COHORT EFFECTS ON SUICIDE RATES: INTERNATIONAL VARIATIONS

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Recently, the long observed pattern of a monotonic increase in suicide with age has shifted, often dramatically, because more recent birth cohorts have exhibited much higher suicide rates at younger ages than earlier cohorts have. These changes, however, did not occur in all countries. We examine cohort variations in suicide rates in 14 modern, western societies using an extension of the age-period-cohort characteristic model that incorporates hierarchical linear modeling. Results support a general Durkheimian perspective. Birth cohorts experiencing relatively less social integration and regulation, as measured by higher rates of nonmarital births and larger relative cohort size, have higher suicide rates than other cohorts. Societies that provide alternative sources of social integration and regulation, as through collectivist institutions or through greater support for families and children, moderate this tendency. On the other hand, when societies experience rapid social change, the relationship between decreased social integration and regulation and increased suicide rates is stronger, especially for males. These results have implications for stemming the increased suicide rates for youth observed in many contemporary societies.

DURKHEIM AND the early moral statisticians were the first to document variations in suicide rates among and within nations (Durkheim [1897] 1951; Morselli [1882] 1975; Quetelet [1833] 1984). In the years that followed, many other scholars examined these differences and found remarkably similar cross-cultural patterns in rates of suicide as well as variations in cultural attitudes and acceptance of suicide (Day 1984; Hendin 1964; Retterstøl 1993). One of the most consistent cross-cultural patterns observed by Durkheim and the moral statisticians was the strong positive association of suicide with age. As he put it, "not only is suicide very rare during childhood but it reaches its height only in old age, and during the interval grows steadily from age to age" (Durkheim [1897] 1951:101).

In recent years, the steep monotonic pattern of increasing suicide with age has shifted. While rates for older men and women often have declined, those for young people, especially young men, have increased. This shift suggests *cohort-based changes* in suicide rates. More recent birth cohorts appear much more prone to suicide and at younger ages than earlier cohorts. The magnitude of these cohort changes varies, however, from one society to another, as in some countries the younger cohorts have not experienced this rapid increase in suicide deaths (Pampel and Williamson 2001).

We apply Durkheim's central thesis regarding the relationship of social integration and regulation to suicide by analyzing cohort variations in suicide rates in 14 western industrialized nations.

THEORETICAL ARGUMENT

While Durkheim's classic discussion delineated four types of suicide, he believed that egoistic and anomic suicide characterized

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suicides in modern societies and that they resulted, respectively, from low levels of social integration and social regulation. Generations of sociologists have found Durkheim's distinctions between integration and regulation conceptually confusing and inconsistent (Fernquist and Cutright 1998; Gibbs and Martin 1964; Johnson 1965; Pescosolido and Georgianna 1989; Pope 1976). Some suggest that integration is the concept most central to Durkheim's development (Gibbs and Martin 1964). Others (Johnson 1965:886) argue that social integration is necessary for social regulation and that it is difficult, both empirically and theoretically, to distinguish the two concepts (Thorlindsson and Bjarnason 1998:98). Generally, however, this literature suggests that both egoistic and anomic suicide reflect the same causal factors within a society—diminished regulation and integration. This conclusion is supported by Durkheim's ([1897] 1951) own comment that "egoism and anomy . . . are usually merely two different aspects of one social state" (p. 288).

We suggest that variations in suicide rates across birth cohorts in a variety of nations are related to differences in social integration and regulation that these cohorts experience. This integration and regulation reflect influences on two levels of analysis: (1) demographic characteristics associated with a birth cohort, or *cohort effects*; and (2) characteristics of the broader society, or *contextual effects*, that may modify the influence of these demographic characteristics.

COHORT EFFECTS

Cohort effects are distinct from age or period effects in that they reflect influences unique to a particular group of people, such as those born between 1950 and 1954 or young men who came of age between 1940 and 1944. Moreover, because the impact of cohort effects can persist throughout the life span, these impacts can last through various ages and historical periods. Cohort effects have been found in a wide variety of areas including criminal behavior (O'Brien 1989), political views and behavior (Alwin and Krosnick 1991; Firebaugh and Chen 1995; Firebaugh and Davis 1988; Weil 1987), and intellectual skills (Alwin 1991). A growing body of work documents a strong relationship of "cohort-related social capital" to cohort variations in lethal violence in the United States (O'Brien and Stockard 2002; O'Brien, Stockard, and Isaacson 1999; Savolainen 2000b; Stockard and O'Brien 2002). This work suggests that demographic factors associated with a birth cohort, such as its sex ratio, relative size, and family structure, are good indicators of cohort-related resources. We build on this research tradition by proposing that two demographic factors—family structure and relative cohort size—strongly affect the social integration and regulation experienced by birth cohorts and thus influence their rates of suicide.

The Durkheimian perspective suggests that higher rates of disrupted family structures and greater family strain are associated with higher suicide rates. Much scholarly work supports this view. Work at the macro level often involves examining suicide rates cross-sectionally and over time using rates of divorce and, sometimes, single parenthood as measures of family disruption. Much micro-level work utilizes "psychological autopsies" to explore the lives of people who have successfully committed suicide, clinical analyses of those who have attempted suicide, and detailed multivariate analyses, as well as clinical examinations, of people who express suicidal ideation or related tendencies. These micro-level analyses use measures of family structure as well as individual-level measures of family strain and conflict to measure social integration and regulation. Whatever the measure of familial integration and regulation, whatever the level of analysis, and whatever the age of the subjects, these studies support the Durkheimian hypothesis in the United States (Breault 1986; Breault and Barkey 1982; Danigelis and Pope 1979; Kposowa, Breault, and Singh 1995; Maris 1969; Pescosolido and Mendelsohn 1986) and in other societies (Diekstra 1995:234–37; Fergusson and Lynskey 1995; Grøholt et al. 1998; Stack 1989, 1990, 1992; Trovato 1987).

Although analyses of the relationship between suicide and family structure originated with Durkheim, analyses of the relationship of suicide to relative cohort size gained prominence with the writings of Easterlin (1980:104–106), who documented a relationship between increased cohort size and self-destructive behaviors such as suicide, homicide, and drug use. Easterlin's theoretical analysis focused on the economic disadvantages that larger cohorts face, especially when they enter a job market crowded with a large number of people seeking relatively rare entry-level jobs. More recent work has also focused on the disadvantages that relatively large cohorts face when they experience less social integration and regulation in their younger, formative years. Relatively large cohorts may overload institutions of social support and control, decreasing the family and community resources available to cohort members (O'Brien 1989; O'Brien, Stockard, and Isaacson 1999; Savolainen 2000b). When they are young, members of large cohorts may also be more likely to interact with, and be responsive to, members of their own cohort rather than with other age groups, promoting the development of a "youth culture" that is "relatively insulated from the influence of older generations" (Holinger et al. 1994:70).

Researchers have examined the relationship of relative cohort size to suicide and homicide rates at the macro level as well as variables related to various psychopathologies at the micro level. They generally find support for the hypothesis that people from larger cohorts face more disadvantages, although the strength of the relationship tends to vary from one country to another and, at least in the United States, to appear strongest when more complete multivariate models and longer time series are used (Diekstra 1995:234–37; Gartner and Parker 1990; Holinger 1987; Holinger et al. 1994; O'Brien 1989; O'Brien and Stockard 2002; O'Brien et al. 1999; Pampel 1996, 1998, 2001; Pampel and Gartner 1995; Pampel and Williamson 2001; Stockard and O'Brien 2002).

To summarize, we hypothesize that two demographic variables—family structure and relative cohort size—influence the social integration and regulation of birth cohorts. This influence occurs in at least three different ways. First, the strain of more children and fewer adults produces decreased financial resources, whether this strain results from more children within a cohort or from fewer adults within a household. Second, the relative lack of adults can lead to less attention and supervision for children, as adult resources are spread more thinly among children. Third, because adults are less involved in children's lives, the influence of peers becomes stronger. While children's peers can provide social support, they cannot provide the same type of integrative or regulative forces, nor can peers provide the emotional support and guidance that can come from adults. In part, cohort effects reflect the aggregation of individual effects—the result of more children growing up in larger families or single-parent families. In addition, however, all members of a birth cohort are affected by these characteristics, no matter what the size or composition of each member's own family. Our reasoning here involves notions of social capital and social closure (Coleman 1990). When cohorts are relatively large, all children, not just those from larger families, experience the reduced ratio of adults to children and the lower level of adult resources in school and community groups. When cohorts contain more single-parent families, networks of parents tend to have less closure. Parents are less likely to know the parents of their children's friends, and peers become a more important influence on all children, regardless of their own family background.[1]

Because males and females have different life experiences and expectations, the influence of cohort-related variables on them may differ. For instance, males might be more negatively affected by larger cohort sizes because of their historically greater involvement with the labor market (Pampel 2001). Boys may be more likely to interact in large peer groups, to seek out same-sex peers as companions, and to avoid adult companionship (Fagot 1994; Maccoby 1990). To the extent that the influence of relative cohort size occurs because of its relationship to young peoples' greater peer, rather than adult, interactions, males might be more likely to be negatively affected by larger cohort sizes. With respect to family

[1] These effects are structural in nature and have nothing to do with how much single parents or those with larger families love their children or want them to do well.

disruption, however, the literature generally indicates that the effects on males and females are similar (McLanahan and Sandefur 1994). Thus, we do not expect to observe gender differences in the influence of family structure on a cohort's risk of suicide.

Contextual Effects

Although the literature suggests that both family structure and relative cohort size influence the incidence of self-destructive behavior in a variety of countries, some studies suggest that the magnitude of this influence may vary from one nation to another. That is, factors associated with national context might modify the influence of family structure and relative cohort size on lethal violence (Pampel 2001; Pampel and Williamson 2001; Savolainen 2000a). We suggest two processes, one involving alternative or additional sources of social integration and regulation, and the second involving the pace of social change.

As noted above, variables such as family structure and relative cohort size may influence social integration and regulation through at least three different avenues: childhood poverty, less attention and supervision, and the greater influence of peers relative to adults. Societies can develop economic and social supports to mitigate these influences. For instance, child and family support programs, paid maternity leave, employment support for mothers, and legal guarantees of gender equality could moderate problems of childhood poverty. Well-developed preschool and child-care programs could increase the attention and supervision that children receive. A cultural and political climate that promotes cross-generational ties could counteract the greater influence of peers relative to adults.

In support of these speculations, Stack (1988; described by Holinger et al. 1994:98–99) found that the relationship of relative cohort size to youth suicide rates was much weaker in welfare capitalist countries, which have stronger redistributive policies than other countries. Pampel (2001) found similar results in an extensive analysis that examined both suicide and homicide rates for females and males over a wide range of ages. Pampel and Gartner (1995) found that the relationship of relative cohort size to homicide rates was weaker in societies with a strong commitment to social protection, including more universally available social welfare programs and a political system that tends to encourage interaction across age groups. Savolainen (2000a) found that the relationship of economic inequality to total homicide rates was moderated in nations with stronger collective institutions of social protection. In contrast, Pampel and Williamson (2001) found that national traditions of social and political equality and support were related to variations in age-trends in suicide and homicide but did not alter the effect of either relative cohort size or family-related variables on these age-trends.

Our expectations regarding the contextual importance of the rate of societal change are based on Durkheim's ([1897] 1951) observation that suicides tend to increase in times of crisis or rapid social change, attributing this increase to "disturbances of the collective order" (p. 246), which diminish social regulation. As he put it, ". . . [W]hen society is disturbed by some painful crisis or by beneficent but abrupt transitions, it is momentarily incapable of exercising this influence [regulation]; thence come the sudden rises in the curve of suicides" (p. 252). Contemporary authors also have documented the relationship of social changes in kinship patterns as well as urbanization and modernization to changes in suicide rates (Retterstøl 1993:60–61; Stack 1990, 1992, 1993). We are unaware of any studies that examine shifts in the influence of cohort-related integration and regulation in countries experiencing differing degrees of social change.

To summarize, we employ a general Durkheimian perspective in our discussion of cohort variations in suicide rates in modern industrialized societies. We hypothesize that relatively large cohorts and those that have a higher incidence of nontraditional family structures experience less social integration and regulation and thus will be more likely to have higher suicide rates. Some literature suggests that these cohort effects will be stronger for males than for females. At the same time, these cohort effects operate within a national social-political context. Based on contemporary literature, as well as on the classic writings of Durkheim, we hypothesize that national contextual effects, including the social-political climate of the country and the rate of social change, can modify the effect of cohort-related variables on suicide rates.

METHODOLOGY

To test our hypotheses we gathered data from the United States and 13 other developed nations: the Scandinavian countries of Denmark, Finland, Norway, and Sweden; Ireland and the United Kingdom from the British Isles; the northern and central European countries of the Netherlands, France, and Switzerland; the southern European country of Italy; and New Zealand, Australia, and Canada. All of these countries have long had well-established systems for gathering vital statistics. They also are populous enough to ensure that suicide rates are statistically reliable from one year to the next.[2] Although all the countries are industrialized democracies, they vary in their demographic, economic, and political characteristics, as well as their cultural attitudes and their suicide rates.

DATA AND MEASURES

Suicide rates were obtained from the World Health Organization (WHO). We use age-period-specific rates within five-year intervals for reasons outlined in O'Brien et al (1999) and to provide comparability with much of the literature on cohort effects (Kahn and Mason 1987; O'Brien 1989; Savolainen 2000b). WHO gathers age-specific suicide data from the statistical reports of individual countries using a standard reporting and auditing format. These data are considered the most reliable source of international health data, including data regarding deaths from lethal violence. Data for all of the countries used in the analysis were available from the early 1950s through 1995. Except for the earliest year, the data on suicides broken down by age are for five-year intervals from 1950 through 1995. For the earliest year, the data for suicides from Denmark, Italy, Norway, Sweden, and Switzerland are for 1951, and from Finland for 1952. To maintain comparability among nations, we limit our analyses to the periods from 1950 to 1995 and examine data for five-year birth cohorts beginning with the cohort born in 1915–1919. We omit from our analysis death rates for children under the age of 10, when suicide is rare, and for people over the age of 75, when population sizes become much smaller and rates are less reliable.

A concern with official measures of suicide deaths, such as those reported by WHO, is that they underreport the true incidence as a result of officials categorizing a suicide as an accidental or undetermined death (Douglas 1967; van Poppel and Day 1996). While researchers tend to agree that suicide is underreported to a greater or lesser degree in all societies (Diekstra 1995:219), analyses indicate that intercountry variations in such underreporting cannot explain intercountry differences in suicide rates (Barraclough 1973; Diekstra 1995; also see Pampel 2001). Additionally, our analyses include random intercepts for countries that help control for intercountry differences in reporting. Finally, while suicide may be more likely to be underreported for younger people than for adults and older people, this should not affect the shifts in the age distribution of suicide that we examine because we include dummy variables for age in our analyses.

Following other work in this area, our measure of family structure is the percentage of nonmarital births in a birth cohort.[3]

[2] Austria, Belgium, Greece, and Portugal were excluded because they had no data on suicide rates for the earliest years under study. Japan was omitted because data were not available on nonmarital births for half of the cohorts. We also lacked data on the country-level variables for Spain, and omitted eastern European countries and Germany because of concerns regarding the reliability and the availability of data.

[3] We use nonmarital births because they can be directly linked to birth cohorts, come directly from birth records rather than from interpolations, and are available for a wide range of countries. Data from the United States indicate that this measure is very highly correlated with Savolainen's (2000b) measure of family structure, which uses census data (Stockard and O'Brien 2002).

The *Demographic Yearbook* published by the United Nations supplied data on nonmarital births for cohorts born after about 1945, and Wimperis (1960) provided data for earlier years. To obtain the percentage of nonmarital births for each cohort born after 1945, we summed the appropriate percentages and divided by the number of years. For earlier cohorts, the data were provided for five-year groupings of birth cohorts, and no calculations were needed. Only countries with relatively complete data on nonmarital births were included.[4]

We operationalize relative cohort size as the percentage of the adult population that was in a five-year cohort when the cohort was young (O'Brien 1989; O'Brien and Stockard 2002, Savolainen 2000b; Stockard and O'Brien 2002). This operationalization is preferred for several reasons. It compares the size of the birth cohort with the size of the cohorts that preceded it, the measurement is made at a crucial age when the birth cohort is entering the job market (leaving home, potentially ready to marry, bear children, etc.), and the age range covered by this measure includes the parental generation of adults who were mainly responsible for rearing members of a birth cohort.[5]

Yearly population figures were obtained from WHO for cohorts born after 1950; information for earlier cohorts was obtained from national censuses, usually from 10-year intervals, except when wars or national crises resulted in longer gaps (Mitchell 1992).[6] We were usually able to measure relative cohort size for two different five-year birth cohorts during a single decennial year: the percentage of those ages 15 to 64 who were 15 to 19 when the cohort was aged 15 to 19, and the percentage of those ages 10 to 59 who were 10 to 14 when the cohort was aged 10 to14. When both measures were available for a cohort, we used the average of the two figures in our analyses. The correlation between these two measures, when both were available, was .99. In a few cases, we had to base the measure on other age groups.[7] Most commonly this measure involved the percentage of those ages 5 to 54 who were 5 to 9 when the cohort was aged 5 to 9, but again, when data for this and other measures of the cohort's relative size were available, the measures were very highly correlated (r = .98 for the measure based on ages 15 to 19, and r = .99 for the measure based on ages 10 to 14).

We use three measures of country-level characteristics, all deriving from the work of Pampel and his associates. The first is a measure of the collectivist, solidaristic, and egalitarian nature of the public policy of the

4 Data on nonmarital births are not available for cohorts 1 and 2 in Canada (born 1915–1919 and 1920–1924), and cohort 1 for Ireland. For the United States, data for cohort 1 were available only for those born between 1917 and 1919, and our measure of nonmarital births for this cohort and country is based only on those years.

5 Some definitions of relative cohort size, for example O'Brien's (1989) "variable measure," allow the generations compared to change with the age of the cohort. For instance, when the cohort was aged 15 to 19, relative cohort size was calculated as the percentage of the population ages 15 to 64 that was 15 to 19; when the cohort was aged 20 to 24, relative cohort size was calculated as the percentage of the population ages 15 to 64 that was 20 to 24; and so on. We use the "fixed" operationalization of relative cohort size because we believe that it focuses on the time in which cohorts enter adulthood and is thus more likely to tap the effects of a relatively large number of new entrants into families, schools, and the job market on members of a cohort.

6 The years in which census data were gathered varied slightly from one country to another. For instance, while the United States conducts a census at the start of every decade (e.g., 1920, 1930, etc.), Canada conducts a decennial census one year later (e.g., 1921, 1931, etc.). Thus, measures of relative cohort size for these countries differ slightly for years in which only census data can be used. We have no reason to suspect that these variations substantively affect our results.

7 A measure based on the percentage of the population ages 5 to 54 that was in the cohort when the cohort was ages 5 to 9 was used for cohort 2 (born in 1920–1924) for Australia, Norway, and the United Kingdom and for cohort 3 (born in 1925–1929) for Ireland and Italy. In addition, because of a lack of other data, a measure based on an average for the ages of 0 to 4 (the percentage of the population aged 0 to 49 that was 0 to 4 when the cohort was age 0 to 4) and age 20 to 24 (the percentage of the population aged 20 to 69 that was 20 to 24 when the cohort was age 20 to 24) was used for cohort 3 for the United Kingdom.

country. This measure of "collectivism" was developed by Pampel and Gartner (1995) and captures the extent to which nations have political systems that provide universal programs for social assistance and strong programs of social protection. These policies should reduce status and income differentials and offer social and physical support for citizens to protect them from economic fluctuations. The scale combines five indicators: democratic corporatism, consensus government, leftist rule, universalism in policies, and governability; and it is highly reliable (Cronbach's alpha = .89) (Pampel 2001; Pampel and Gartner 1995).

The second measure, women-friendly institutions, was developed by Pampel (2001) to measure institutional support for women. This measure consists of measures of child and family support, maternity leave, preschool access, legal equality for women, and employment support for mothers. The institutional arrangements included in this measure provide support for mothers and children that can supplement or compensate for support that has traditionally come from families. In all, there are 10 items taken from these domains, and Cronbach's alpha for this index is .94. Higher scores indicate nations with more support for women and mothers.

The measures of collectivism and women-friendly institutions are time-invariant. As Pampel (1993) and Pampel and Williamson (2001) note, this does not deny that these characteristics have changed over time, but does assume relatively stable rankings of the countries on these variables. We have no reason to assume that these relative rankings have altered dramatically since 1950.

The third country-level variable, change in traditional family roles, is based on an indicator used by Pampel and Williamson (2001). The measure is a composite of four items: marriage rate, divorce rate, fertility rate, and the female labor force participation rate. Marriage rates and fertility rates were reversed in computing the index, thus higher scores indicate societies and periods with low marriage and fertility rates and high divorce and female labor force participation rates. The scale reflects a single factor-analytic dimension and has a Cronbach's alpha of .68. Pampel and Williamson (2001) calculated this measure for all of the countries in our analysis for all five-year periods from 1955 to 1995, the majority of years in our analysis. We used their results to develop a measure of the extent to which family roles have changed within each society by subtracting the lowest value of this scale from the highest value that occurred over the period from 1955 to 1995.[8] Importantly, our measure of change in traditional family roles taps the extent of *change* in family roles within a country over time. It is essentially uncorrelated with the measure of percentage of nonmarital births ($r = -.02$), reflecting the fact that rapid family change has occurred equally in countries with both high and low levels of nonmarital births.

We hypothesize that countries that are more collectivistic or that have more women-friendly institutions will be more likely to have alternative sources of social support that can compensate for the loss of social integration and regulation that results from larger cohort sizes and nontraditional family structures. In other words, we expect that the influence of our cohort-based measures of social integration and regulation on age-period-specific suicide rates will be smaller in countries with high levels of collectivism and strong women-friendly institutions. We also hypothesize that countries with greater changes in traditional family roles will be less able to ameliorate the negative impacts of increases in relative cohort size or family structure. Thus, among countries exhibiting greater rates of change in family roles, the relationship between cohort-related integration and regulation and age-period-specific suicide rates will be stronger.

ANALYSIS

Our analysis is based on the age-period-cohort-characteristic model in which the dependent variable (the logged age-period-spe-

[8] The two country-level measures of institutional political and social support are positively correlated ($r = .54$, $p < .05$). Both have negative correlations with family change, although neither correlation is strong or significant (correlation of change in traditional family roles with collectivism equals $-.10$, $p = .72$; correlation with women-friendly institutions equals $-.30$, $p = .30$).

cific suicide rates for males and for females) is regressed on dummy variables for age groups and periods in addition to the cohort characteristics of relative cohort size and nonmarital birth rates. This use of dummy variables provides strong controls for the effects of age and period (Pampel and Peters 1995). Factors that change over time and whose effects are constant across age groups, such as variations in the media, income inequality, levels of divorce, or political strife, are controlled through the period dummy variables. Factors related to age that are constant across periods, such as the greater tendency for older people to commit suicide when compared with young people, are controlled through the use of dummy variables for age categories. The interaction of these variables with periods is not controlled by the dummy variables for age, but these dummy variables do control for the main effects of a large number of variables that are not included in the model to the extent that they are related to either period or age. We supplement the traditional age-period-cohort-characteristic model by including country-level intercepts as a random variable for the countries included in our analysis. This controls for nation-specific cultural or political factors that may influence suicide rates. Taken together, these variables help control for the main effects of a large number of variables that are not included in the model.

Table 1 presents the data for the United States that were used in our analyses and illustrates the type of data used for other countries. The rows and columns indicate period and age, and each cell contains the age-period-specific suicide rate. Cohort 1 was born between 1915 and 1919, cohort 2 between 1920 and 1924, and so on. The last cohort in our analysis (cohort 14) was born between 1980 and 1984. By following a particular cohort diagonally through the table, one can see how cohorts move through the space of time and age. (Cohort 1 is on the right-most diagonal, cohort 2 is to the left of cohort 1, and so on, with cohort 14 represented by the bottom left-hand cell.) The marginal at the bottom of the table contains two values that remain the same for each cohort over time: the relative cohort size, and the percentage of the cohort members who were born to unwed mothers. Data like those in Table 1 are examined for all 14 countries with each age-period-specific suicide rate representing a case.[9]

We use the natural log of the age-period-specific suicide rates as the dependent variable in all of our analyses. The natural log is used because our interest focuses on proportional changes in suicide death rates. For example, we are as interested in the doubling of the suicide rate for those aged 10 to 14 as for those aged 55 to 59. Yet because suicide rates for those in the 10-to-14-year age group are usually much lower in magnitude than rates for those who are older, examining the raw data would not allow us to capture this similarity.

The use of the natural logs produces a problem, however, when the suicide rate equals zero, for the natural log of zero is undefined. This condition occurred with several of our data points.[10] To include as many cases as possible in our analysis, yet preserve the substantive essence of very low rates in these cases, we substituted the lowest rate recorded for any age group of that gender in that country for the zero, a procedure that probably resulted in estimates for these age groups that were slightly elevated,[11] and, of course, slightly higher estimates of the suicide rates. To examine any bias that might have resulted from this procedure, we also analyzed the data in two other ways: (1) adding 1 to the rate for each case and then taking the natural log of this value; and (2) counting the zero rates as missing values. In each case, the substantive

[9] Because of missing data on the percentage of nonmarital births there were 75 cases for Canada, 85 for Ireland, and 94 cases for each of the other 12 countries in the analysis.

[10] For females, 80 of 1,316 suicide rates equaled zero; for males, 21 of 1,316 observations equaled zero. For males, all the zero rates, except 3, fell in the 10-to-14-year-old age group. Except for two countries, all of the zero rates for females fell in the 10-to-14-year-old age group. Ireland had the greatest number of zero data points (25 for females and 9 for males).

[11] Zeros represent *observed* rates of zero; they are not rates of suicide calculated from so few cases that the rates were considered "too unreliable to report." Thus, keeping these cases in our analysis is important.

Table 1. Age-Period-Specific Suicide Rates and Measures of Cohort Characteristics: United States, 1950 to 1995

	Age													
Year	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	65–69	70–74	
1950	**5**	**4**	**3**	**2**	**1**	—	—	—	—	—	—	—	—	—
	.3	2.7	6.2	8.1	10.1									
1955	**6**	**5**	**4**	**3**	**2**	**1**	—	—	—	—	—	—	—	—
	.3	2.6	5.5	7.9	8.9	10.5								
1960	**7**	**6**	**5**	**4**	**3**	**2**	**1**	—	—	—	—	—	—	—
	.5	3.6	7.1	9.0	10.9	13.2	15.2							
1965	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	—	—	—	—	—	—
	.5	4.0	8.9	11.3	13.3	15.8	17.5	18.7						
1970	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	—	—	—	—	—
	.6	5.9	12.2	13.9	14.3	15.9	17.8	19.5	20.5					
1975	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	—	—	—	—
	.8	7.6	16.5	16.5	16.2	16.2	18.6	19.9	20.2	20.6				
1980	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	—	—	—
	.8	8.5	16.1	16.5	15.3	15.4	15.3	15.3	16.4	16.3	15.5			
1985	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	—	—
	1.6	10.0	15.6	15.5	14.9	14.3	14.9	15.5	15.8	17.0	16.3	16.8		
1990	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	—
	1.5	11.1	15.1	15.0	15.4	15.6	14.9	15.0	14.7	16.1	15.9	16.6	19.6	
1995	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	—
	1.7	10.5	16.2	15.2	15.6	15.0	15.5	14.7	14.5	12.9	13.6	14.5	17.3	
Relative cohort size	10.42	10.53	10.82	11.72	14.03	15.33	15.27	14.62	12.43	10.87	10.80	12.39	13.69	13.89
Cohort number	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Nonmarital births	19.61	15.59	12.11	8.97	5.99	4.82	4.06	3.82	3.62	4.08	3.92	2.93	2.57	2.10

Note: In each row, the cohort number appears on top in bold type, and the age-period-specific suicide rate appears beneath it. Cohort 1 was born 1915–1919.

Table 2. Suicide Rates by Sex for 15-to-19-Year-Olds and 50-to-54-Year-Olds for Each Country in the Analysis: 14 Western Industrialized Countries, 1950 to 1995

		15-to-19-Year-Olds		50-to-54-Year-Olds	
Country	Statistic	Males	Females	Males	Females
Australia	Mean	9.4	2.8	24.3	9.5
	Range	4.3–17.2	1.0–4.4	19.2–39.0	6.5–13.3
Canada	Mean	12.3	3.08	27.8	10.9
	Range	2.6–21.4	1.1–4.9	21.8–29.9	7.4–14.5
Denmark	Mean	8.5	3.5	58.3	33.5
	Range	3.7–11.9	1.1–6.2	22.8–78.8	15.3–44.7
United Kingdom	Mean	3.9	1.5	15.5	8.6
	Range	2.5–5.9	.8–2.1	13.6–17.6	4.2–11.6
Finland	Mean	20.0	4.2	55.2	18.7
	Range	7.3–40.1	2.6–7.0	48.7–65.5	15.1–25.3
France	Mean	6.3	3.0	40.5	15.8
	Range	3.9–9.1	1.9–4.3	37.5–45.0	12.7–18.7
Ireland	Mean	4.6	.8	16.1	5.7
	Range	0–16.9	0–3.1	5.0–22.6	0–9.2
Italy	Mean	3.0	1.9	13.5	6.3
	Range	2.1–4.4	.8–3.4	10.4–15.6	5.0–7.5
Netherlands	Mean	3.8	1.3	18.0	13.9
	Range	1.2–6.7	.5–2.4	13.6–23.1	12.2–15.5
New Zealand	Mean	12.2	4.4	21.9	11.9
	Range	1.6–33.0	0–10.6	16.5–25.0	5.6–23.7
Norway	Mean	8.8	2.5	25.9	10.8
	Range	1.0–20.3	0–8.4	17.6–33.2	8.0–19.6
Sweden	Mean	8.6	4.3	40.7	19.2
	Range	4.8–13.1	.9–7.7	32.9–53.5	15.9–31.7
Switzerland	Mean	15.3	5.4	47.0	19.0
	Range	9.4–22.9	3.7–7.3	34.0–62.5	12.7–21.8
United States	Mean	10.5	2.6	25.1	9.4
	Range	3.5–18.1	1.3–3.7	22.8–29.0	6.5–12.7
Total	Mean	9.1	2.9	30.4	13.8
	Range	0–40.1	0–10.6	5.0–78.8	0–44.7

Note: N = 140 (10 in each country) for ages 15 to 19 and N = 84 (6 in each country) for those 50 to 54 years of age.

results are similar to those reported here. These supplementary results are available from the authors on request.

RESULTS

Descriptive Results

Table 2 shows the average suicide rates for each country in the analysis from the early 1950s through 1995, separately for males and females and for two age groups—15-to-19-year-olds and 50-to-54-year-olds. As expected, rates are higher for the older age group and for males in both age groups. Rates vary dramatically from a low of 0 (teenage males in Ireland in 1950, 1955, and 1965; teenage females in Ireland from 1950 to 1970; older women in Ireland in 1965 and 1970) to very high values. The highest value for teenage males was 40.1 per 100,000, recorded for Finns in 1990; the highest for teenage females was 10.6 per 100,000, recorded in New Zealand in 1980. Among 50-to-54-year-olds, the highest value for men was 78.8 per 100,000, while the highest value for women was 44.7 per 100,000, both recorded for Danes in 1980.

Table 3. Relative Cohort Size and Percentage of Nonmarital Births for Each Country in the Analysis: 14 Western Industrialized Countries

	Relative Cohort Size			Percentage of Nonmarital Births		
Country	Mean	Range	N	Mean	Range	N
Australia	12.28	10.27–14.34	94	5.02	3.92–13.76	94
Canada	13.64	9.61–15.69	94	4.36	2.15–14.78	85
Denmark	11.74	7.64–13.38	94	10.16	6.96–37.94	94
United Kingdom	10.73	9.06–12.79	94	5.48	4.20–14.42	94
Finland	13.03	8.96–16.14	94	6.97	4.14–13.82	94
France	11.32	8.31–13.55	94	8.09	5.94–14.40	94
Ireland	14.31	12.11–16.11	94	2.95	1.76–6.24	85
Italy	12.32	7.77–14.96	94	4.16	2.00–5.10	94
Netherlands	13.12	8.38–15.41	94	1.82	1.24–5.90	94
New Zealand	13.27	10.50–15.76	94	5.86	4.00–22.96	94
Norway	11.66	9.01–14.47	94	6.31	3.52–17.76	94
Sweden	10.60	8.75–12.48	94	14.19	9.46–44.22	94
Switzerland	10.86	8.22–12.16	94	3.87	3.40–5.30	94
United States	12.88	10.42–15.33	94	4.55	2.10–19.61	94
Total	12.27	7.64–16.14	1,316	6.02	1.24–44.22	1,298

Suicide rates vary widely from one country to another. For the older age group, the highest average rates for both men and women are found in Denmark, Finland, France, Sweden, and Switzerland. The lowest average rates for both sex groups are found in Italy and Ireland. As with adults, substantially higher average rates are found among male and female teenagers in Finland and Switzerland and for female teens, but not males, in Sweden. For teens, males and females in New Zealand and males in Australia, Canada, and the United States have higher average suicide rates than the mean for the entire set of countries. Within all countries and all periods, female suicide rates are lower than male rates.

The rates also vary greatly from one year to another. Among teenagers, for most countries, rates were substantially higher in the 1990s than in earlier periods. For instance, even though rates among teenage males in Ireland were almost zero in 1950, 1955, and 1965, in 1995 the suicide rate for 15-to-19-year-old males was 16.9 per 100,000. For young men in New Zealand, the rates rose from 11.7 per 100,000 in 1950 to 33.0 in 1995. In contrast, among adults, more variation typically occurred from one year to another, often with no discernable trend toward higher rates in more recent periods and even declines. For instance, among 50-to-54-year-old men in Ireland, the suicide rate was 9.9 in 1950, fell to 5.0 in 1970, but went up to 21.2 in 1995. In New Zealand, 50-to-54-year-old men had a suicide rate of 16.9 in 1950, 25.0 in 1970, and a rate of 22.3 in 1995.

Table 3 reports descriptive data on relative cohort size and percentage of nonmarital births for each country in the analysis. Relative cohort size varies from 7.64 for cohort 14 (born in 1980–1984) in Denmark, to 16.14 for cohort 7 (born in 1945–1949) in Finland. Canada, Finland, Ireland, the Netherlands, New Zealand, and the United States all tend to have higher average relative cohort sizes than do the other countries. The lowest average values are found in Sweden, Switzerland, United Kingdom, and France. The average percentage of nonmarital births varies from 1.24 for cohort 9 (born 1955–1959) in the Netherlands to 44.22 for cohort 14 in Sweden. Sweden also has the highest overall value, with an average of 14.19 across all cohorts. The lowest average values across all cohorts are found in the Netherlands and Ireland. In general, neither the percentage of nonmarital births nor relative cohort size are monotonic functions of cohort date of birth (e.g., see, data for the United States in Table 1).

Table 4 displays the country-level data for women-friendly institutions, collectivism, and change in traditional family roles. France and Sweden have the highest scores on the index for women-friendly institutions, while Australia and New Zealand have the lowest. Denmark, Sweden, and Norway have the highest collectivism values, while the United States, Canada, and Australia have the lowest values. The change in traditional family roles index ranges from a high of 2.73 for Canada to a low of 1.43 for Switzerland. Our hypotheses suggest that the positive effects of relative cohort size and percentage of nonmarital births will be weaker in countries with high scores on women-friendly institutions and collectivism and stronger in countries with high scores on change in traditional family roles.

Table 4. Country-Level Variables: Index Values for Women-Friendly Institutions, Collectivism, and Change in Traditional Family Roles: 14 Western Industrialized Countries

Country	Women-Friendly Institutions	Collectivism	Change in Traditional Family Roles
Australia	–.91	–1.00	1.97
Canada	–.68	–1.23	2.73
Denmark	.69	1.17	1.92
United Kingdom	–.50	–.76	1.69
Finland	.69	.53	1.76
France	1.29	–.84	1.52
Ireland	–.52	–.55	1.57
Italy	–.06	–.65	1.29
Netherlands	–.20	1.02	2.19
New Zealand	–.91	–.83	2.18
Norway	.39	1.68	2.01
Sweden	1.15	1.51	1.60
Switzerland	–.85	.71	1.43
United States	–.78	–1.62	1.83

Tests of Hypotheses

We use hierarchical linear modeling (with PROC MIXED in SAS) to examine our hypotheses. The models always specify period, age group, relative cohort size, and percentage of nonmarital births as fixed effects and include terms to estimate the random variance of the intercepts for countries and the random coefficient variances for differences in these fixed effects. Changes in the various models in Table 5 reflect the contextual, country-level variables introduced to account for changes in the slopes of relative cohort size and percentage of nonmarital births across countries. Model 1 contains none of the country-level variables; Models 2, 3, and 4 contain one of the variables; Models 5, 6, and 7 contain various combinations of two of the country-level variables; and Model 8 contains all three country-level variables. All of the models contain dummy variables for age and period and intercepts for nation. Thus, they include very strong controls for influences that covary with these variables, such as the tendency for suicide rates to vary with age, economic change, or cultural variations from one nation to another.

Two statistics help determine the fit of our models (see Table 5). The Bayesian Information Criterion (BIC) assesses the relative fit of different models while taking into consideration the sample size and number of independent variables (Raftery 1995). Lower values of BIC indicate a better fit. Using this criterion, Model 2 for females, which includes women-friendly institutions, and Model 6 for males, which includes women-friendly institutions and change in traditional family roles, provide the best fits. The "–2 × the likelihood ratio chi-square" statistic is used to test the statistical significance of differences in fit between two models when one of the models is nested within the other. When compared with the baseline model, Models 2 and 3 provide a significantly better fit for women, as do Models 2 and 4 for men ($p < .01$). Only two of the models containing two country-level variables significantly ($p < .05$) improve the model fit over the best-fitting model that contains one of the two country-level variables: Model 7 for women and Model 6 for men. The models containing three country-level variables do not significantly improve model fit. In all of the

Table 5. Fit Statistics for Models Containing Country-Level Variables for Women and Men: 14 Western Industrialized Countries, 1950 to 1995

	Women		Men	
Model Number and Description	–2 × Likelihood	BIC	–2 × Likelihood	BIC
Model 1: Level 1 coefficients only	1,424.3	1,503.5	1,010.5	1,089.6
Model 2: With women-friendly institutions	1,407.7***	1,492.1	998.2***	1,085.3
Model 3: With collectivism	1,409.3**	1,496.4	1,004.5	1,091.6
Model 4: With change in traditional family roles	1,419.0	1,506.1	999.0***	1,086.1
Model 5: With women-friendly institutions and collectivism	1,402.6	1,495.0	997.8	1,092.8
Model 6: With women-friendly institutions and change in traditional family roles	1,405.4	1,500.4	989.8*	1,084.8
Model 7: With Collectivism and change in traditional family roles	1,398.4*	1,493.4	991.6	1,086.6
Model 8: With women-friendly institutions, collectivism, and change in traditional family roles	1,397.2	1,500.2	988.3	1,091.3

Note: For models with one country-level variable (Models 2, 3, and 4), the significance levels are computed by comparing the model with the baseline model (Model 1). For those models with two country-level variables (Models 5, 6, and 7), the model is compared with the best-fitting "one-country-level-variable model" that contains one of the country-level variables in that model. Model 8 is compared with the best-fitting model containing two country-level variables.

*$p < .05$ **$p < .01$ ***$p < .001$ (two-tailed tests)

16 models in Table 5, the signs of the coefficients for the effects of the contextual (country-level) variables on the slopes of relative cohort size and percentage of nonmarital births are always in the predicted direction: Women-friendly institutions and collectivism reduce the impact of relative cohort size and percentage of nonmarital births on the age-period-specific suicide rates and change in traditional family roles increases their impact.

Table 6 includes the coefficients for the best-fitting models for each sex group and the baseline model with only level-1 coefficients. (The coefficients from all of the other models are available on request.) The level-1 coefficients indicate the fixed effects for relative cohort size and percentage of nonmarital births across countries controlling for other variables in the model. The level-2 coefficients indicate the effects of the contextual variables on the slopes associated with the two cohort characteristics, and the random coefficient variances indicate the amount of variance that remains between countries for the intercepts and the slopes of both relative cohort size and percentage of nonmarital births once other variables in the model have been controlled.[12]

As hypothesized, the level-1 coefficients are all positive, indicating that cohorts that are relatively larger or that have larger percentages of nonmarital births have higher suicide rates, even when age, period, and national differences are controlled. However, the coefficients associated with the percentage of nonmarital births are consistently stronger than those associated with relative cohort size. In addition, as hypothesized, the coefficients associated with relative cohort size are stronger for males than for females.[13]

[12] We do not report the effects of country-level characteristics on the intercepts for countries because none of these effects is statistically significant in any of our models. To save space, and because they are not our focus of interest, we do not report the period and age-group coefficients. There would be 10 fixed age-group coefficients, 13 fixed period coefficients, 140 (10 × 14) random age-group coefficients, and 182 (13 × 14) random period coefficients.

[13] O'Brien et al. (1999) note the potential for autocorrelation due to cohorts, as most cohorts

Table 6. Unstandardized Coefficients Showing the Influence of Country-Level Variables on the Effects of Relative Cohort Size and Percentage of Nonmarital Births on Logged Age-Period-Specific Suicide Rates for Women and Men: 14 Western Industrialized Countries, 1950 to 1995

	Women			Men		
Independent Variable	Model 1	Model 2	Model 6	Model 1	Model 2	Model 6
Level-1 Coefficients						
Relative cohort size	.026	.022	.024	.034***	.033***	.034***
	(.020)	(.019)	(.019)	(.009)	(.007)	(.007)
Percentage of nonmarital births	.050**	.055***	.051***	.046***	.050***	.045***
	(.017)	(.006)	(.007)	(.011)	(.008)	(.007)
Level-2 Coefficients Showing Effects of Women-Friendly Institutions on:						
Relative cohort size	—	–.032	–.034	—	–.029**	–.028**
		(.025)	(.026)		(.010)	(.010)
Percentage of nonmarital births	—	–.051***	–.043***	—	–.031***	–.018*
		(.006)	(.009)		(.010)	(.009)
Level-2 Coefficients Showing Effects of Change in Traditional Family Roles on:						
Relative cohort size	—	—	.000	—	—	.017
			(.053)			(.022)
Percentage of nonmarital births	—	—	.044	—	—	.073**
			(.027)			(.025)
Random Coefficient Variance						
Intercept	.177**	.148**	.146**	.237**	.211**	.205**
	(.072)	(.061)	(.060)	(.093)	(.083)	(.081)
Relative cohort size	.005*	.004*	.004*	.001	.000	.000
	(.002)	(.002)	(.002)	(.000)	(.000)	(.000)
Percentage of nonmarital births	.003*	.000	.000	.001*	.000	.000
	(.001)	(.000)	(.000)	(.001)	(.000)	(.000)

Note: Numbers in parentheses are standard errors. Each model also includes age group and period random variables. Model 2 is the best-fitting model for women, and Model 6 is the best-fitting model for men. See Table 5 for model fit statistics.

* $p < .05$ ** $p < .01$ *** $p < .001$ (one-tailed tests)

The level-2 coefficients are also all in the hypothesized direction. Coefficients associated with women-friendly institutions are negative, indicating that the effects of relative cohort size and percentage of nonmarital births are muted in countries in which political systems provide more extensive programs for social assistance and protection, including support for mothers and children. Coefficients associated with the amount of change in traditional family roles are positive, indicating that the effects of relative

contribute more than one observation to the data set. In recent papers, we use the cluster option in STATA to correct estimated standard errors for nonindependence of errors within cohorts (O'Brien and Stockard 2002; Stockard and O'Brien 2002). In an unreported analysis, we ran an OLS regression analysis with fixed effects for countries, periods, and age groups and examined the effects of relative cohort size and percentage of nonmarital births on age-period-specific suicide rates. The effects were positive and statistically significant ($p < .001$ for percentage of nonmarital births for both males and females, $p < .01$ for relative cohort size for males, and $p < .05$ for relative cohort size for females). We then ran the same regression analysis in STATA treating each of the 196 cohorts (14 for each of the 14 nations) as clusters. The standard errors of relative cohort size and percentage of nonmarital births increased, but the coefficients for each of these variables remained statistically significant for both males and females. Unfortunately, this option is not available for the hierarchical linear models that we used in this paper.

cohort size and percentage of nonmarital births are stronger in societies experiencing more rapid change in family roles. For females, none of the level-2 coefficients predicting slopes associated with relative cohort size are significant at the $p < .05$ level, although those in Models 2 and 6 for women-friendly institutions are significant at the $p < .10$ level. All of the level-2 coefficients predicting slopes associated with percentage of nonmarital births are significant, with the exception of change in traditional family roles in Model 6 for women. For men, all of the level-2 coefficients are significant with the exception of the coefficient for the interaction of change in traditional family roles and relative cohort size in Model 6.

For men, comparing the random coefficient variances of Model 1 with those of Models 2 and 6 indicates that including country-level variables reduces the variance in the slopes between countries to statistically insignificant levels for both relative cohort size and percentage of nonmarital births. For women this variance is nonsignificant for percentage of nonmarital births, but not for relative cohort size. For both men and women, the random coefficient variance in the intercepts indicates that a statistically significant amount of variance remains once all the country-level variables are entered into the models. In other words, while these country-level variables can often account for variations in the slopes of percentage of nonmarital births and relative cohort size between countries, they do not explain differences among the countries in overall levels of suicide. Importantly, in none of the models in Table 5 are the country-level variables significantly related to the country-level intercepts.

To summarize, for both men and women, the best-fitting models include the measure of women-friendly institutions. For men, the best-fitting model also includes change in traditional family roles. For women, the results indicate that percentage of nonmarital births, but not relative cohort size, has a significant main effect on age-period-specific suicide rates, while for men both cohort-related variables have significant main effects. For both sex groups, the influence of percentage of nonmarital births is moderated by supportive social institutions and enhanced in a context of greater change, although the effects are not always statistically significant. The best-fitting models (as well as the other models in Table 5) indicate that these contextual variables also have a similar moderating or enhancing effect on relative cohort size.

DISCUSSION

Our results support both of our major hypotheses. As expected, when examined as a whole, data from a wide range of western nations over most of the last half of the twentieth century support the hypothesis that cohorts with higher percentages of nonmarital births tend to have higher suicide rates. The expected relationship between relatively large cohorts and higher suicide rates was found for men, but not for women, although the sign of the relationship was in the predicted direction for women. We suggest that these variables are indicators of the extent to which birth cohorts experience varying levels of social integration and regulation—the key factors influencing suicide in a general Durkheimian perspective. The inclusion of intercepts for nations provides an extremely strong control, adjusting for a large number of variables not included in the model, but which might be related to national differences such as cultural norms, medical care or levels of inequality.[14] The

[14] A reviewer noted that nonmarital fertility may not have the same normative valuation in all of the countries included in our analysis—and that is indeed possible, given the substantial variation in this variable from one country to another, both historically and currently. Yet, normative valuation may be theoretically distinct from integration and regulation. Even if a practice is seen as more or less accepted across a group of societies, it can have the same structural effect of promoting (or inhibiting) strong social ties. In fact, this is what we test when we examine the relationship of percentage of nonmarital births to suicide rates while introducing random intercepts for countries. The fact that percentage of nonmarital births is strongly associated with suicide rates across all the countries within our sample, even after these country-level variables are controlled, would suggest that the integrative/regulative aspects of variations in family structure have effects that are independent of normative views toward the practice.

inclusion of dummy variables for both age and period support the contention that these are cohort effects rather than the result of incomplete controls for age and period effects.

Our second hypothesis, which suggests that national contextual effects systematically influence the relationship of cohort-related measures of social integration and social regulation to suicide, also received strong support. The finding that the influence of cohort-related measures of integration and regulation is weaker in societies with a strong commitment to social and political equality, especially involving institutions that support women, suggests that various social programs found in such societies, as well as general norms of egalitarianism, may provide alternative sources of social regulation and integration. In addition, the influence of cohort-related measures of integration and regulation is stronger in societies that have experienced rapid change in family roles. Rapid change in a society's basic social institutions makes it difficult to maintain social regulation and integration. Again, it is important to note that these significant contextual influences appear even with the very strong controls introduced by the dummy variables for age and period and country intercepts.

As expected, the influence of family structure was similar for both sex groups, supporting studies using other dependent variables, such as educational attainment and delinquency, which have found that family disruption influences males and females to a similar extent (McLanahan and Sandefur 1994). In contrast, relative cohort size significantly influenced the age-period-specific suicide rates of males, but not females. Pampel (2001) suggests that such differences might occur because the effect of larger cohort sizes on economic opportunities is more likely to apply to males than to females. We suggest that these differences may also reflect the tendency for boys to be more likely than girls to interact in larger peer groups and to avoid adult companionship (Fagot 1994; Maccoby 1990) and thus to be more prone to the influence of peers.

Differences in suicide rates traditionally found among societies continue to exist within all of our statistical models. Measures of cohort-related integration and regulation, social/political climate, and the rate of social change appear to do an excellent job of explaining variations in age-period-specific rates of suicide across a wide group of modern industrialized nations, but these measures do not account for cross-national variations in the rates. This finding provides additional support for the view that such international differences in suicide rates reflect deep-seated cultural patterns regarding suicide (Day 1984; Hendin 1964; Retterstøl 1993).

Even though our results cannot account for general differences in the magnitude of suicide rates among countries, they can account for differences in *changes* in the rates of youthful suicide. The examination of three countries—Australia, Norway, and Sweden—illustrates how the contextual factors in our model influence the impact that cohort-related variables may have on suicide rates. Over the time period in this study, birth cohorts in all three countries had sharp increases in the nonmarital birth rate: from 4.7 for cohort 1 to 10.7 for cohort 13 in Australia, from 7.0 to 11.54 in Norway, and from 15.80 to 34.74 in Sweden. Given the hypothesized effects of family structure on suicide rates, we would expect that young people in cohort 13 (who were ages 15 to 19 in 1995) would have much higher suicide rates than those in cohort 1 in all three countries.

Table 3 shows, however, that Australia, like other English-speaking countries, has a social-political tradition that has provided fewer universal programs for social assistance and protection and fewer institutional supports for women. At the same time, it has experienced a relatively large degree of change in traditional family institutions. Given this context, we would expect these Australian cohorts to be relatively unprotected from the declining social integration and regulation that occurred with rising rates of nonmarital births. This is, in fact, what happened: The total suicide rate among 15-to-19-year-olds in Australia has almost tripled, rising from 3.26 in 1950 for cohort 1 to 8.99 in 1995 for cohort 13.

Both Norway and Sweden have extensive programs of universal social support, as reflected by their relatively high scores on the measures of women-friendly institutions and collectivism. Thus, we would expect that birth cohorts in both countries would be protected from changing levels of cohort integration and regulation. Yet, these two countries differ markedly in the extent to which they have experienced change in traditional family roles: Norway has experienced substantially more change than Sweden. This rapid rate of institutional change could make it more difficult for a society, even one with a strong tradition of political and social equality, to ameliorate the negative impacts of decreases in cohort-related integration and regulation. Again, the results are as expected: Suicide rates for Norwegian 15-to-19-year-olds rose steeply in the last half of the twentieth century, from .49 in 1951 (cohort 1) to 13.37 in 1995 (cohort 13), while in Sweden the rates rose only slightly, from 6.72 to 7.07 per 100,000.

To summarize, our results support a general Durkheimian perspective: Throughout a wide range of modern, western societies, birth cohorts that experience relatively less social integration and regulation have higher suicide death rates than do other cohorts. This tendency is moderated in societies that provide alternative sources of social integration and regulation. On the other hand, when societies experience rapid social change, the relationship between lower levels of integration and regulation and higher suicide rates is magnified.

Our results have at least two implications for stemming suicides among youth. First, social institutions, especially women-friendly institutions that support families and children, can serve to mitigate the loss of social capital resulting from high levels of nonmarital births and large birth cohorts. We propose that our measures of cohort-related social integration and regulation influence suicide rates through their relationship with family poverty, attention and supervision provided by adults to young people, and the relative importance of peers and adults. Countries with higher levels of collectivism and women-friendly institutions address each of these issues. Their extensive systems of monetary supports for families and children result in relatively low levels of childhood poverty. State-supported systems of child care, parental leave, and family-friendly working hours help assure higher levels of parental attention and supervision. Finally, the "corporatist" nature of these societies may promote greater cross-generational communication and support (Pampel 2001). Given their political and cultural traditions, other countries may not be able to mimic these institutional practices closely. Yet, our results indicate that suicide rates of youth could be moderated if countries were to develop means of supplementing social integration and regulation for those cohorts that are most at risk.

Second, as illustrated by the experience of Norway, even strong alternative sources of integration and regulation do not appear to be sufficient remedies for societies faced with high rates of social change in traditional family structures. All of the English-speaking countries in our analysis (Australia, Canada, Ireland, United Kingdom, United States, and New Zealand) provide fewer alternative means of social support to families and children than do most of the other countries in our analysis. At the same time, these countries have often experienced rapid change in traditional family roles. This combination of factors suggests that young cohorts in these societies, and especially males, may be at special risk. These countries may need to devote extensive resources to their younger cohorts if they wish to alleviate their high rates of suicide.

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REFERENCES

Alwin, Duane F. 1991. "Family of Origin and Cohort Differences in Verbal Ability." *American Sociological Review* 56:625–38.

Alwin, Duane F. and Jon A. Krosnick. 1991. "Aging, Cohorts, and the Stability of Sociopolitical Orientations over the Life Span." *American Journal of Sociology* 97:169–95.

Barraclough, Brian. 1973. "Differences between National Suicide Rates." *British Journal of Psychiatry* 122:95–6.

Breault, K. D. 1986. "Suicide in America: A Test of Durkheim's Theory of Religious and Family Integration, 1933–1980." *American Journal of Sociology* 92:628–56.

Breault, K. D. and Karen Barkey. 1982. "A Comparative Analysis of Durkheim's Theory of Egoistic Suicide." *Sociological Quarterly* 23:321–31.

Coleman, James S. 1990. *Foundations of Social Theory*. Cambridge, MA: Belknap.

Danigelis, Nick and Whitney Pope. 1979. "Durkheim's Theory of Suicide as Applied to the Family: An Empirical Test." *Social Forces* 57:1081–1106.

Day, Lincoln H. 1984. "Death from Non-War Violence: An International Comparison." *Social Science and Medicine* 19:917–27.

Diekstra, René F.W. 1995. "Depression and Suicidal Behaviors in Adolescence: Sociocultural and Time Trends." Pp. 212–46 in *Psychosocial Disturbances in Young People*, edited by M. Rutter. Cambridge, England: Cambridge University Press.

Douglas, Jack D. 1967. *The Social Meanings of Suicide*. Princeton, NJ: Princeton University Press.

Durkheim, Emile. [1897] 1951. *Suicide: A Study in Sociology*. Translated by J. A. Spaulding and G. Simpson. Edited and with an introduction by G. Simpson. Reprint, New York: Free Press.

Easterlin, Richard A. 1980. *Birth and Fortune*. New York: Basic Books.

Fagot, Beverly I. 1994. "Peer Relations and the Development of Competence in Boys and Girls. Pp. 53–66 in *Childhood Gender Segregation*, edited by C. Leaper. San Francisco, CA: Jossey-Bass.

Fergusson, David M. and Michael T. Lynskey. 1995. "Childhood Circumstances, Adolescent Adjustment, and Suicide Attempts in a New Zealand Birth Cohort." *Journal of the American Academy of Child and Adolescent Psychiatry* 34:612–22.

Fernquist, Robert M. and Phillips Cutright. 1998. "Societal Integration and Age Standardized Suicide Rates in Developed Countries: 1955–1989." *Social Science Research* 27:109–27.

Firebaugh, Glenn and Kevin Chen. 1995. "Vote Turnout of Nineteenth Amendment Women: The Enduring Effects of Disenfranchisement." *American Journal of Sociology* 100:972–96.

Firebaugh, Glenn and Kenneth E. Davis. 1988. "Attitudes toward Women's Familial Roles: Changes in the United States, 1977–1985." *Gender and Society* 2:39–57.

Gartner, Rosemary and Robert Nash Parker. 1990. "Cross-National Evidence on Homicide and the Age Structure of the Population." *Social Forces* 69:351–71.

Gibbs, Jack P. and Walter T. Martin. 1964. *Status Integration and Suicide*. Eugene, OR: University of Oregon Press.

Grohølt, Berit, Øivind Ekeberg, Lars Wichstrøm, and Tor Haldorsen. 1998. "Suicide among Children and Younger and Older Adolescents in Norway: A Comparative Study." *Journal of the American Academy of Child and Adolescent Psychiatry* 37:473–87.

Hendin, Herbert. 1964. *Suicide and Scandinavia*. New York: Grune and Stratton.

Holinger, Paul C. 1987. *Violent Deaths in the United States*. New York: Guilford.

Holinger, Paul C., Daniel Offer, James T. Barter, and Carl C. Bell. 1994. *Suicide and Homicide among Adolescents*. New York: Guilford.

Johnson, Barclay D. 1965. "Durkheim's One Cause of Suicide." *American Sociological Review* 30:875–86.

Kahn, Joan R. and William M. Mason. 1987. "Political Alienation, Cohort Size, and the Easterlin Hypothesis." *American Sociological Review* 52:155–69.

Kposowa, Augustine J., K. D. Breault, and Gopal K. Singh. 1995. "White Male Suicide in the United States: A Multivariate Individual-Level Analysis." *Social Forces* 74:315–23.

Maccoby, Eleanor E. 1990. "Gender and Relationships: A Developmental Account." *American Psychologist* 45:513–20.

Maris, Ronald W. 1969. *Social Forces in Urban Suicide*. Homewood, IL: Dorsey.

McLanahan, Sara and Gary Sandefur. 1994. *Growing Up with a Single Parent*. Cambridge, MA: Harvard University Press.

Mitchell, Brian R. 1992. *International Historical Statistics Europe, 1750–1988*. 3d ed. New York: Stockton.

Morselli, Henry. [1882] 1975. *Suicide: An Essay on Comparative Moral Statistics*. Reprint, New York: Arnon.

O'Brien, Robert M. 1989. "Relative Cohort Size and Age-Specific Crime Rates: An Age-Period-Relative-Cohort-Size Model." *Criminology* 27:57–78.

O'Brien, Robert M. and Jean Stockard. 2002. "Variations in Age-Specific Homicide Death

Rates: A Cohort Explanation for Changes in the Age Distribution of Homicide Deaths." *Social Science Research* 31:124–50.

O'Brien, Robert M., Jean Stockard, and Lynne Isaacson. 1999. "The Enduring Effects of Cohort Characteristics on Age-Specific Homicide Rates, 1960–1995. *American Journal of Sociology* 104:1061–95.

Quetelet, Adolphe. [1833] 1984. *Research on the Propensity for Crime at Different Ages.* Translated with an introduction by S. F. Sylvester. Reprint, Cincinnati, OH: Anderson.

Pampel, Fred C. 1993. "Relative Cohort Size and Fertility: The Socio-Political Context of the Easterlin Effect." *American Sociological Review* 58:496–514.

———. 1996. "Cohort Size and Age-Specific Suicide Rates: A Contingent Relationship." *Demography* 33:341–55.

———. 1998. "National Context, Social Change, and Sex Differences in Suicide Rates." *American Sociological Review* 63:744–58.

———. 2001. *The Institutional Context of Population Change.* Chicago, IL: University of Chicago Press.

Pampel, Fred C. and Rosemary Gartner. 1995. "Age Structure, Socio-Political Institutions, and National Homicide Rates." *European Sociological Review* 11:243–60.

Pampel, Fred C. and H. Elizabeth Peters. 1995. "The Easterlin Effect." *Annual Review of Sociology* 21:163–94.

Pampel, Fred C. and John B. Williamson. 2001. "Age Patterns of Suicide and Homicide Mortality Rates in High Income Nations." *Social Forces* 80:251–82.

Pescosolido, Bernice A. and Sharon Georgianna. 1989. "Durkheim, Suicide, and Religion: Toward a Network Theory of Suicide." *American Sociological Review* 54:33–48.

Pescosolido, Bernice A. and Robert Mendelsohn. 1986. "Social Causation or Social Construction of Suicide? An Investigation into the Social Organization of Official Rates." *American Sociological Review* 51:80–101.

Pope, Whitney. 1976. *Durkheim's Suicide.* Chicago, IL: University of Chicago Press.

Raftery, Adrian E. 1995. "Bayesian Model Selection in Social Research." *Sociological Methodology* 25:111–63.

Retterstøl, Nils. 1993. *Suicide: A European Perspective.* Cambridge, England: Cambridge University Press.

Savolainen, Jukka. 2000a. "Inequality, Welfare State, and Homicide: Further Support for the Institutional Anomie Theory." *Criminology* 38:1021–42.

Savolainen, Jukka. 2000b. "Relative Cohort Size and Age-Specific Arrest Rates: A Conditional Interpretation of the Easterlin Effect." *Criminology* 38:117–36.

Stack, Steven. 1988. "The Impact of Relative Cohort Size on National Suicide Trends, 1950–1980: A Comparative Analysis." Paper presented at the annual meeting of the American Association of Suicidology, May 28, San Francisco, CA.

———. 1989. "The Impact of Divorce on Suicide in Norway, 1951–1980." *Journal of Marriage and the Family* 51:229–38.

———. 1990. "The Effect of Divorce on Suicide in Denmark, 1951–1980." *The Sociological Quarterly* 31:359–70.

———. 1992. "The Effect of Divorce on Suicide in Finland: A Time Series Analysis." *Journal of Marriage and the Family* 54:636–39.

———. 1993. "The Effect of Modernization on Suicide in Finland: 1800–1984." *Sociological Perspectives* 36:137–48.

Stockard, Jean and Robert M. O'Brien. 2002. "Cohort Variations and Changes in Age-Specific Suicide Rates Over-Time: Explaining Variations in Youth Suicide." *Social Forces* 81:605–42

Thorlindsson, Thorolfur and Thoroddur Bjarnason. 1998. "Modeling Durkheim on the Micro Level: A Study of Youth Suicidality." *American Sociological Review* 63:94–110.

Trovato, Frank. 1987. "A Longitudinal Analysis of Divorce and Suicide in Canada." *Journal of Marriage and the Family* 49:193–203.

van Poppel, Frans and Lincoln H. Day. 1996. "A Test of Durkheim's Theory of Suicide—Without Committing the 'Ecological Fallacy.'" *American Sociological Review* 61:500–507.

Weil, Frederick D. 1987. "Cohorts, Regimes, and the Legitimation of Democracy: West Germany Since 1945." *American Sociological Review* 52:308–24.

Wimperis, Virginia. 1960. *The Unmarried Mother and Her Child.* London, England: George Allen and Unwin.