Risk Determinants of Suicide Attempts Among Adolescents

By JOSÉ-ALBERTO MOLINA and ROSA DUARTE*

ABSTRACT.   In this article we present evidence about the factors that determine four gradual decisions on the part of adolescents to attempt suicide. To that end, we estimate a series of binary choice models by using data drawn from the U.S. National Youth Risk Behavior Surveys corresponding to 1991, 1993, 1995, and 1997. Our results show that the decisions to attempt suicide are motivated by both demographic and psychosocial variables, such as gender, age, ethnicity, education failure, possession of a gun, habitual participation in sporting activities, individual weight perception, and taking pills or provoking vomiting to lose weight. Moreover, we also find that a significant degree of influence is exerted by another group of factors, such as the consumption of drugs, sexual relationships, and, finally, pregnancy.

> *The calm,*
> *Cool face of the river,*
> *Asked me for a kiss*
> *   –Langston Hughes*

American Journal of Economics and Sociology, Vol. 65, No. 2 (April, 2006).

I

Introduction

SUICIDAL BEHAVIOR HAS ATTRACTED THE ATTENTION OF BOTH POLICYMAKERS AND ACADEMICS alike and has given rise to a number of governmental resolutions and academic papers. From among the former, we can cite as examples the inclusion of a suicide index as an indicator of health status in the *Healthy People 2010* report published by the U.S. Department of Health and Human Services (2000), the official *Surgeon General's Call to Action to Prevent Suicide* from the U.S. Public Health Service (1999), and the 1997 Senate resolution that recognized suicide as a national problem and declared suicide prevention to be a national priority (S. Res. 84). With respect to academic papers, the earliest of these argued that suicide could only be explained sociologically (Durkheim 1897; Halbwachs 1930; Henry and Short 1954; Gibbs and Martin 1964). Since then, the focus of research has passed to the analysis of the evolution of aggregate suicide rates, with the conclusion being drawn that, in accordance with the relative cohort size model of Easterlin (1978), higher cohort sizes imply higher suicide rates (O'Connell 1975; Smith and Welch 1981; Holinger and Offer 1982; Ahlburg and Schapiro 1984; Pampel 1996). This result can be explained by the fact that a higher cohort size will generate greater competition for, for example, employment; this, in turn, implies greater psychological pressure that will affect individual behavior and thus raise the possibility of suicide.

Despite the clear relevance of suicidal behavior for society as a whole,[1] economists do not appear to have paid any particular attention to determining why people consider taking such a tragic step. The first of the limited exceptions to this rule is the seminar contribution of Hamermesh and Soss (1974). In this paper, the authors develop an economic theory of suicide on the basis of the argument that much of the variation in aggregate suicide rates is due to economic decision making and, therefore, that such a variation can be explained by using hypotheses derived from economic theory. In this line, and although the behavior of the suicidal individual is complex, there would appear to be some habitual economic determinants, such as income (South 1984; Burnley 1994, 1995) or unemployment (Lester,

Motohashi, and Yang 1992; Yang, Stack, and Lester 1992; Morrell et al. 1993; Cantor, Slatrer, and Najman 1995; Johansson and Sundquist 1997), together with other sociodemographic characteristics, such as marital status (Motohashi 1991; Burr, McCall, and Powell-Griner 1994; Lester 1995; Kposowa, Breault, and Singh 1995), ethnicity (Jedlicka, Shin, and Lee 1977; Davis 1979; South 1984; Lester 1988), family stressors (Bonner and Rich 1987; Pfeffer 1989; Morano, Cisler, and Lemerond 1993), or the possession of guns (Boyd 1983; Sommers 1984; Yang and Lester 1991; Southwick 1997).[2]

This public health problem is especially worrying among adolescents, with aggregate rates among this age group tripling from 4.5 per 100,000 in 1950 to 13.5 per 100,000 in 1990 (Cutler, Glaeser, and Norberg 2000). Moreover, throughout the 1990s suicide was the third highest cause of death among adolescents, headed only by accidents at 38.5 per 100,000, and homicide at 20.3 per 100,000 (Freeman 1998; Cutler, Glaeser, and Norberg 2000). Focusing on young people, Freeman (1998) constitutes an excellent paper that analyzes the demographic, economic, and social determinants of suicide among adolescents in order to identify risk factors that could be used by policymakers to redirect prevention efforts toward more effective policies. Quite apart from the clear relevance of this contribution, however, and knowing, as we do, of the behavioral distinction between suicide attempts and suicide completions, one equally important aspect is to analyze the particular factors that influence the decision to attempt suicide. In this regard, we know that adolescents who have pre-viously attempted suicide constitute an especially high risk group for subsequently being successful in their objective. This can also be appreciated from a quantitative perspective, with almost a quarter of adolescents in America, around 24 percent, having reported that they have thought seriously about the possibility of attempting suicide during the last decade. This percentage is higher than that corresponding to adolescents who make a plan, 17.4 percent, which is itself almost twice the percentage of young people who actually attempt suicide, 9.1 percent. Finally, we should note that all these figures are much higher than that corresponding to attempted suicides that result in an injury requiring treatment by a doctor, 2.65 percent (National Youth Risk Behavior Surveys 1991, 1993, 1995, 1997).[3]

The aspect upon which we have just focused illustrates how important it is to take the suicide attempts of such adolescents seriously and for clinicians to manage their care cautiously. Nevertheless, despite this relevance, the only economic paper that analyzes the determinants of why young people seriously consider attempting suicide is Cutler, Glaeser, and Norberg (2000). This paper concludes, first, that there is a fundamental distinction between suicide attempts and suicide completions and, second, that there is strong evidence that social interactions are important in suicide among young people. Notwithstanding its clear relevance, this paper suffers from an important weakness, namely, that it uses only one cross-section to derive its empirical results, that is to say, the first wave of the National Longitudinal Survey of Adolescent Health corresponding to 1996, with such an approach obviously not allowing for a time pattern of the problem.

In the light of all the above, the aim of our article is to offer evidence from the 1990s on the factors that drive American adolescents, both male and female, to attempt suicide. In particular, we provide a complete perspective of the risk factors that determine the four prior and gradual steps that lead to committing suicide: seriously considering attempting suicide; planning how to carry out the attempt; actually attempting suicide; and, finally, attempting suicide resulting in injuries that had to be treated by a doctor or nurse. In this way, we offer an in-depth study of all the behavior leading to suicide attempts among American adolescents corresponding to the 1990s.

To meet this objective, we follow the recommendations of *The Surgeon General's Call to Action to Prevent Suicide* (U.S. Public Health Service 1999) and concentrate on an analysis that takes account of not only the demographic characteristics but also the personal factors and social interactions that are especially important for the adolescent population. We follow the line established by the principal theory that offers explanations for suicidal behavior among young people, that is to say, the rational-suicide theory, also called the depression theory (Hamersmesh and Soss 1974; Kimenyi and Shughart 1986; Virén 1999; Cutler, Glaeser, and Norberg 2000). According to this theory, suicide and depression are clearly correlated; therefore, we consider a number of factors that lead to depression among adolescents, such as consuming addictive drugs or

having psychosocial disorders or other factors that contribute to an intense turbulence in the relationship between sexual partners. Within the demographic characteristics, we include gender, age, ethnicity, and the education level of the parents. As regards the personal and social factors group, we consider drug use, education failure, possession of a gun, participation in physical education, individual weight perception, taking pills or provoking vomiting to lose weight and, finally, sexual variables, such as the number of individuals with whom sexual relations have been maintained, plus, in the case of girls, the number of times they have become pregnant and, in the case of boys, the number of pregnancies for which they are responsible. Thus, for each of the four previously specified decisions to attempt suicide we estimate various binary choice models that result from the sequential introduction of these exogenous variables. The variables have been grouped into the following categories: (1) demographic, (2) drug use, (3) psychosocial, and (4) sexual.[4] All this information has been taken from the National Youth Risk Behavior Surveys corresponding to 1991, 1993, 1995, and 1997. The representative sample contains 55,734 adolescents of school age, from 9th to 12th grade, with all the U.S. states reflected.

The rest of the article is organized as follows. Section II is dedicated to describing the data and the empirical model. The results appear in Section III and, finally, Section IV closes the article with a summary of the most relevant conclusions.

II

Data and Empirical Model

Data

As mentioned earlier, the data used in this work come from the four available National Youth Risk Behavior Surveys corresponding to 1991, 1993, 1995, and 1997 and carried out by the Division of Adolescent and School Health from the National Center for Chronic Disease Prevention and Health Promotion (Centers for Disease Control and Prevention). These surveys contain complete information on both individual and social characteristics, such as drug use, school performance, physical self-evaluation, and sexual habits. All this infor-

mation was obtained directly from the adolescents surveyed, who anonymously answered a complete questionnaire. Their parents were not present during the interviews and were not informed about their children's responses, which thus avoids any underreporting in the responses (Evans, Hanses, and Mittlemark 1977; Warner 1978). The data set contained 12,272, 16,292, 10,904, and 16,262 feasible observations for the four years, with all the respondents studied being between the 9th and 12th grades. The information was collected in a range of different public and private centers. One obvious feature of our sample is that adolescents who have successfully committed suicide are not included in the sample, and thus these data tell us only about the determinants of unsuccessful suicide attempts.

The data set includes answers to four gradual questions on attempted suicide among young people, with each question revealing some particularly illustrative aspects when such attempts are distinguished by reference to gender, age, and ethnicity (see Table 1). The four specific questions included in all sample surveys are: (1) "During the past 12 months, did you ever seriously consider attempting suicide?" (2) "During the past 12 months, did you make a plan about how you would attempt suicide?" (3) "During the past 12 months, how many times did you actually attempt suicide?" and (4) "If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?"

Reading Table 1, we can first appreciate that the percentage of adolescents who have attempted suicide during the 1990s becomes lower as the attempt draws closer to effectively committing suicide. Thus, as we have stated in the Introduction, we observe that the percentage of adolescents who have seriously thought about the possibility of attempting suicide is around 24 percent, whilst the percentage of those who make a plan falls to 17.4 percent, which is, in turn, almost twice the percentage of young people who actually attempt suicide, 9.1 percent, with these three figures all being much higher than that corresponding to those who attempt suicide resulting in an injury that had to be treated by a doctor, 2.65 percent. These averages clearly indicate that there are different steps in the mental decision process followed by adolescents who are considering suicide, with many of

Table 1

Percentages of Suicide Attempts (Means and St. Dev.)

	Total	Girls	Boys
Dec. 1: Thinking	23.60	29.93	17.01
	(0.4246)	(0.4580)	(0.3757)
Age			
<16 years old	24.05	31.45	15.52
	(0.4274)	(0.4644)	(0.3621)
=16 years old	25.12	32.18	17.63
	(0.4337)	(0.4672)	(0.3811)
>16 years old	22.41	27.40	17.62
	(0.4170)	(0.4460)	(0.3810)
Ethnicity			
Black Not Hispanic	18.32	23.52	12.03
	(0.3869)	(0.4242)	(0.3254)
White Not Hispanic	24.84	31.56	18.57
	(0.4321)	(0.4648)	(0.3889)
Hispanic	25.30	32.72	17.28
	(0.4348)	(0.4692)	(0.3781)
American Native	35.31	40.99	30.71
	(0.4784)	(0.4929)	(0.4622)
Dec. 2: Making Plan	17.38	21.86	12.71
	(0.3789)	(0.4133)	(0.3331)
Age			
<16 years old	17.76	23.41	11.27
	(0.3822)	(0.4234)	(0.3163)
=16 years old	18.68	23.70	13.40
	(0.3897)	(0.4253)	(0.3407)
>16 years old	16.33	19.53	13.26
	(0.3696)	(0.3965)	(0.3391)
Ethnicity			
Black Not Hispanic	13.35	16.97	9.00
	(0.3401)	(0.3754)	(0.2863)

Table 1 *Continued*

	Total	Girls	Boys
White Not Hispanic	17.82	22.36	13.60
	(0.3827)	(0.4167)	(0.3428)
Hispanic	19.20	24.62	13.37
	(0.3939)	(0.4308)	(0.3403)
American Native	27.27	34.23	21.46
	(0.4458)	(0.4756)	(0.4113)
Dec. 3: Attempting	9.14	12.65	5.42
	(0.2882)	(0.3324)	(0.2264)
Age			
<16 years old	10.01	14.21	5.12
	(0.3001)	(0.3492)	(0.2204)
=16 years old	9.80	13.66	5.69
	(0.2974)	(0.3435)	(0.2317)
>16 years old	8.12	10.84	5.46
	(0.2732)	(0.3109)	(0.2272)
Ethnicity			
Black Not Hispanic	7.64	10.04	4.61
	(0.2656)	(0.3006)	(0.2098)
White Not Hispanic	7.64	11.12	4.36
	(0.2656)	(0.3144)	(0.2043)
Hispanic	11.72	16.16	6.89
	(0.3217)	(0.3681)	(0.2532)
American Native	22.12	26.00	18.80
	(0.4155)	(0.4397)	(0.3916)
Dec. 4: Attempting Treated	2.65	3.51	1.74
	(0.1605)	(0.1840)	(0.1306)
Age			
<16 years old	2.65	3.59	1.56
	(0.1608)	(0.1861)	(0.1240)
=16 years old	2.91	3.87	1.85
	(0.1680)	(0.1929)	(0.1349)
>16 years old	2.50	3.22	1.79
	(0.1560)	(0.1767)	(0.1326)

Table 1 *Continued*

	Total	Girls	Boys
Ethnicity			
Black Not Hispanic	2.60	3.35	1.66
	(0.1591)	(0.1800)	(0.1277)
White Not Hispanic	2.23	3.12	1.41
	(0.1478)	(0.1739)	(0.1177)
Hispanic	3.04	3.99	2.00
	(0.1718)	(0.1957)	(0.1399)
American Native	6.91	7.50	6.41
	(0.2540)	(0.2641)	(0.2455)

these young people abandoning such thoughts as the actual attempt becomes closer. Distinguishing by gender, all attempt decisions are more prevalent among adolescent girls, with the percentages for the attempt/treated decision being approximately twice as high among girls, 3.5 percent, as among boys, 1.7 percent.

If we consider the results by age groups, we find that the prevalence of the first two and the fourth attempt decisions increases up to the age of 16 and thereafter decreases. This pattern is especially clear in the case of girls, whereas the prevalence remains stable for boys after that critical age. With respect to the actual attempt, we can note for both the total sample and the female subsample that the percentage decreases slightly as these adolescents become older, whereas for the male subsample the prevalence increases up to the age of 16 and then decreases. Regarding the distribution by ethnicity, we can note for the three first attempt decisions that for the total sample, as well as for the majority of cases in both gender subsamples, young American Indians or Alaskan Natives show the highest percentages of suicide attempts, followed by Hispanics, white not Hispanics, and black not Hispanics. This ranking is also valid for the fourth decision with respect to the first two ethnic groups. It is interesting to note that in all three age and four ethnic groups, girls have higher rates, by two to three times, than boys.

Definitions, average percentages, and standard deviations of the

variables for the total sample appear in Table 2. As we have stated above, we distinguish four dependent variables according to the character of the attempt, that is to say, Thinking, Making Plan, Attempting, and Attempting Treated, with all these variables reflecting the answers to the four questions included in the four sample surveys. We relate these probabilities to a variety of determinants derived from depression theory, namely, consuming addictive drugs and having psychosocial disorders or other factors that contribute to an intense turbulence in the relationship between sexual partners.

Thus, with respect to drug use, we consider the consumption of soft drugs, such as alcohol, and hard drugs, with this latter variable being made up of marijuana, cocaine, and other illicit drugs. As regards the psychosocial factors, we have grouped these into two categories: (1) those related to the socioeducational context, such as education failure, attendance at physical education classes, or gun possession, and (2) those related to the harmful self-evaluation of the subjects' own bodies, for example, perceiving themselves as fat, or taking pills or provoking vomiting to lose weight. Finally, with respect to the sexual variables, we include having sexual relations with a number of partners, getting pregnant in the case of girls, and causing pregnancy in the case of boys.

In short, we assume the following independent variables that we have grouped into four blocks: (1) those standard variables that correspond to the demographic situation of the adolescents (gender, age < 16, age > 16, black not Hispanic, white not Hispanic, Hispanic, American Native, father educ, and mother educ), (2) variables relative to drug use (alcohol and illicit), (3) those corresponding to psychosocial characteristics (educ failure, gun, physical educ, fat, vomit, and pills) and, finally, (4) those that indicate the sexual habits of adolescents (sexual intercourse and pregnancy).

Table 2 offers a brief descriptive analysis of all these variables. Given that we have already described the four dependent variables, we now concentrate on describing the mean values corresponding to all the independent variables. Thus, we can observe that 50.7 percent of the individuals surveyed are girls and 49.3 percent boys, and that their average age is 16.2 years. We can also note that 26.2 percent of the adolescents are black not Hispanic, 39.6 percent are white not Hispanic, 26.5 percent are Hispanic, 0.9 percent are American Native

Table 2

Definition and Descriptive Analysis of Variables (Means and St. Dev.)

Variable	Description	Total	Girls	Boys
Thinking	This takes the value 1 if the adolescent has seriously considered attempting suicide in the last 12 months, and 0 otherwise	0.236 (0.425)	0.299 (0.458)	0.170 (0.376)
Making Plan	This takes the value 1 if the adolescent has made a plan about how to attempt suicide in the last 12 months, and 0 otherwise	0.174 (0.379)	0.219 (0.413)	0.127 (0.333)
Attempting	This takes the value 1 if the adolescent has actually attempted suicide in the last 12 months, and 0 otherwise	0.091 (0.288)	0.127 (0.332)	0.054 (0.226)
Attempting Treated	This takes the value 1 if the adolescent actually attempted suicide, resulting in injury, poisoning, or overdose that had to be treated by a doctor or nurse in the last 12 months, and 0 otherwise	0.026 (0.161)	0.035 (0.184)	0.017 (0.131)
Gender	This takes the value 1 if the adolescent is female, and 0 if male	0.507 (0.500)	— —	— —

Table 2   *Continued*

Variable	Description	Total	Girls	Boys
Age	Age of the adolescent	16.210 (1.237)	16.154 (1.232)	16.268 (1.239)
Black Not Hispanic	This takes the value 1 if the adolescent is black not Hispanic, and 0 otherwise	0.262 (0.440)	0.282 (0.450)	0.243 (0.429)
White Not Hispanic	This takes the value 1 if the adolescent is white not Hispanic, and 0 otherwise	0.397 (0.489)	0.375 (0.484)	0.418 (0.493)
Hispanic	This takes the value 1 if the adolescent is Hispanic, and 0 otherwise	0.265 (0.441)	0.269 (0.444)	0.260 (0.438)
American Native	This takes the value 1 if the adolescent is an American Native (Native American or Alaskan Native), and 0 otherwise	0.009 (0.094)	0.008 (0.089)	0.010 (0.100)
Other	This takes the value 1 if the adolescent belongs to the other ethnic group (Asian or Pacific Islanders or other), and 0 otherwise	0.067 (0.69)	0.066 (0.73)	0.069 (0.69)
Father Educ	This takes the value 0 if the adolescent's father did not finish high school, 1 if graduated from high school, 2 if received some education after high school, and 3 if graduated from college	1.689 (1.144)	1.615 (1.147)	1.763 (1.137)

	Description			
Mother Educ	This takes the value 0 if the adolescent's mother did not finish high school, 1 if graduated from high school, 2 if received some education after high school, and 3 if graduated from college	1.643 (1.119)	1.562 (1.129)	1.729 (1.102)
Alcohol	Number of days during the last 30 on which alcohol has been consumed	2.811 (5.233)	2.151 (4.220)	3.501 (6.037)
Illicit	This takes the value 1 if the adolescent had consumed marijuana, cocaine, or other illicit drugs, such as LSD, ecstasy, speed, heroin, etc., on some occasion, and 0 otherwise	0.390 (0.488)	0.347 (0.476)	0.434 (0.496)
Educ Failure	This takes the value 0 if the adolescent's age differs by 1 year or less from that corresponding to his/her grade, 1 if 2 years, 2 if 3 years, and 3 if 4 or more	0.088 (0.315)	0.067 (0.276)	0.109 (0.350)
Gun	This takes the value 1 if the adolescent has ever carried a gun during the last 30 days, and 0 otherwise	0.084 (0.278)	0.024 (0.153)	0.147 (0.354)
Physical Educ	This takes values from 0 to 5 according to the number of days of the week on which the adolescent attends physical education classes	2.101 (2.308)	1.904 (2.280)	2.302 (2.319)

Table 2   *Continued*

Variable	Description	Total	Girls	Boys
Fat	This takes the value 1 if the adolescent perceives him/herself to be fat or very fat, and 0 otherwise	0.299 (0.458)	0.371 (0.483)	0.224 (0.417)
Vomit	This takes the value 1 if the adolescent vomited to lose weight or to keep from gaining weight during the last 30 days, and 0 otherwise.	0.036 (0.186)	0.051 (0.220)	0.020 (0.140)
Pills	This takes the value 1 if the adolescent took diet pills to lose weight or keep from gaining weight during the last 30 days, and 0 otherwise.	0.033 (0.178)	0.047 (0.211)	0.018 (0.134)
Sexual Intercourse	Number of individuals with whom the adolescent has maintained sexual relations over the course of his/her life	1.766 (2.146)	1.411 (1.884)	2.140 (2.332)
Pregnancy	Number of times that the adolescent has been pregnant (females) or has caused pregnancy (males)	0.107 (0.367)	0.116 (0.370)	0.097 (0.363)

(American Indian or Alaskan Native), and that the remaining 6.7 percent belong to other ethnic groups. With respect to the education level of the parents, Table 2 shows a mean value of 1.6, which indicates that the mean level for both fathers and mothers is slightly higher than that of high school graduate.

With respect to drug use, we can appreciate that boys consume much more than girls. Thus, the number of alcohol consumption days per month is 3.50 for boys and 2.15 for girls. The consumption of illicit hard drugs is also higher for boys than for girls, with 43.4 percent of boys having used such drugs at some point in their lives and 34.66 percent of girls having done so.

Education failure is higher for boys than for girls, with the former both playing more sports and possessing more guns than the latter. Concentrating on the possession of guns, it is very illustrative that 8.4 percent of adolescents have handled a gun on some day during the previous month. There are also significant differences in the perception that adolescents have of their bodies, with 22.4 percent of boys thinking that they are fat and no fewer than 37.7 percent of girls having that opinion of themselves. Moreover, girls use extreme methods to lose weight to a greater extent than boys. Thus, 5.12 percent and 4.67 percent of girls have provoked vomiting or taken pills, respectively, for this purpose, while these percentages are only 1.99 percent and 1.82 percent for boys.

Finally, boys exhibit a higher rate of sexual intercourse than girls. We can further note that the mean pregnancy rate is 0.11, with the mean value being slightly higher for girls who become pregnant, 0.12, than for boys who father a child, 0.10. In short, while our gender subsamples present similar values with respect to demographic characteristics, we can observe some significant distinguishing features as regards the habits and psychosocial characteristics of adolescent boys and girls.

Empirical Model

The generic binary choice model applied to our case can be represented as:

$$Y_i = \begin{cases} 1 & if \quad Y_i^* = x_i'\beta + u_i > 0 \\ 0 & otherwise \end{cases} \tag{1}$$

where the variable Y_i, for any individual i, will take the value 1 if that individual has attempted suicide and the value 0 otherwise. Associated to this, there is a latent variable $Y_i^* = x_i'\beta + u_i$, where β is a vector of k parameters, x_i is a vector of k individual characteristics, and u_i is a nonobservable random variable. This latent variable has a positive sign, that is to say, $Y_i = 1$, when the individual has attempted suicide and a negative one, $Y_i = 0$, when he or she has not.

In accordance with the above, the probability that the individual does or does not attempt suicide is given by $Pr\,(attempt) = Pr\,(Y_i = 1) = Pr\,(u_i > -\,x_i'\beta) = 1 - F(-x_i'\beta)$, and $Pr\,(no\ attempt) = Pr\,(Y_i = 0) = Pr\,(u_i < -x_i'\beta) = F(-x_i'\beta)$, where F denotes the distribution function of the random variable u_i, and with the likelihood function for the N individuals of the sample being:

$$L = \prod_{i=1}^{N} \left(1 - F(-x_i'\beta)\right)^{Y_i} \left(F(-x_i'\beta)\right)^{1-Y_i} \tag{2}$$

If we consider that the random variable is distributed according to a normal distribution with mean 0 and unitary variance, the previous model constitutes a probit, while if it is distributed according to the logistical function, we obtain the logit model. These models will allow us, when maximizing the likelihood function, to obtain estimates of the parameters and, therefore, of the effect that the individual variables have on the probability of attempting suicide.

III

Empirical Results

WE NOW PRESENT THE EMPIRICAL RESULTS THAT ALLOW US TO MEET our objective, that is to say, to determine the risk factors associated with suicide attempts among American adolescents. As we have established earlier, we have distinguished four gradual attempt decisions, from the least to the most harmful: seriously considering attempting suicide; making a plan about how to attempt it; actually attempting suicide; and attempting suicide resulting in injuries that had to be treated by a doctor or nurse. For all four decisions we offer a detailed description of the results that we have derived from estimating a set of binary choice models, into which we have introduced all the different

explanatory variables relative to demographic characteristics, drug consumption, psychosocial variables, and sexual habits.

As both probit and logit binary choice models provide very similar qualitative and quantitative results, we have limited ourselves to all the estimated parameters and the corresponding *t*-rates for the probit versions, with those of the logit formulations also being available from the authors upon request. After estimating all the probit versions, we appreciate that gender appears significant and, as a result, we have further estimated all versions separately for male and female adolescents.

In line with the point made earlier concerning the sample decisions, namely, that answers given to the "thinking and planning an attempt" should be viewed with some skepticism, in what follows we pay greater attention to the determinants of both attempting and attempting with injuries decisions. However, we also draw attention to the main differences with the results corresponding to the first two decisions (see Tables 3, 4, 5, and 6).

Starting with the demographic variables, all our results show that the probability of attempting suicide is higher for girls than for boys, which is consistent with the descriptive numbers cited above. Moreover, this first group of explanatory variables also indicates for both genders that the age >16 variable exhibits a negative sign. Thus, the highest probability of attempting suicide appears up to the age of 16, with this probability falling significantly in the over 16 group. With respect to ethnicity, we can observe that, in general, the black not Hispanic, white not Hispanic, and Hispanic groups show a lower, significant probability of attempting suicide compared to the reference group others (Asian and others), while in the majority of their decisions American Native adolescents present a higher probability than do others, although this is not significant for the most part of the cases. In general, the parameters corresponding to the education level of parents are significant and negative for the actually attempting decision, which indicates that a higher level of parental education reduces the probability of a child attempting suicide. Neither of these two education variables appear as significant for the attempting/treated decision.

As regards the second group of variables, namely, drug use, our

Table 3

Probit Model Estimations: Thinking

	Total		Girls		Boys	
Intercept	−1.0408	(−24.00)***	−0.6173	(−11.22)***	−1.0257	(−16.11)***
Gender	0.4571	(25.08)***	—	—	—	—
Age <16	0.0167	(0.73)	0.0468	(1.57)	−0.0260	(−0.72)
Age >16	−0.1337	(−6.34)***	−0.1837	(−6.60)***	−0.0710	(−2.19)**
Black Not Hisp.	−0.4474	(−11.82)***	−0.4068	(−8.16)***	−0.4995	(−8.44)***
White Not Hisp.	−0.1494	(−4.32)***	−0.1721	(−3.67)***	−0.1274	(−2.48)**
Hispanic	−0.1677	(−4.54)***	−0.1028	(−2.08)**	−0.2416	(−4.33)***
American Native	0.1013	(1.13)	0.1010	(0.84)	0.0876	(0.64)
Father Educ	−0.0242	(−2.68)***	−0.0404	(−3.41)***	−0.0001	(−0.01)
Mother Educ	−0.0135	(−1.46)	−0.0107	(−0.89)	−0.0145	(−1.00)
Alcohol	0.0157	(8.83)***	0.0199	(7.08)***	0.0130	(5.48)***
Illicit	0.3103	(16.20)***	0.2862	(11.18)***	0.3196	(10.93)***
Educ Failure	0.0500	(1.56)	0.0350	(0.74)	0.0637	(1.45)
Gun	0.1484	(4.38)***	0.2581	(3.41)***	0.1659	(4.27)***
Physical Educ	−0.0117	(−3.01)***	−0.0052	(−0.99)	−0.0189	(−3.19)***
Fat	0.1724	(9.53)***	0.1754	(7.70)***	0.1728	(5.76)***
Vomit	0.5567	(13.17)***	0.5886	(12.51)***	0.4019	(4.04)***
Pills	0.2028	(4.55)***	0.1594	(3.22)***	0.3949	(3.80)***
Sexual Interc.	0.0318	(6.29)***	0.0584	(8.29)***	0.0111	(1.47)
Pregnancy	0.1054	(4.40)***	0.0774	(2.43)**	0.1370	(3.69)***
Number of Obs.	30,171		15,670		14,501	
% Correct Predicted	78.7		73.2		84.7	
Log Likelihood	−14,630.7		−8,638.5		−5,940.53	

t-values appear in parentheses.
*Significant at the 10% level.
***Significant at the 5% level.
****Significant at the 1% level.

Table 4

Probit Model Estimations: Making Plan

	Total		Girls		Boys	
Intercept	-1.1793	(-25.76)***	-0.8515	(-14.63)***	-1.1341	(-16.90)***
Gender	0.3859	(19.79)***	—	—	—	—
Age <16	0.0134	(0.55)	0.0646	(2.04)**	-0.0608	(-1.58)
Age >16	-0.1480	(-6.59)***	-0.2071	(-6.95)***	-0.0770	(-2.24)**
Black Not Hisp.	-0.4754	(-11.87)***	-0.4314	(-8.16)***	-0.5259	(-8.40)***
White Not Hisp.	-0.1966	(-5.40)***	-0.2198	(-4.45)***	-0.1773	(-3.29)***
Hispanic	-0.1656	(-4.27)***	-0.1005	(-1.93)*	-0.2320	(-3.97)***
American Native	-0.0668	(-0.69)	-0.0321	(-0.25)	-0.1332	(-0.88)
Father Educ	-0.0269	(-2.79)***	-0.0438	(-3.47)***	-0.0026	(-0.17)
Mother Educ	-0.0067	(-0.68)	-0.0061	(-0.47)	-0.0039	(-0.25)
Alcohol	0.0170	(9.23)***	0.0228	(7.93)***	0.0134	(5.40)***
Illicit	0.2940	(14.44)***	0.2679	(9.87)***	0.2965	(9.50)***
Educ Failure	0.0484	(1.44)	0.0639	(1.30)	0.0372	(0.80)
Gun	0.1835	(5.22)***	0.3353	(4.39)***	0.2082	(5.13)***
Physical Educ	-0.0109	(-2.61)***	-0.0041	(-0.74)	-0.0182	(-2.89)***
Fat	0.1494	(7.75)***	0.1630	(6.71)***	0.1305	(4.07)***
Vomit	0.5774	(13.51)***	0.6200	(13.06)***	0.3600	(3.48)***
Pills	0.1881	(4.09)***	0.1306	(2.55)**	0.4268	(4.00)***
Sexual Interc.	0.0389	(7.31)***	0.0726	(9.84)***	0.0102	(1.27)
Pregnancy	0.0667	(2.64)***	0.0435	(1.29)	0.0954	(2.43)**
Number of Obs.	30,172		15,675		13,488	
% Correct Predicted	83.7		79.8		87.9	
Log Likelihood	-12,539.7		-7,362.45		-5,106.84	

t-values appear in parentheses.
*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Table 5

Probit Model Estimations: Attempting

	Total		Girls		Boys	
Intercept	-1.7851	(-30.17)***	-1.2178	(-17.74)	-1.7101	(-18.11)
Gender	0.6222	(23.02)***	—	—	—	—
Age <16	0.1185	(3.77)***	0.1068	(2.81)***	0.1459	(2.57)***
Age >16	-0.1759	(-5.98)***	-0.2255	(-6.25)***	-0.0786	(-1.53)
Black Not Hisp.	-0.4579	(-9.05)***	-0.4045	(-6.46)***	-0.5658	(-6.43)***
White Not Hisp.	-0.3254	(-7.04)***	-0.3268	(-5.59)***	-0.3231	(-4.31)***
Hispanic	-0.1000	(-2.07)**	-0.0351	(-0.58)	-0.2000	(-2.51)***
American Native	0.2450	(2.26)**	0.2072	(1.49)	0.2887	(1.68)*
Father Educ	-0.0324	(-2.62)***	-0.0361	(-2.38)**	-0.0236	(-1.10)
Mother Educ	-0.0456	(-3.63)***	-0.0387	(-2.51)**	-0.0553	(-2.52)**
Alcohol	0.0212	(9.58)***	0.0229	(7.13)***	0.0202	(6.37)***
Illicit	0.3362	(12.73)***	0.3251	(10.05)***	0.3339	(7.15)***
Educ Failure	0.2025	(4.92)***	0.1680	(2.93)***	0.2454	(4.13)***
Gun	0.2585	(5.80)***	0.3330	(3.92)***	0.2759	(5.11)***
Physical Educ	-0.0050	(-0.93)	0.0068	(1.01)	-0.0256	(-2.77)***
Fat	0.0567	(2.28)**	0.0385	(1.30)	0.0994	(2.15)**
Vomit	0.6257	(12.95)***	0.6293	(11.93)***	0.6337	(5.12)***
Pills	0.2042	(3.81)***	0.1649	(2.82)***	0.4491	(3.33)***
Sexual Interc.	0.0556	(8.25)***	0.0744	(8.62)***	0.0347	(3.12)***
Pregnancy	0.1438	(4.85)***	0.1485	(3.94)***	0.1233	(2.48)**
Number of Obs.	28,198		14,710		13,488	
% Correct Predicted	91.8		88.3		95.6	
Log Likelihood	-7,031.32		-4,808.55		-2,197.24	

t-values appear in parentheses.
*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Table 6

Probit Model Estimations: Attempting Treated

	Total		Girls		Boys	
Intercept	-2.7035	(-27.58)***	-2.2414	(-19.62)***	-2.5263	(-16.28)***
Gender	0.6119	(13.66)***				
Age <16	0.0881	(1.79)*	0.0771	(1.32)	0.1178	(1.26)
Age >16	-0.1381	(-3.03)***	-0.1579	(-2.87)***	-0.0988	(-1.18)
Black Not Hisp.	-0.2633	(-3.27)***	-0.0516	(-0.50)	-0.7595	(-5.28)***
White Not Hisp.	-0.1683	(-2.26)**	-0.0726	(-0.74)	-0.2970	(-2.59)***
Hispanic	-0.0426	(-0.54)	0.1145	(1.12)	-0.2906	(-2.33)**
American Native	0.0323	(0.19)	0.1706	(0.79)	-0.2285	(-0.75)
Father Educ	0.0013	(0.07)	-0.0147	(-0.63)	0.0390	(1.12)
Mother Educ	-0.0187	(-0.96)	-0.0076	(-0.32)	-0.0343	(-0.97)
Alcohol	0.0312	(10.91)***	0.0291	(7.10)***	0.0331	(7.88)***
Illicit	0.3116	(7.42)***	0.2995	(6.03)***	0.3380	(4.09)***
Educ Failure	0.1901	(3.25)***	0.2090	(2.68)***	0.1892	(2.09)**
Gun	0.3993	(6.63)***	0.5737	(5.87)***	0.3313	(4.18)***
Physical Educ	0.0057	(0.69)	0.0176	(1.73)*	-0.0146	(-0.97)
Fat	-0.1178	(-2.93)***	-0.1471	(-3.14)***	-0.0409	(-0.52)
Vomit	0.6962	(11.05)***	0.6996	(10.18)***	0.7533	(4.55)***
Pills	0.0464	(0.59)	0.0408	(0.48)	0.2085	(1.02)
Sexual Interc.	0.0546	(5.46)***	0.0686	(5.57)***	0.0463	(2.64)***
Pregnancy	0.2185	(5.62)***	0.2041	(4.07)***	0.2261	(3.48)***
Number of Obs.	28,155		14,688		13,467	
% Correct Predicted	97.6		96.6		98.7	
Log Likelihood	-2,645		-1,851.75		-771.460	

t-values appear in parentheses.
*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

results confirm for both the total and the two gender subsamples that there is a positive and significant relationship between the consumption of alcohol and illicit drugs and the probability of attempting suicide. Moreover, these variables maintain their significance and signs with the explanation of the four sample decisions, and thus appear as key factors in the explanation of the sequential process that drives to suicide. One direct explanation for this finding is that the consumption of drugs can be considered as an indicator of districts characterized by social disorganization, where attempting suicide could be regarded as one more manifestation of that situation.

With respect to the psychosocial aspects, our results show that the probability of attempting suicide is higher among those who possess a gun for those who do not usually participate in sports, with this variable only being significant for boys. The results corresponding to physical education are derived from the fact that this variable indicates both participation and group integration, as well as the individual preferences of adolescents for healthy habits. Education failure also appears as significant for both attempting and attempting with injuries decisions, although it is not significant for the thinking and making a plan decisions. With respect to the fat variable, our results suggest that a negative perception of their bodies could cause instability in adolescents and, consequently, lead them to seriously think about the possibility of suicide. However, we can also note that this variable is significant and negative for both the total sample and the female subsample in the last decision, namely, that of attempting with injuries. The reason for this could lie in the fact that, in this most extreme decision, the behavior of the girl is such that the family doctor has probably already given prior treatment for the psychological ailments that have driven her to view herself as being fat, although in reality she is thin. In this line, adolescents who either take pills or provoke vomiting in order to lose weight also have a higher and significant probability of both seriously considering an attempt and actually attempting suicide.

Our results also confirm the relationship between, on the one hand, seriously thinking about suicide, making a plan, actually attempting, or attempting resulting in injuries and, on the other, the number of partners with whom the adolescent has had sexual intercourse or the

number of pregnancies, with the latter aspect being regarded as probably unexpected. These results indicate that both higher sexual instability or an unexpected pregnancy positively affect the probability of suicidal thoughts and acts for both male and female adolescents alike. Thus, the deleterious effects of early childbearing, such as lower educational attainment or lower occupational status, will imply negative perspectives about the future. As a consequence, pregnancy is usually perceived as a negative fact among adolescents and, in this line, can drive them toward depression, which, as we said earlier, is a fundamental scenario when young people are seriously thinking of the possibility of suicide.

IV

Summary and Conclusions

IN THIS ARTICLE WE HAVE STUDIED THE FACTORS THAT LEAD American adolescents between the 9th to 12th grades to attempt suicide. Specifically, we have analyzed the determinants of the four previous and gradual steps that lead to committing suicide, that is to say, seriously considering attempting suicide, making a plan about how to make the attempt, actually attempting suicide, and, finally, attempting suicide resulting in injuries that had to be treated by a doctor or nurse. The choice of both the subject matter being considered and the group being analyzed is justified by the supposition that attempted suicide will result in a following step to an eventually successful attempt and the fact that suicide is the third highest cause of death among American adolescents. In this line, the previous literature on suicidal behavior indicates that the first step for suicide prevention is to identify the risk factors. While recognizing that suicide is the result of a very diverse group of factors, we think that our study of the personal and social characteristics of young people who have attempted suicide could help us to identify these risk determinants. To that end, we have modeled the decision by adolescents to attempt suicide by estimating binary choice models in which account has been taken of demographic characteristics, drug consumption, psychosocial aspects, and sexual variables.

Two main conclusions emerge. First, our evidence is clearly

consistent with depression theory, according to which more severely depressed adolescents have a greater probability of attempting suicide. Second, the risk determinants of the more serious attempt decisions are mainly concentrated in the drug use and sexual variables.

More particularly, we have found that the probability of attempting suicide is higher among female adolescents than among their male counterparts. Similarly, we have concluded that adolescents coming from an ethnic minority, that is to say, American Indian or Alaskan Native adolescents, have a higher propensity to consider the possibility of attempting suicide. Additionally, suicidal behavior is more probable until the age of 16, which is a critical point. In light of these results, it is clear that educational strategies aimed at preventing suicide should mainly focus on young females and should be particularly addressed to the intermediate stages of adolescence.

With respect to drug consumption, we have found empirical evidence that this is clearly a determining factor. From among the many negative health effects of alcohol and illicit hard drug consumption, we have identified the psychological damage that can lead adolescents to think in terms of suicide. In this line, our results suggest that the establishment of relationships between suicide prevention campaigns and other prevention programs on alcohol or drug abuse may improve suicide prevention efforts.

We should also note the fact that educational failure on the part of adolescents has a clear influence on potentially suicidal behavior, but only in the last two attempt decisions. Similarly, the possession of a gun, self-perception in physical terms, and the use of extreme methods to lose weight also have a clear influence. Thus, adolescents who have suffered educational failure, who possess a gun, or who are often distressed by their physical appearance are more sensitive to the possibility of attempting suicide. We have also found that habitual participation in sporting activities acts in the opposite direction. Thus, our results suggest that interventions should include promoting self-esteem among young people and should take educational failure into account as an underlying factor that might drive adolescents to think in terms of attempting suicide. The promotion of sports or other activities that clearly imply the building of strong relationships with

other adolescents also seems to be advisable when seeking to improve suicide prevention.

Finally, the recent literature has paid scant attention to the link between suicide attempts and sexual behavior among adolescents. As a response to this, we have first introduced two indicators of sexual relationships, namely, the number of different sexual partners and pregnancy. The results show that these two factors are strongly linked to the probability of attempting suicide. Thus, greater promiscuity could be interpreted by the adolescent as a history of continuous failure, and an excess of sexual partners at this critical age could lead to higher levels of psychological instability, which has been identified as a clear determinant in the possibility of attempting suicide. With respect to pregnancy, usually unexpected, adolescents commonly perceive early childbearing as a problem that can lead to serious consideration of suicide. Against this background, it would appear that a more complete sexual education, together with special attention being given to young mothers and fathers, could help in suicide prevention.

In short, our results would appear to confirm the broadly accepted thesis indicating that suicide is never a result of a single factor or event, but rather emerges from a complex interaction of many factors and usually involves a history of psychosocial problems. In this line, these results could be used by school and community leaders for the purpose of identifying those adolescents who have the highest risk of attempting suicide, given that, as we have established earlier, such an attempt is a major risk factor for subsequent suicide among young people.

Notes

1. In this regard, we can cite some famous mass suicides, such as Jonestown; the California group who believed they were joining a comet; the Masada; the Japanese jumping off the hills to death in front of invading American troops; the kamikazes of World War II; and today's suicidal bombers.

2. We should also mention that a significant proportion of suicides are classified as accidental deaths when the intent is not known (for humane, family reputation, and insurance reasons).

3. The fact that while 24 percent of American adolescents thought seriously about suicide, only 2.65 percent actually attempted it and suffered injuries as a consequence suggests that the thinking category (as well as the make a plan category) would appear to be rather impressionistic or romantic and, as a consequence, that adolescent answers to such polls should be viewed with skepticism.

4. In addition to these independent factors categorized in four groups, we should mention that adolescents also commit suicide in anger or frustration or to cause pain to someone. However, our lack of statistical information in this regard means that we have not been able to include this group in the analysis.

References

Ahlburgh, D. A., and M. O. Schapiro. (1984). "Socioeconomic Ramifications of Changing Cohort Size: An Analysis of U.S. Postwar Suicide Rates by Age and Sex." *Demography* 21: 97–108.

Bonner, R. L., and A. R. Rich. (1987). "Toward a Predictive Model of Suicidal Ideation and Behavior: Some Preliminary Data in College Students." *Suicide and Life Threatening Behavior* 17: 50–63.

Boyd, J. H. (1983). "The Increasing Rate of Suicide by Firearms." *New England Journal of Medicine* 308: 872–874.

Burr, J. A., P.-L. McCall, and E. Powell-Griner. (1994). "Catholic Religion and Suicide: The Mediating Effects of Divorce." *Social Science Quarterly* 75: 300–318.

Burnley, I. H. (1994). "Differential and Spatial Aspects of Suicide Mortality in New South Wales and Sidney 1980 to 1991." *Australian Journal of Public Health* 18: 293–304.

——. (1995). "Socioeconomic and Spatial Differences in Mortality and Means of Committing Suicide in New South Wales, Australia 1985–1991." *Social Science and Medicine* 41: 687–698.

Cantor, C., P. J. Slater, and J. M. Najman. (1995). "Socioeconomic Indices and Suicide Rate in Queensland." *Australian Journal of Public Health* 19: 417–420.

Cutler, D. M., E. L. Glaeser, and K. E. Norberg. (2000). "Explaining the Rise in Youth Suicide." In *Risky Behavior Among Youth*. Chicago: University of Chicago Press.

Davis, R. (1979). "Black Suicide in the Seventies: Current Trends." *Suicide and Life-Threatening Behavior* 9: 131–140.

Durkheim, E. [1897] (1966). *Suicide.* New York: Macmillan.

Easterlin, R. A. (1978). "What Will 1984 Be Like? Socioeconomic Implications of Recent Twists in Age Structure." *Demography* 15: 397–432.

Evans, R. I., W. B. Hansen, and M. B. Mittlemark. (1977). "Increasing the Validity of Self-Reports on Smoking Behaviour in Children." *Journal of Applied Psychology* 62: 521–523.

Freeman, D. G. (1998). "Determinants of Youth Suicide: The Easterlin-Holinger Cohort Hypothesis Re-Examined." *American Journal of Economics and Sociology* 57: 183–200.

Gibbs, J. P., and W. T. Martin. (1964). *Status Integration and Suicide.* Eugene, OR: University of Oregon Press .

Halbwachs, M. (1930). *The Causes of Suicide.* New York: Free Press.

Hamermersch, D., and N. Soss. (1974). "An Economic Theory of Suicide." *Journal of Political Economy* 82: 83–98.

Henry, A. F., and J. F. Short. (1954). *Suicide and Homicide: Some Economic, Sociological and Psychological Aspects of Aggression.* Glencoe, IL: Free Press.

Holinger, P. C., and D. Offer. (1982). "Prediction of Adolescent Suicide: A Population Model." *American Journal of Psychiatry* 139: 302–307.

Jedlicka, D., Y. Shin, and E. Lee. (1977). "Suicide Among Blacks." *Phylon* 38: 448–455.

Johansson, S.-E., and J. Sundquist. (1997). "Unemployment is an Important Risk Factor for Suicide in Contemporary Sweden: An 11-Year Follow-Up Study of a Cross-Sectional Sample of 37,789 People." *Public Health* 111: 41–45.

Kimenyi, M. S., and W. F. Shughart. (1986). "Economics of Suicide: Rational or Irrational Choice." *Atlantic Economic Journal* 14: 121.

Kposowa, A. J., K. D. Breault, and G. K. Singh. (1995). "White Male Suicide in the United States: A Multivariate Individual-level Analysis." *Social Forces* 74: 315–325.

Lester, D. (1988). "A Regional Analysis of Suicide and Homicide Rates in the USA: Search for Broad Cultural Patterns." *Social Psychiatry and Psychiatric Epidemiology* 23: 202–205.

——. (1995). "Suicide and Alternative Measures of Domestic Integration." *Psychological Reports* 77: 1322.

Lester, D., Y. Motohashi, and B. Yang. (1992). "The Impact of the Economy on Suicide and Homicide Rates in Japan and the United States." *International Journal of Social Psychiatry* 38: 314–317.

Morano, C., R. A. Cisler, and J. Lemerond. (1993). "Risk Factors for Adolescent Suicidal Behavior: Loss, Insufficient Family Support and Hopelessness." *Adolescence* 29: 851–865.

Morrell, S., R. Taylor, S. Quine, and C. Kerr. (1993). "Suicide and Unemployment in Australia 1907–1990." *Social Science and Medicine* 36: 749–756.

Motohashi, Y. (1991). "Effects of Socioeconomic Factors on Secular Trends in Suicide in Japan 1953–1986." *Journal of Biosocial Science* 23: 221–227.

O'Connell, M. (1975). *The Effect of Changing Age Distribution on Fertility and Suicide in Developed Countries.* Ph.D. diss. University of Pennsylvania.

Pampel, F. C. (1996). "Cohort Size and Age-Specific Suicide Rates: A Contingent Relationship." *Demography* 33: 341–355.

Pfeffer, C. R. (1989). "Family Characteristics and Support Systems as Risk Factors for Youth Suicidal Behavior." In *Report of the Secretary's Task Force on Youth Suicide, Vol. 2: Risk Factors for Youth Suicide.* Washington, DC: U.S. Department of Health and Human Services.

Smith, J., and F. Welch. (1981). "No Time to Be Young: The Economic Prospects for Large Cohorts in the United States." *Population and Development Review* 7: 71–83.

Sommers, P. M. (1984). "The Effect of Gun Control Laws on Suicide Rates." *Atlantic Economic Journal* 12: 67–69.

South, S. J. (1984). "Racial Differences in Suicide: The Effect of Economic Convergence." *Social Science Quarterly* 65: 172–180.

Southwick, L., Jr. (1997). "Do Guns Cause Crime? Does Crime Cause Guns? A Granger Test." *Atlantic Economic Journal* 25: 256–273.

U.S. Department of Health and Human Services. (2000). *Healthy People 2010: Understanding and Improving Health.* Washington, DC: Government Printing Office.

U.S. Public Health Service. (1999). *The Surgeon General's Call to Action to Prevent Suicide.* Washington, DC: Government Printing Office.

Virén, M. (1999). "Testing the 'Natural Rate of Suicide' Hypothesis." *International Journal of Social Economists* 26: 1428–1440.

Warner, K. E. (1978). "Possible Increases in the Underreporting of Cigarette Consumption." *Journal of the American Statistical Association* 73: 314–317.

Yang, B., and D. Lester. (1991). "The Effect of Gun Availability on Suicide Rates." *Atlantic Economic Journal* 19: 74.

Yang, B., S. Stack, and D. Lester. (1992). "Suicide and Unemployment: Predicting the Smoothed Trend and Yearly Fluctuations." *Journal of Socio-Economics* 21: 39–41.