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Family and Household Formations and Suicide in the United States

Family support systems have been theoretically linked to suicide risk. But no research to date has investigated the effects of detailed living arrangements on individual risk of suicide. Using data on 825,462 adults from the National Health Interview Survey Linked Mortality File reveals that living in families with stronger sources of social support and integration decreases risk of suicide. These effects persist despite controls for important individual level characteristics. Risk of suicide decreases for persons in married as well as unmarried families when children are present and risk increases for persons living with unrelated adults. These results reveal the structural importance of family formation on the social integrative forces that contribute to an individual's risk of suicide.

Sociologists have long been interested in social factors impacting suicide risk. Following a tradition established by the French sociologist Emile Durkheim (1951/1897), much of the work has focused on larger social contexts, including characteristics of counties, cities, and nations (Baller & Richardson, 2002; O'Brien & Stockard, 2006; Pampel, 1996; Stockard & O'Brien, 2002; Wadsworth & Kubrin, 2007). At both the aggregate and individual level (Breault, 1986; Kposowa, Breault, & Singh,

1995; Kposowa, 2000; Stack, 2000a, 2000b), this impressive body of work documents the effects of social relationships and circumstances on suicide and highlights the deleterious effects of family histories of depression and other mental illnesses on suicide risk (Qin, Agerbo, & Mortensen, 2003; Treméau et al., 2005). Some work even provides evidence that suicide is heritable, and the propensity to commit suicide can be transmitted within families (see Brent & Mann, 2005, for a review). But despite theoretical links to domestic support systems, very few studies have examined suicide within varying family environments, and no studies to date have focused on the living arrangements within the household. Accordingly, this paper builds on existing theoretical tenets surrounding the family and suicide risk by examining a major contributor to preventable mortality as not just an individual or an aggregate phenomenon but as a health issue enveloped in individual circumstances and family configurations.

THE SIGNIFICANCE AND THEORETICAL HISTORY OF SUICIDE

Suicide is a pervasive cause of death—it has remained a leader of preventable mortality over the last 50 years, and the most current government reports show that it was the 11th leading cause of death and the second leading external cause of mortality (behind accidents, but far ahead of homicides) in the United States in 2005, contributing to over 32,000 deaths (Kung, Hoyert, Xu, & Murphy, 2008).

Largely driven by the work of Durkheim (1951/1897), suicide has been identified as

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a cause of death directly linked to social conditions. Durkheim proposed and empirically supported that, although clearly an individual act, taking one's own life is rooted in social relationships and social structure. At the heart of social structure are the intersection of what Durkheim termed social integration and social regulation (Bearman, 1991). Theoretically applied, social integration consists of ways in which individuals are bonded to each other, and social regulation is the extent to which individuals are held to group values, beliefs, and norms. Thus, Durkheim based his typologies of suicide on the levels (or lack) of social integration and regulation possessed.

Many suicide scholars since have noted the difficulty in specifying theoretically important differences between social integration and regulation. Johnson (1965) suggested that, upon closer inspection of the premises in Durkheim's work, integration is a necessary component of regulation and is consequently the only component of social structure impacting suicide. Similarly, Gibbs and Martin (1964), in developing their status integration theory of suicide, purported that social integration is the principal and most important component in Durkheim's analysis. Other researchers more recently (O'Brien & Stockard, 2006) have followed Bearman (1991) by emphasizing the inherent link between integration and regulation and their consequent relationship with suicide mortality. However construed, it is difficult to deny that those who are strongly integrated into groups will also tend to be regulated, and those lacking in integration will consequently lack social regulation. This approach suggests that a lack of social integration is most often related to suicide mortality and that assertion is supported by the wealth of literature on the subject in developed countries (Breault, 1986; Cutright & Fernquist, 2000; Gibbs, 2000; Kposowa et al., 1995; O'Brien & Stockard; Stack & Wasserman, 1993).

Durkheim's work cemented the idea that social factors—including family structure, religion, military service, or changes in class position—provide important contexts that shape outcomes of social significance. Social integration, then, refers to the important relations that tie individuals to others such that they are affected by and committed to the moral demands of the group (Bearman, 1991; Durkheim, 1951/1897). Integrated individuals share common beliefs and

sentiments and are devoted to common goals (Johnson, 1965). Thus, those who are well integrated into family and social life possess a deep connection and derive greater purpose from the group. Belonging to a group that one cares about provides incentives and a sense of obligation to fulfill one's roles and continue living in spite of any adversity. This sense of belonging and a strong connection to the collective moral life may confer reduced risks of suicide.

Family Structure and Risk of Suicide

Family conditions represent important structural contributors to individual well-being, and household living situations provide an important arena for understanding how persons live their lives or ultimately decide to end them. To date, most researchers have approached suicide and social integration at the broad macro level (Baller & Richardson, 2002; Durkheim, 1951/1897; Kubrin, Wadsworth, & DiPietro, 2006; Wadsworth & Kubrin, 2007) or at the individual level (Denney, Rogers, Krueger, & Wadsworth, 2009; Kposowa, 2000) and very few researchers have focused on household composition as a determinant of suicide risk despite the possible links to familial support systems.

As a cause of death linked to social circumstances, suicide arises in part on the basis of variations in the quality and number of relationships people have with others around them. Extant research documents the effects of social support and family relationships on health and mortality prospects generally (Berkman & Glass, 2000; Eng, Rimm, Fitzmaurice, & Kawachi, 2002), showing that increased social ties decrease risk of death and the likelihood of some forms of ill health. Family relations, in particular, provide a seminal source of social support and consequent well-being. Those who are married, for example, are often more satisfied in all aspects of life, healthier, and live longer. Spouses provide social support in stressful situations and impart an enhanced sense of meaning and obligation in life (Umberson, 1992; Waite, 2006). In addition, the presence of other family members, such as children or other relatives, creates a setting for increased social support, more close relationships, and possibly stronger economic stability, impacting the way individuals go about their daily lives. Despite this, the structural correlates of family

and household living situations on suicide risk represents, "perhaps, the most neglected area of suicide research" (Stack, 2000b, p. 169), given the importance placed on the family, or domestic forms of integration, in Durkheim's (1951/1897) classic study. This is attributable, in large part, to the absence of individual and household level data that would allow for examination into how living arrangements are linked to prospective suicide mortality.

Identifying household compositional effects on health is a difficult task when only certain areas of family life, because of unavailable data or other limitations, are examined and analyzed. For instance, marital dissolution generally increases the turmoil in a person's life and results in negative health effects (Waite, 1995). But divorce is a benefit for some people, namely, those involved in unions that were themselves bad for overall health and well-being. Others experience decrements from a divorce, but these can be temporary or long-term (Amato, 2000) depending in part on support systems available to individuals in times of need. Conceptualized as a component of family composition, marital status helps to identify the benefits and detriments of a very central social support system on health and mortality prospects. Importantly, the effect of marital status on health in general depends on household context (Hughes & Waite, 2002). For example, the presence of children or other family members may help curb the potential stressors of a marital dissolution or other crises.

Marital status has shown consistent relationships with suicide mortality. The strongest and most commonly used marital status indicator, divorce, has been shown in many works to increase risk (Baller & Richardson, 2002; Gibbs, 2000; Kposowa, 2000; Stack & Wasserman, 1993). The majority of these studies relied on aggregate family measures like the divorce rate or indicators of family size over large geographic areas. Considerable household variation exists within county level measures of marital status. For example, a measure of the proportion of never married adults in a county fails to recognize that some never married adults simply live alone, whereas others may live with their children, other relatives, or unrelated persons (Hughes & Waite, 2002).

Much of the individual level work on marital status and suicide reveals increased risk for all unmarried adults—including divorced, never married, or widowed persons—compared to

married persons (Denney et al., 2009; Kposowa, 2000; Stack, 2000b). From a Durkheimian theoretical perspective, this could be because of a lack of integrative forces—the person loses social ties and contacts through a divorce or spousal death—but also from a reduction in regulatory forces—the person no longer has the barriers and regulations placed on life that come from the marital union.

But important issues remain regarding the reasons behind the marital status-suicide link. For example, is an unmarried adult truly void of immediate social contacts, providing both integrative and regulatory components, following a divorce? What if that divorcee lives with other relatives? Other family members can reduce the unpleasantness of a separation or provide additional social contacts and increased integration for unmarried adults. Research has shown that suicide is a unique form of mortality and one that tends to decrease in occurrence when one maintains more immediate social ties (Denney et al., 2009). An unmarried adult will have very different sources of social support depending on the total composition of the household, and those varying sources can impact risk of suicide.

Further, what if those other family members include children? The presence of children provides a unique buffer to ill health and early mortality for many adults (Hughes & Waite, 2002; Rogers, Hummer, & Nam, 2000). Indeed, Durkheim (1951/1897) asserted that a marital union provided the most benefit against suicide when it included children. Children serve to strengthen purpose and direction in life and responsibility to others, thereby increasing social integrative forces within a family. But health and mortality research has revealed that single parents often suffer worse health, increased stress, and early mortality (Hughes & Waite; Rogers et al.). Finding the necessary means to provide for oneself and one's family in a disadvantaged state proves to be difficult and take its toll on individual health and mortality. But children represent a unique social and familial entity—the bond between parent and child is arguably the strongest social bond. Therefore, the presence of children may protect adults from suicide risk in married as well as unmarried adult households.

Finally, the health and mortality prospects in households with unrelated adults have received little, if any, attention. These types

of households present a distinct avenue of inquiry for suicide mortality research. If suicide risk reduces merely through increased social contacts, then qualitative differences between relationships within the household would be less important. If, however, the protective interactions and relationships do depend on a sense of keeping the family order, and if relatives do rearrange themselves to protect family members as Rogers (1996) contended, then households with unrelated adults may experience different risk. Specifically, unrelated adults would have less to gain from keeping household order, may come and go and behave as they please with few repercussions, and may serve as disruptive forces within the household, thereby increasing the risk of suicide mortality for inhabitants of these households.

Hypotheses

The arguments put forth here suggest a set of hypotheses regarding the effects of family and household living arrangements on an individual's risk of suicide mortality after accounting for individual level characteristics: first, living in families that include a marital union lowers the risk of suicide; second, living in families with or without a marital union but that include children lowers the risk of suicide; third, living in families without a marital union but that include other relatives lowers the risk of suicide; and fourth, living in households with unrelated adults increases the risk of suicide. These intricate relationships cannot be measured and investigated without household and individual level data. Utilizing such data provides an opportunity to build measures and examine whether family and household compositions matter for individuals' risks of suicide.

METHOD

The National Health Interview Survey (NHIS), conducted by the National Center for Health Statistics (NCHS), is a nationally representative cross-sectional survey of noninstitutionalized civilians and serves as the principal source of information on the health status of the United States population. Annually, the NHIS contacts approximately 40,000 households and conducts personal and telephone interviews with 75,000 to 100,000 individuals, obtaining response rates that are consistently 90% or better (National

Center for Health Statistics, various years). The survey is designed as a household-level initiative, identifying a reference adult for each household who provides information on the household and its inhabitants. Therefore, the NHIS allows for examination of individuals nested within households.

Recently, the NCHS provided linked mortality status for multiple survey years of the NHIS through the Linked Mortality File (LMF). Multiple steps are necessary to create the NHIS-LMF. The analyses conducted here first combine repeated cross-sectional NHIS individual and household data for the years 1986 to 1996. Second, prospective mortality files from 1986 to 2002 are combined to create a mortality data set. Third, the mortality data is merged with the individual and household file to create the NHIS-LMF. The National Center for Health Statistics (2007) uses a probabilistic mortality matching scheme that assigns weights to multiple factors including social security number, first and last name, and date of birth. Respondents under age 18, comprising 28% of the original sample, are included in the construction of household variables and are subsequently dropped because they cannot give consent to have their records linked to mortality (National Center for Health Statistics, 2007). Importantly, approximately 6.0% of all suicides occurred among persons under age 18 in the United States in 2005 (Kung et al., 2008), a significant proportion the current work is unable to address. An additional 2.5% of the cases are dropped because the NCHS designates them as ineligible to be linked to prospective mortality or because they are missing data on the key variables; ineligible cases are those whose records include insufficient identifying data, such as name and social security number, to create a mortality record (National Center for Health Statistics, 2007). For the years used here, less than 3.0% of cases are deemed ineligible in any single year and the National Center for Health Statistics (2007) provides weights that adjust for the exclusion of ineligible records.

The result from these steps is a data set that includes information on 825,462 adults in 446,519 households interviewed between 1986 and 1996 linked to 1,166 suicide deaths through 2002, representing the largest number of suicide deaths linked to individual and household data to date. This provides a large enough data set to examine individual and household correlates

of suicide mortality, a relatively rare cause of death.

Variables

The NHIS collects a core set of sociodemographic, socioeconomic, and health measures that do not vary over the years used here (National Center for Health Statistics, various years). Individual level covariates include age, sex, race, educational attainment, employment status, income, and self-rated health, all of which are related to suicide risk (Denney et al., 2009; Stack, 2000a, 2000b). An age squared term is included to account for the nonlinear relationship between suicide and age, identified by past research (Kposowa et al., 1995; Pampel, 1996). Although there are no measures on mental health, some research suggests that individuals consider many dimensions of their mental and physical health when rating their own health (Idler, Hudson, & Leventhol, 1999).

Sex is coded dichotomously with female as the referent. Race is also a dichotomous variable with non-Hispanic White as the referent. Although recent research discusses important racial and ethnic differences in aggregate suicide rates (Kubrin et al., 2006; Wadsworth & Kubrin, 2007) and differences in the effects of marital integration on suicide among African Americans (Stack, 1996), the relatively small number of individual deaths used here prohibits more detailed analyses. Separate dummy variables capture educational attainment and employment status categories with referents of greater than high school educated and employed, respectively.

For income, the reference person reports the total income of the household in categories defined by the NCHS, and that value is assigned to each individual living in the dwelling. To approximate a continuous measure of income, the midpoint of each category is taken and a median value for the open-ended category is estimated (Parker & Fenwick, 1983). The value is then adjusted to account for varying purchasing power among different sized families (see Van der Gaag & Smolensky, 1982), and the consumer price index is used to regulate changes in purchasing power over time. To estimate missing income data for approximately 18% of the sample, a number of covariates in the data, including a less detailed measure of income, were used. Following Gelman and Hill (2007),

stochastic variation is incorporated into the predicted values to better represent variability in the actual income data. Consistency of the income variable was evaluated by estimating models with and without the missing income data, and no discernible difference in results was found. For interpretability, terciles were generated and dummy variables are included in the final models, allowing comparison of mortality prospects for those in the lowest and middle income categories to those in the highest income category (the referent).

Finally, self-rated health is measured continuously from 0 (*poor health*) to 4 (*excellent health*). Individual marital status is highly correlated with the household types described below; thus, it is excluded as an individual predictor.

To take advantage of the multilevel nature of the NHIS data, multiple variables were created to construct the household configurations. First, a variable was created to identify those households that included children under age 18. Second, a variable was created to indicate whether a marital union existed within the household. A third variable was constructed to identify households with unmarried adults living with other nonchild relatives. And finally, a variable was constructed to identify households that included unrelated adults residing in the dwelling.

Some household configurations are more common than others, but all household configurations used in the analysis represent the living situation of at least 3.0% of the sample. Married families with no children, married families with children under the age of 18, unmarried families with other non-child-related adults present, unmarried families with children under the age of 18, and households with unrelated adults are included. A sufficient number of suicide deaths for analysis were recorded in each of the household types. Because suicide is a relatively rare cause of death, the types of households are limited. Therefore, unmarried families include adults who are not married but may have been divorced, never married, or widowed. All family and household types in the multivariate analyses are in reference to a single person living alone. Finally, a continuous measure of total household size is included to account for decreased risk of suicide for those in larger households (Denney et al., 2009).

The dependent variable, suicide mortality, is coded 1 for suicidal death defined through

the World Health Organization's (2007) 10th revision of the *International Statistical Classification of Diseases, Injuries, and Causes of Death* as death from intentional self-harm (codes X60–X84) and coded 0 for all other respondents who either survived the follow-up or died from other causes. Although the classification of suicidal death rests on individuals with varying levels of medical knowledge and training (Timmermans, 2005), Pescosolido and Mendelsohn (1986) have demonstrated that it is not misreported in a systematic way.

Statistical Analyses

Multivariate analyses employ a shared frailty hazard model framework specifying the distribution of the hazard as Weibull to better capture the risk of suicide for individuals within families. Duration in quarter year intervals is used to classify the hazard of death from 1986 to 2002. Thus, the risk of death is calculated at four points over the course of a year, starting from the quarter and year of the interview. Records are censored at the time of death from a cause other than suicide or if respondents survive to the end of the follow-up period.

Plots of the hazard function indicated that the hazard rate for suicide increased at a decreasing rate over time—a pattern captured by the Weibull distribution. Indeed, the main temporal advantage to specifying a Weibull distribution is that it allows the hazard rate to vary on the basis of the parameter α . Estimated with Stata software, changes in the hazard rate parameter are based on values of ρ rather than α , and the inverse, $1/\rho$, makes the interpretation of the parameter useful (Hoffman, 2004). An estimate of $1/\rho$ greater than 1 indicates that the hazard is decreasing over time, between 0.5 and 1 indicates that the hazard is increasing at a decreasing rate, and between 0 and 0.5 indicates that the hazard is increasing at an increasing rate (Hoffman).

Further, the models allow for shared frailty at the household level. Popular in epidemiological work but less so in the sociological literature, shared frailty models explicitly acknowledge and adjust for the notion that persons in similar situations or in groups display similar levels or likelihood of a dependent variable, an advantage over other approaches such as adjusting for clustered standard errors. In this sense, the shared frailty models can be thought

of as random effects models for survival data (Gutierrez, 2002). Frailty in hazard modeling simply represents an unknown risk factor that is believed to raise or lower an individual's relative risk. Shared frailty is an extension of this basic concept, suggesting that persons in similar environments are exposed to similar unknown risks. According to Cleves, Gould, and Gutierrez (2004, p. 294) "A shared frailty is a frailty model where the frailties are no longer observation specific, but instead are shared across groups of observations, thus causing those observations within the same group to be correlated."

Specifying shared frailty is a straightforward adjustment to the hazard modeling framework, adding one additional parameter to the model, an indicator of unobserved heterogeneity. Thus, the assumption applied to the current analysis is that individuals within households share similar unobserved risks to suicide. Estimated with Stata software (StataCorp, 2006), the shared frailty models generate theta (θ), which is an indicator of unobserved heterogeneity at the household level. Increasing values of θ indicate increasing levels of shared frailty, which can result in lessening effects of covariates over time and simultaneous increasing importance of frailty on suicide risk in the household. The shared frailty modeled here is with an inverse Gaussian distribution, meaning the effects of the hazard ratios will never completely disappear (Gutierrez, 2002). Likelihood ratio tests of the theta values generated in the models identify the significance of shared frailty considerations. Specifying shared frailty does not change the interpretation of model estimates. Results from the multivariate models are reported as hazard ratios and can be interpreted as the risk of suicide mortality over the follow-up period relative to the referent.

To evaluate model fit, G statistics are calculated as $-2 * (\log \text{likelihood of Model 1} - \log \text{likelihood of Model 2})$ with a χ^2 distribution and degrees of freedom equal to the number of new variables included between models (see Hosmer & Lemeshow, 2000, for a discussion and Bond Huie, Krueger, Rogers, & Hummer, 2003, for an example). Stata 9.0 software is used to incorporate sample weights that account for the sampling design of the NHIS (National Center for Health Statistics, various years; StataCorp, 2006).

RESULTS

Table 1 provides weighted means of the model covariates for the full sample and for those who died from suicide over the follow-up period. A well-documented trend in the United States is that men kill themselves far more often than women do (Kung et al., 2008), and this is consistent with the data used here—though men made up slightly less than half of the full sample, they accounted for 78% of the suicides. Further differences exist by individual level characteristics. Non-Hispanic Whites made up 77% of the full sample and 84% of all suicides. Comparing the proportions in the full

sample versus the proportions among those who died of suicide, greater percentages of less than high school educated, high school educated, unemployed, and low income persons committed suicide over the follow-up period. Not surprisingly, the mean self-rated health for those who took their own life, 2.58, was lower than the mean for the full sample, 2.79.

Some patterns emerge in the proportions among the living arrangements for those who died of suicide versus the full sample in Table 1 as well. First, single adults living alone represented 14% of the full sample but 20% of the suicidal deaths. Second, families with married adults and children accounted for 35% of the total sample but only 28% of all suicides. The proportions for the full sample and for suicide deaths for other unmarried family formations and for unrelated adult households are small and show little variation. Finally, the mean household size for those who committed suicide, 2.67, is less than the mean household size for the full sample, 2.97. These results are descriptive and cannot reveal relationships between living arrangements and suicide risk while accounting for other important confounders.

Table 2 provides the results from baseline, household, and individual covariates models on the risk of suicide mortality for U.S. adults. Model 1 is a baseline model with no covariates but provides important information about the use of a Weibull shared frailty hazard framework in the current investigation. First, the value of $1/\rho$ indicates that the hazard increased at a decreasing rate over the time period. Second, the significant value of θ reveals the importance of shared frailty considerations.

Model 2 includes the family and household living arrangements and individual sociodemographic controls. Consistent with prior works, males and Whites were at increased risk of suicide mortality, compared to their female and non-White counterparts. In addition, the hazard ratios for age and age squared reflect a nonlinear relationship with suicide. Not surprisingly, Model 2 fits significantly better than Model 1.

After accounting for the individual level sociodemographic covariates, Model 2 also shows that living in a family with a marital union reduced the risk of suicide by 34% with no children and by 51% for those with children in the household compared to single persons living alone. The risk of suicide was also reduced for those living in unmarried adult families.

Table 1. *Weighted Means of Individual Characteristics and Family or Household Living Arrangements for the Full Sample and for Those Who Died of Suicide Over the Follow-Up Period, U.S. Adults, 1986–2002*

Variables	Full Sample (N = 825,462)	Suicide Deaths (N = 1,166)
Individual characteristics		
Age	44.0	44.1
Sex (male = 1)	0.48	0.78
Race (non-Hispanic white = 1)	0.77	0.84
Education		
Less than high school	0.22	0.25
High school	0.38	0.41
More than high school	0.40	0.34
Employment		
Unemployed	0.03	0.05
Not in labor force	0.32	0.33
Employed	0.65	0.62
Household income		
Less than or equal to \$20,000	0.33	0.39
Self-rated health	2.79	2.58
Family/household living arrangement		
Single living alone	0.14	0.20
Marital union, no children	0.37	0.39
Marital union with children	0.35	0.28
Unmarried with other relatives	0.08	0.09
Unmarried with children	0.06	0.04
Unrelated adult in household	0.03	0.03
Household size	2.97	2.67

Table 2. Summary of Shared Frailty Weibull Hazard Analysis for Variables Assessing Risk of Suicide Mortality, U.S. Adults, (N = 825,462)

Variable	Hazard Ratio		
	Model 1	Model 2 ^a	Model 3 ^b
Family or household			
living arrangement			
Single living alone (ref)			
Marital union, no children		0.66	0.67
Marital union with children		0.49	0.52
Unmarried with other relatives		0.76	0.71
Unmarried with children		0.84	0.78
Unrelated adult in household		1.02	1.11
Household size		0.97	0.94
Individual characteristics			
Age		0.80	0.81
Age ²		1.01	1.01
Sex (female, ref)			
Male		4.16	4.49
Race (non-Hispanic)			
White, (ref)			
Non-White		0.65	0.59
Education (more than high school, ref)			
Less than high school			1.29
High school			1.29
Employment			
(employed, ref)			
Unemployed			1.58
Not in labor force			1.49
Income (highest third, ref)			
Middle third			1.14
Lowest third			1.03
Self-rated health			0.81
Log likelihood	-218,060	-194,790	-193,008
1/ ρ	0.55	0.26	0.26
θ^c	7.70	9.84	9.30

Note. All values are weighted and all hazard ratios are significant at the $p < .05$ level.

^aModel 2 significantly better than Model 1.

^bModel 3 significantly better than Model 2.

^cLikelihood ratio tests of θ indicate significant shared frailty at the $p < .01$ level for all models.

Persons living in unmarried adult families with other nonchild relatives experienced a 24% reduced risk, and those living in unmarried adult families with children experienced a 16% reduced risk. Those living in unrelated adult households experienced a slight increase, and there was a slight decrease for each member added to the household.

Finally, Model 3 includes additional individual-level socioeconomic and health covariates identified by previous studies as important predictors of suicide and reveals that family or household living arrangements still associate with individual risk of suicide mortality. Compared to single adult living alone households, persons living in families with a marital union without children experienced a 33% decreased risk and in married families with children experienced a 48% decreased risk of suicide mortality over the follow-up. Conducting t tests of significance on the model coefficients and standard errors provides additional insight into the protective effects of family configuration. Although marriage was protective for both arrangements, living in a family with a marital union and children provided significantly more protection than living in a family with a marital union and no children ($t = 62.5$, $p \leq .01$).

Model 3 also shows that in the absence of a marital union, living with other relatives decreased the risk of suicide as well, even after accounting for important individual level controls. In fact, persons residing in unmarried families with other nonchild relatives and in unmarried families with children experienced 29% and 22% decreased risk, respectively. Although persons in families with unmarried adults and children experienced reduced risk, the presence of a marital union in addition to children reduced the risk significantly further ($t = 30.0$, $p \leq .01$). Similar tests revealed that the reduced risk for persons living in families with a marital union but no children was significant compared to persons living in unmarried families with other relatives and unmarried families with children ($t = 12.5$, $p \leq .01$ and $t = 30.0$, $p \leq .01$, respectively). Though children and other relatives provide protection against suicide for those in unmarried families, the presence of a marital union provides the most protection for residents.

Further, Model 3 shows that, generally, as household size increases, the risk of suicide decreases. Indeed, the risk ratio for household

size in Model 3, 0.94, indicates that risk decreased 6% with each person added to the household. Contrary to this, persons living in households that include unrelated adults were at an 11% increased risk of suicide mortality. The increased risk of members living in households with unrelated adults indicates that the protective effects of immediate social ties and supports are relationship specific.

The additional individual controls in Model 3 are in the expected direction and have little impact on the family and household living arrangements. Consistent with prior works at the individual level, less education, not working, lower income, and worse health are associated with increased risk of suicide mortality (Denney et al., 2009; Stack, 2000a, 2000b). Yet these important controls do little to change the relationship between living arrangement and suicide, with the possible exception of unrelated adult households. Examining the HRs for the different living arrangements and moving from Model 2 to Model 3 shows that risk slightly increased in families with a marital union and slightly decreased for unmarried families with additional controls. The increased risk for persons residing in unrelated adult households increased to 11% with the added controls. Model 3 fits significantly better than Model 2, and the significant value of θ illustrates the continued importance of the shared frailty framework.

DISCUSSION

Even with Durkheim's (1951/1897) early theoretical emphases on domestic forms of integration contributing to suicide, no prior research has explored family and household living arrangements on individuals' risk. The current work begins to address this gap by using unique data to show that household composition impacts the risk of suicide mortality for its inhabitants.

In support of the hypotheses, persons living in families with arguably stronger sources of social support and integration have decreased risks of suicide mortality over the follow-up. Indeed, persons residing in families that include a marital union, children under age 18, or other relatives experience reduced risk compared to single adults living alone. Persons living in unmarried families with other nonchild relatives or with children experience reduced risk of suicide, but persons living in families with a marital union experience the greatest protection against risk.

These protective effects persist despite controls for important individual characteristics.

Despite research describing general health and mortality disadvantage for unmarried adults, the presence of children or other adults in unmarried adult households protects members against suicide mortality. Finding that the risk of unmarried adults is reduced by living in families with other relatives or children sheds new light on the structural forces of integration acting to discourage taking one's own life. Typically associated with increased risk in the suicide literature, divorced, never married, and widowed persons can overcome the disadvantage of being alone or the disruption of a marital dissolution if there are other immediate social support mechanisms in place. Thus, trying to pin down the effects of marital status on suicide without other structural indicators such as how the household is otherwise constructed may lead to an incomplete picture of the relationship between family support systems and suicide risk.

Persons who reside in households with unrelated adults, however, are at an increased risk of suicide mortality. Though the increased risk is slight and may partially be a result of large sample size, this finding nevertheless suggests that protection against suicide involves qualitative distinctions that are more than just increasing the number of immediate social ties and interactions with others. Indeed, in the case of suicide, relatives may organize relationships to specifically protect family members (Rogers, 1996) whereas unrelated adults might add to household disruption by not adhering as closely to house rules and regulations, causing an unwelcome economic strain, or failing to play a supportive role because they are not as invested in the household.

Suicide is a particularly destructive and pervasive cause of death in the United States. No study has yet examined household structural contributors impacting individual risk for this type of mortality. The NHIS-LMF provides a unique resource in this regard—the relationships between detailed family and household formations and suicide risk can come only from high quality data on individuals nested within households. On the negative side, the data are cross-sectional in nature and cannot evaluate the impact of changing conditions on suicide risk. In particular, many of the covariates used here are measured at the time of interview and not reassessed at the time of death. Further, suicide

is a relatively rare form of death, and stratifying analyses by gender or race groups becomes problematic with a comparably small number of deaths. This comes with repercussions because, for example, men commit suicide in the United States at a rate 4 times that of women (Kung et al., 2008), and recent individual-level studies of suicide indicate that traits contributing to risk are different enough for men and women to declare that analyses combining gender may be incomplete (Denney et al., 2009; Kposowa, 2000). Recent race-specific suicide research on the rising rates among some minority populations have uncovered important differences in suicide risk between young Black males and young White males (Kubrin et al., 2006) and by level of assimilation into mainstream culture among Hispanics (Wadsworth & Kubrin, 2007). Stack (1996) reports that the integrative effects of marriage and family living may be less important for Black than White suicide. These emerging issues should be more fully explored in future analyses with additional years of NCHS mortality matching.

Future mortality matches will also allow researchers to check the robustness of the findings reported here, especially for the more infrequent household types with relatively small numbers of death. And though adult suicide in the United States represents an important and relatively stable cause of death, slowly declining over the past few decades (Centers for Disease Control and Prevention, 2005), an alarming suicide trend in the United States is an increase in youth suicide (Bossarte & Caine, 2008), an important area the current research cannot address because public use mortality matches for those under the age of 18 are not currently available.

The results presented here show that living arrangements matter for individual risk of suicide mortality even after controlling for important individual-level determinants of suicide. Core NHIS data do not include measures for other important predictors, including migration (Wadsworth & Kubrin, 2007), religiosity (Ellison, Burr, & McCall, 1997), genetic propensities (Brent & Mann, 2005), and cultural indicators relating to norms on suicide acceptability (Cutright & Fernquist, 2000). Future work should incorporate these factors while examining various household and family configurations.

Suicide has far-reaching effects on a decedent's family, household, and community. Those left behind, especially those with whom the act severs immediate and important relationships, must cope with the loss of a friend, a relative, or both. That household composition matters for individual risk of suicide mortality is but the first step investigating how living and family arrangements impact risk. Future research should elaborate on the mechanisms that contribute to these findings, including how household socioeconomic climate and family health status affect members' tendencies toward suicide. Such efforts can only add to an understanding of the determinants of suicide mortality and aid in the reduction of a major preventable cause of death.

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