year, and the incidence of suicide was assessed during the 14-year period between the return of the 1996 questionnaire and June 1, 2010.

Sensitivity analyses

To determine whether our findings were robust to the specific form of the social integration index that was used, we conducted sensitivity analyses specifying social integration as a continuous variable and disaggregated into its constituent components. We conducted several additional sensitivity analyses to assess the robustness of our estimates to additional sources of potential confounding. First, severe medical conditions have been shown to have a positive association with suicide risk (58-60), and poor health has been shown to compromise social relationships (57, 61, 62). We therefore refitted the multivariable regression models after excluding participants who at baseline had reported a history of cancer (specifically, any type of cancer with the exception of non-melanoma skin cancer) or a serious cardiovascular condition (specifically, myocardial infarction, coronary artery bypass graft surgery, percutaneous transluminal coronary angioplasty, or stroke). Second, poor mental health may confound the observed relationship between social integration and suicide (17, 18, 20). We therefore refitted the regression models after excluding participants who at baseline had poor mental health status, defined as a score of ≤52 on the 5-item Mental Health Inventory (63, 64). The Nurses’ Health Study also included two variables for self-reported antidepressant medication use and self-reported physician-diagnosed depression, but these two variables were not added to the survey until 1996; therefore the sensitivity analyses for these variables adopted 1996 as the baseline year. In addition, instead of excluding these participants from analysis we also conducted sensitivity analyses in which we adjusted for these conditions as baseline covariates.

RESULTS

Of 121 701 women initially enrolled into the Nurses’ Health Study, 104 064 (85.5%) remained under follow-up in 1992. Of these, 72 607 women (69.8%) responded to the social integration questions in the 1992 survey and therefore constituted the primary sample for analysis. Compared to non-responders, responders had a lower incidence of suicide during the subsequent 18 years of follow-up (4 suicides vs. 5 suicides per 100 000 person-years; Mantel-Haenszel rate ratio, 0.76; 95% confidence interval [CI], 0.46 to 1.27), but the difference was not statistically significant. Baseline summary statistics for the sample are provided in Table 1. The social integration index had a mean value of 6.62 (standard deviation, 3.11). The majority of participants were classified into the highest (31 071 [42.8%]) category of social integration. Socially isolated (i.e., less socially integrated) women were more likely to be employed full time, were less physically active, consumed more alcohol and caffeine, and were more likely to smoke compared with socially integrated women.

Over 1 209 366 person-years of follow-up, there were 43 suicide events. The most frequently occurring means of suicide were poisoning by solid or liquid substances (21
followed by firearms and explosives (8 [18.6%]) and strangulation and suffocation (6 [14.0%]). The cumulative incidence of suicide was highest among the most socially isolated women (Figure 1). Gray’s (43) test rejected the null hypothesis that the cumulative incidence functions were equal across categories (P<0.001). The same pattern was observed in estimates from the multivariable Cox proportional hazards regression models adjusted for covariates (Table 2). The hazard of suicide was lowest among participants in the highest (adjusted hazard ratio [AHR], 0.23; 95% CI, 0.09 to 0.59) and second-highest (AHR, 0.26; 95% CI, 0.09 to 0.74) categories of social integration. A decreasing trend was observed across the categories (Ptrend=0.001).

For the analysis of changes in social integration from 1992 to 1996, 65 507 participants were included (Table 3). Over these 4 years, the mean change in the social integration index was −0.21 (standard deviation, 2.50); 14 231 (22.7%) participants experienced a decline in social integration, 11 068 (16.9%) participants experienced an increase in social integration, and 40 208 (61.4%) participants experienced no change. Participants who were categorized as having the highest level of social integration in both 1992 and 1996 had a reduced hazard of suicide over the subsequent 14 years of follow-up (AHR, 0.15; 95% CI, 0.03 to 0.65), while other trajectories of social integration were less protective; a decreasing trend across trajectory categories was observed (Ptrend=0.03).

The sensitivity analyses did not substantively alter our findings. When the social integration index was specified as a continuous variable, each one point difference in the index was associated with an 18% lower relative hazard of suicide (AHR, 0.82; 95% CI, 0.74 to 0.92). When we disaggregate the social integration index into its constituent components, no single dimension of social integration appeared to drive our findings (eTable 2). The estimates remained qualitatively similar when we excluded participants who at baseline had poor mental health status or had a history of cancer or a serious cardiovascular condition or when we adjusted for these factors as covariates (eTables 3 and 4), or when we excluded participants who at baseline reported antidepressant medication use and/or a history of physician-diagnosed depression (or when we adjusted for these factors as covariates) (eTable 5).

DISCUSSION

In this longitudinal study of 72 607 women in the U.S., we found that social integration at baseline was associated with a lower risk of suicide over 18 years of follow-up. The association was statistically significant, even stronger in magnitude than that observed in our recently published study of social integration and suicide among men (16), and robust to several sensitivity analyses. Furthermore, excluding participants with poor mental health status, as measured at baseline by several different indicators, did not overturn the observed associations.

There are a number of important strengths and weaknesses to our study. First, this analysis was based on long-term follow-up data derived from a well-characterized, nationwide, population-based cohort. However, the participants in the Nurses’ Health Study are also racially, generationally, and socioeconomically homogeneous. Second, U.S. national suicide
rates exceed the incidence rate observed in our sample (1), suggesting a lower overall level of psychiatric morbidity. These two points suggest important limitations in the generalizability of our findings, given the higher socioeconomic status and lower psychiatric morbidity of the study participants relative to the general population. Third, in contrast to our previously published study on social integration and suicide mortality among men (16), these data contained multiple indicators of mental health status. Adjustment for the potentially confounding effects of poor mental health did not appreciably change our estimates. Although the 5-item Mental Health Inventory is only a screening measure, it has been shown to have excellent sensitivity and specificity for detecting major depressive disorder (63, 64). Similarly, recall for “self-reported, physician-diagnosed” chronic conditions has been shown to be accurate when compared with medical record review (55, 65, 66). Fourth, relatively few suicide events were observed, with only 43 suicides occurring in the study sample over the 18-year follow-up period, thereby limiting our ability to detect statistically significant associations in the analysis of social integration trajectories. We also attempted to disaggregate the social integration index into its individual components but were similarly limited by small cell sizes. Nonetheless, the number of events observed in our study was larger than any other previously published study of suicide among women with comparable data on social determinants (26). Fifth, although our exposure variable has been previously validated and is frequently used in the literature, the social integration index fails to capture a number of different aspects of social integration, such as relationship quality, degree of reciprocity, geographic proximity, or network density (67-73). Sixth, unobserved confounding could potentially explain the estimated associations. Even with adjustment for age, adverse health behaviors and chronic conditions were less prevalent among women who were socially well-integrated. Thus it is possible that social integration may, to a certain extent, be a proxy for good health -- which is a known protective factor against suicide (58-60).

Classically, researchers have argued that men may be more advantaged by social relationships compared with women (74-77). Although our primary finding may be interpreted as standing in contrast to this earlier body of literature, it is also possible that the social integration index used in our analysis systematically captured supportive relationships while ignoring negative aspects of these relationships (76-78) and that a scale that captures both positive and negative aspects of social relationships may have yielded more nuanced results. It is also possible that social integration may have differential associations with suicide vs. suicide ideation or attempts, and that its association with suicidal behavior overall (e.g., a composite outcome that includes suicide ideation, suicide attempts, or suicide) among women may be muted.

Our study has important implications for suicide prevention. Guidelines for clinical practice have generally focused on suicide risk screening, assessment, and treatment (79-82). Our study confirms some of the prior studies that have informed these guidelines in emphasizing the importance of social isolation as a potential risk factor for suicide. In clinical practice, asking patients about the extent of their participation in a range of social relationships may yield information useful for risk assessment or in developing tailored interventions aimed at strengthening social relationships to be more functional and satisfying. In addition to
individually targeted approaches, however, our findings suggest that a public health approach to suicide prevention may also be of benefit. As Knox et al. (83) and Knox (84) have convincingly argued, based in part on the classic argument by Rose (85) for shifting the entire population distribution of disease, community-based interventions may be able to reduce the overall burden of suicide more effectively than intensive efforts focused on “high-risk” individuals. For example, health and social policy may be used to promote certain types of social ties, increase civic engagement, develop public spaces for group activities, or reduce relationship strain (86). Clearly, the “high-risk” and “population strategy” approaches each have their advantages and disadvantages, and the optimal prevention strategy likely requires a judicious mix of both (87).

CONCLUSIONS

Although it has been frequently assumed that social integration has an inverse association with poor mental health outcomes, including suicide, most evidence in support of this hypothesis has been based on aggregate data. Our study strongly suggests that social integration has a protective association against suicide risk for women, even after adjustment for multiple indicators of poor mental health. Interventions aimed at strengthening existing social network structures, or creating new ones, may be valuable programmatic tools in the primary prevention of suicide.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The authors thank their colleagues in the Channing Division of Network Medicine, Department of Medicine, Brigham and Women’s Hospital and at Harvard Medical School for their assistance with collecting and managing the Nurses’ Health Study data and for reviewing the analysis protocol, findings, statistical code, and manuscript.

ACT and ML had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

The Nurses’ Health Study was funded by U.S. National Institutes of Health (NIH) UM1 CA186107. This analysis was additionally supported through a Seed Grant from the Robert Wood Johnson Foundation Health and Society Scholars Program. The sponsors of the study had no role in design or conduct of the study; collection, management, analysis, and interpretation of the data; or preparation, review, or approval of the manuscript.

REFERENCES


JAMA Psychiatry. Author manuscript; available in PMC 2016 October 01.


Figure 1. Cumulative incidence of suicide among women in the Nurses’ Health Study

<table>
<thead>
<tr>
<th>Category</th>
<th>No. at risk</th>
<th>Follow-up, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category I</td>
<td>5547</td>
<td>0  2  4  6  8 10 12 14 16 18</td>
</tr>
<tr>
<td></td>
<td>5133</td>
<td>4446</td>
</tr>
<tr>
<td>Category II</td>
<td>20959</td>
<td>19730</td>
</tr>
<tr>
<td></td>
<td>14314</td>
<td>12846</td>
</tr>
<tr>
<td>Category III</td>
<td>15030</td>
<td>29701</td>
</tr>
</tbody>
</table>

Log-rank P < .001
Table 1

Adjusted^a baseline sample characteristics of women in the Nurses’ Health Study, by social integration category measured in 1992

<table>
<thead>
<tr>
<th>Social integration category^b</th>
<th>I (lowest) (n=5547)</th>
<th>II (middle) (n=20959)</th>
<th>III (middle) (n=15030)</th>
<th>IV (highest) (n=31071)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years, mean (SD)</td>
<td>57.9 (7.1)</td>
<td>58.5 (7.3)</td>
<td>57.8 (7.1)</td>
<td>58.6 (7.1)</td>
</tr>
<tr>
<td>Race/ethnic white, (%)</td>
<td>97.6</td>
<td>97.6</td>
<td>98.0</td>
<td>97.9</td>
</tr>
<tr>
<td>Employment status, (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not employed outside the home/Retired</td>
<td>23.2</td>
<td>26.4</td>
<td>29.4</td>
<td>31.8</td>
</tr>
<tr>
<td>Employed part-time</td>
<td>14.2</td>
<td>17.5</td>
<td>20.8</td>
<td>22.2</td>
</tr>
<tr>
<td>Employed full-time</td>
<td>50.0</td>
<td>44.7</td>
<td>40.1</td>
<td>36.5</td>
</tr>
<tr>
<td>Missing</td>
<td>12.6</td>
<td>11.3</td>
<td>9.8</td>
<td>9.5</td>
</tr>
<tr>
<td>Family history of alcoholism, (%)</td>
<td>23.6</td>
<td>23.1</td>
<td>21.2</td>
<td>19.9</td>
</tr>
<tr>
<td>Body mass index, kg/m²^c</td>
<td>26.2 (5.5)</td>
<td>26.1 (5.2)</td>
<td>25.9 (4.9)</td>
<td>26.1 (4.9)</td>
</tr>
<tr>
<td>Physical activity, METs/wk^c</td>
<td>16.2 (21.8)</td>
<td>17.8 (21.6)</td>
<td>19.7 (24.1)</td>
<td>20.4 (23.8)</td>
</tr>
<tr>
<td>Alcohol intake, g/day</td>
<td>6.5 (12.3)</td>
<td>5.5 (10.2)</td>
<td>5.5 (9.4)</td>
<td>4.5 (8.4)</td>
</tr>
<tr>
<td>Caffeine intake, g/day</td>
<td>297 (234)</td>
<td>275 (227)</td>
<td>265 (218)</td>
<td>240 (212)</td>
</tr>
<tr>
<td>Smoking status, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>31.9</td>
<td>39.1</td>
<td>40.9</td>
<td>50.6</td>
</tr>
<tr>
<td>Former</td>
<td>42.6</td>
<td>43.2</td>
<td>44.7</td>
<td>39.8</td>
</tr>
<tr>
<td>Current, 1-14 cigarettes/day</td>
<td>8.1</td>
<td>6.9</td>
<td>6.3</td>
<td>4.6</td>
</tr>
<tr>
<td>Current, 15-24 cigarettes/day</td>
<td>10.6</td>
<td>7.4</td>
<td>5.8</td>
<td>3.6</td>
</tr>
<tr>
<td>Current, 25 or more cigarettes/day</td>
<td>6.8</td>
<td>3.4</td>
<td>2.3</td>
<td>1.4</td>
</tr>
<tr>
<td>History of hypertension, (%)</td>
<td>37.1</td>
<td>35.0</td>
<td>34.6</td>
<td>33.2</td>
</tr>
<tr>
<td>History of diabetes, (%)</td>
<td>7.1</td>
<td>6.0</td>
<td>5.2</td>
<td>5.1</td>
</tr>
<tr>
<td>History of hypercholesterolemia, (%)</td>
<td>45.1</td>
<td>45.9</td>
<td>45.7</td>
<td>46.0</td>
</tr>
</tbody>
</table>

^a Values are means (SD) or percentages and are standardized to the age distribution of the study population.

^b Construction of the social integration index is described in Am J Epidemiol 1979;109:186-204.

^c METs/wk = metabolic equivalent of tasks per week.
Table 2

Relative hazard ratios for suicide (95% CI) among women in the Nurses’ Health Study, 1992-2010, by social integration category measured in 1992

<table>
<thead>
<tr>
<th>Social integration category b</th>
<th>Adjusted for age</th>
<th>Adjusted for age and other variables a</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (lowest)</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>II</td>
<td>0.43 (0.20-0.94)</td>
<td>0.51 (0.23-1.16)</td>
</tr>
<tr>
<td>III</td>
<td>0.21 (0.08-0.59)</td>
<td>0.26 (0.09-0.74)</td>
</tr>
<tr>
<td>IV (highest)</td>
<td>0.17 (0.07-0.42)</td>
<td>0.23 (0.09-0.59)</td>
</tr>
</tbody>
</table>

P trend <0.001 0.002

a Estimates were adjusted for age; employment status (not employed outside the home or retired, employed part-time outside the home, employed full-time outside the home); family history of alcoholism (y/n); body mass index (<20, 20-24.9, 25–29.9, 30–34.9, ≥35 kg/m2); physical activity in metabolic equivalent of tasks per week (quintiles); caffeine intake (g/day); alcohol intake (g/day); smoking status (never, former, and current in categories of 1-14, 15-24, and ≥25 cigarettes per day); and baseline history of diabetes, hypertension, or hypercholesterolemia (yes/no).

b Construction of the social integration index is described in Am J Epidemiol 1979;109:186-204.
Table 3
Relative hazard ratios for suicide (95% CI) among women in the Nurses’ Health Study, 1996-2010, by social integration trajectory from 1992 to 1996

<table>
<thead>
<tr>
<th>Social integration trajectory from 1992 to 1996</th>
<th>Adjusted for age</th>
<th>Adjusted for age and other variables (^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change, remained in lowest category (I) in 1992 &amp; 1996</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>Decline from 1992 to 1996</td>
<td>0.35 (0.10-1.20)</td>
<td>0.37 (0.10-1.34)</td>
</tr>
<tr>
<td>No change, remained in intermediate category (II or III) in 1992 &amp; 1996</td>
<td>0.22 (0.06-0.81)</td>
<td>0.24 (0.06-0.97)</td>
</tr>
<tr>
<td>Increase from 1992 to 1996</td>
<td>0.25 (0.06-1.01)</td>
<td>0.29 (0.07-1.25)</td>
</tr>
<tr>
<td>No change, remained in highest category (IV) in 1992 &amp; 1996</td>
<td>0.13 (0.03-0.53)</td>
<td>0.15 (0.04-0.65)</td>
</tr>
</tbody>
</table>

\(^a\) Estimates were adjusted for all socio-demographic, health behavior, and medical history variables listed in Table 2.

\(^b\) Construction of the social integration index is described in Am J Epidemiol 1979;109:186-204.