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Value of Life and Behavior Toward Health Risks: An Interpretation of Social Capital

by

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Abstract

An individual assessing a risky job can be understood as a public good. He and each of his valued relationships place a demand for the preservation of his life and health for which he accepts a responsibility to preserve. Additional demands generally do not deplete his capacity for beneficial relationships, hence, they are nonrival. It follows that the more extensive are his relationships the greater is his social capital. Although a common metric to compare and aggregate such relationships is not practical, the paper demonstrates that the common social capital indicators can yield qualitative predictions on changes in risky behaviors in the context of conventional value of life models familiar within health economics. The individual will change his behavior toward risk upon experiencing an exogenous change in his social capital: when he marries, has children, acquires friends, or experiences a more socially active community. The empirical sections of the paper show this prediction to conform well to prior studies of micro data as well as to original empirical analysis of aggregate data.

When valuing a statistical life, health economists apply a model derived from the logic of compensating wage differentials [1,2]. Observations on the tradeoffs men and women are willing to make between risk and reward are applied to infer the individual's self-valuation of life. This paper extends that model by incorporating a variant of prior research on social capital [3,4,5], which becomes redefined as a nonrival, public good; in this model, a person's social capital is augmented through additions to his valued relationships: spouse, child, friend, or community role. Observed changes in these relationships, within and across individuals, help to predict changes in behavior toward health risks.

Intuitively, my model views the decision maker as an agent for the values placed upon him by each of his valued relationships including himself. Self, spouse, children, and so on each add a demand value for his continued presence and health; as their willing agent he accepts the responsibility to consider these values when faced with choices involving health risks. The voluntary acceptance of this specific responsibility is thus the central motive in this model for him to stay healthy.

The importance of responsibility in one's health decisions is widely recognized and even a part of folklore; the proposed model derives it from accepted economic theory. The social capital concept, most often described as a community phenomenon [5], becomes a more plausible economic concept when reformulated at the level of the individual decision maker [6]. Research on social capital effects within a developed country, as presently is available, may have no immediate or obvious and practical policy implication; but, it will be striking on seeing how frequently social capital variables

perform well in the data. Future success in the social capital research endeavor overall, might lead to more effective means to improve community health; and, this exploratory study demonstrates that the nexus of social capital and health is worth further study (see also Folland, 2003). The results also support my prior work on the relation of community social capital to community health status indicators [7].

It is well known that both men and women gain from marriage [8], but the present approach differs from previous views as to why. In a prominent explanation, marriage is claimed to provide a nurturing environment, and certainly this would provide a benefit to health. However, the proposed model poses the decision maker as motivated to preserve his social capital and thus himself so as to enjoy it, his health is thus improved by his avoiding health risky behaviors. In some cases, the responsibility and nurturing models offer distinct and testable differences.

Section I describes the several literatures upon which the model is based. Section II presents the formal theory. Section III finds indirect tests of the hypotheses model in secondary literature. Section IV describes the data used in the empirical research. Section V presents and discusses the empirical analyses. Section VI develops a discussion and conclusion.

I. The Literature

The most widely accepted value-of-life approaches in health economics, as judged by the frequency of reference in the literature, are 'willingness to pay' and 'willingness to accept'. Both derive from an analytical model best described by Mishan [9] and by Viscusi [2]. The equilibrium occurs at a tangency of the market offer curve,

which indicates the willingness of the market to reward risk, and the indifference curve that represents the highest attainable expected utility. The slope of the indifference curve at equilibrium provides evidence of the individual's willingness to trade risk-to-life for a monetary reward (or a psychic reward).

Under willingness to pay, an individual buys a reduction in risk, such as through a fee paid for a life-extending surgical procedure. The method is frequently made operational by securing responses to questionnaires describing medical procedures, each contingent on their consequences, hence, it is called the contingent value-of-life method [10,11,12,13,14,15,16]. Alternatively, the necessary data may be derived from actual behaviors, such as the observed willingness of consumers to pay for safety features on automobiles [17].

Willingness to accept estimates are usually based on data over behaviors toward occupational risks [2]. Here, the methods are closest to the original model of compensating wages by Rosen [1], though the concept dates back to observations on differences in wages across jobs by Adam Smith [18]. As before, the market offer curve represents the willingness of employers to reward risk. Here an individual accepts a risky job because the wage gain offsets the downside. The logic extends to nonmarket risks and rewards, such as in the case of smoking; here the reward is not in the money but in the pleasure of smoking. Note that under willingness to accept, there is no budget constraint, and there can occur, in principle, substantially different results from the two methods [19,20].

The present paper connects the ideas of value-of-life with the social capital concept by applying a utility model incorporating social capital as a variable. First,

consider that one's value-of-life is universally dependent on more than monetary and material variables. We describe health, loved ones, friends and community responsibilities often as being more important than income. We usually understand these variables to be held constant during an analysis of utility maximization subject to constraints. Only seldom do we inquire systematically into what happens when such variables change.

There are, however, exceptions to the rule. Health economists describe the effect of ill health on preferences as a rotation of indifference curves; the marginal rate of substitution between health care and other goods changes so that when rich we value health care relatively more. A recent utility model by Akerlof [21] applies a similar utility formulation to describe changes in the behaviors of men subsequent to getting married. Akerlof and Kranton [22] similarly insert a noneconomic state variable in a utility model when exploring the concept of personal identity. Finally, Laibson [23] applies a similar utility construction when modeling consumer behavioral responses to noneconomic "cues". It is understood in these models that the utility function is not itself reformulated by the event, instead we see a different aspect of it projected upon the familiar two dimensional plane of study.

Finally, my model features the social capital concept originally described in the sociology literature and more prominently developed by political scientist Robert Putnam [3,5]. He described it as a community level measure of social activity and community mindedness; his social capital index is a factor analytic construction based on the variables defined in Appendix Table 1. The concept has been widely adopted in seminars (Harvard, World Bank), and it has been pursued in numerous scholarly works

[3,5,6,24,25,26,27]. The recent iHEA annual meeting in San Franciso (2003) featured two sessions on social capital and health. The National Bureau of Economic Research has published over a half dozen papers on the subject and prominent journals, such as The Economic Journal and Quarterly Journal of Economics have published multiple articles on it. The aim, in some cases, has been to develop a genuine economic basis for social capital theory. Glaeser et al [6] develop a microeconomic interpretation of social capital, and they promote the idea that incorporating social capital should begin at the individual level. Their model describes the process of investment.

The proposed model here is developed out of ideas from these three literatures and applied to predicting the adoption of health risky behaviors. The empirical work includes Putnam's index, and both the theoretical and empirical models feature both marriage and children as additional social capital variables.

II. The Model

Let the individual be an expected utility maximizer, where utility is defined over the money value of the wage and/or the psychic return, *m*, and his individual social capital, *S*. The decision maker is a public good to the valued relationships in his life in that his value to them is not depleted when more enter into his relationship; for example, the birth of a child does not diminish his value to his spouse. In general, letting D_j indicate the demand value for him by person *j*, his total social capital is:

(1) $S = \sum_j D_j$ where each D_j represents the demand value placed on the individual via relationship *j*.

Note that each *j* expresses a willingness to pay and that these can be added in principle. In practice, however, such data would be infeasible to acquire. Thus, in the empirical section, I use separate indicators for each social capital element. In the model which is depicted here, one may think of *S* as a vector of social capital elements.

For each of these relationships, including himself, he acts as an agent; it is assumed, at present, that he acts as a perfect agent. His total social capital, *S*, is assumed to be independent of his return from risk, *m*. In the case of the selection of a risky new job, this return is his monetary gain. Many choices with risks to health, however, such as smoking cigarettes, offer only a psychic return evaluated in terms of the pleasure received from the act—that is, *m* is then the money metric of his purely psychic return.

This model is similar to Becker's [28] altruism within the family, and it is akin to Andreoni's [29] impure altruism in which an individual also gains a benefit directly from the act of giving. As in Bergstrom's [30] life insurance model, the individual's value of life is elevated inasmuch as he perceives that his life is more valuable to his family than his absence. By reflection of his family's value of him, he is also of more value to himself, he "has more to lose".

Family altruism, however, has drawn critical analyses from both Bergstrom [30, 31] and Jone-Lee [32, 33]. They demonstrated in a utilitarian framework that pure altruism and pure paternalism each require the identical conditions for Pareto Efficiency as those required for the pure selfishness case. Should the individual decision maker in the present model consider his options purely selfishly? And, if he does not, will the result be inefficient for the family?

A point to the contrary is that individual actions are commonly contra efficiency; the model describes plausible behavior: One takes greater care to avoid risks when one has responsibilities and as well when existence is more rewarding. But, a more important point is also true in this context: Altruism primarily aimed at each other's safety, as opposed to their wealth, avoids the stated paradox. The remarkable case described by Bergstrom [30] and by Jones-Lee [33] arises when altruism causes an overvaluation of public goods by neglecting their inherent opportunity costs. Jones-Lee [33] showed that efficient altruism equates with efficient selfishness when the altruism is general, applying in an equivalent manner to both wealth and safety. Consider the habit of smoking. Unlike the loss of a risky job, quitting smoking entails no loss of income to the family, it is entirely a private loss of psychic benefits to the individual. In turn, the family's concern is predominantly for the individual's safety.

Jones-Lee demonstrated that an emphasis on safety, as here, results in a higher optimal value of a statistical life is higher than in the pure selfishness case. He expressed this result as well in his assessment of the U.K. population: "...it transpires that one can, with some confidence, conclude that the value of a statistical life for a 'caring' society will be some 10% to 40% larger than the value that would be appropriate for a society of purely self-interested individuals" (Jones-Lee, [33], 89).

Returning to the utility framework that I have described, let the probability of death be defined as *p*, and let the death benefit be defined as *DB*. Now the expected utility can be described as:

(2) $EU = (1-p)U(S_o, m) + pU(0,0,DB_o)$

Note that the death benefit, *DB*, paid to the beneficiaries is valued in life by the individual as agent for these heirs. It is natural to assume that the death benefit provides less utility than the utility attainable in life, that is, $U(S_o, m) - U(0,0,DB_o) > 0$. Were this not true, then any increase in *p* would increase expected utility, implying that suicide would be rational or that persons would seek out radically risky jobs. Since such behavior is rare, it will be assumed that the utility of living exceeds the utility of the death benefit. This assumption is a sufficient to establish that the indifference curves will have the conventional shape and slope, though the fact that one "good", the probably of death, is actually a bad, implies that these indifference curves will have an upward slope.

Equation (2) describes the person's preference relations over *p*, *S*, and *m*, and his preference ordering is assumed to be complete. He is constrained, however, to combinations of *m* and *p* that are offered by the market. We can expect that employers offer a greater monetary return in trade for his assumption of greater risk. In a competitive market, they pay him the marginal product of risk taking. We can assume further that this marginal product diminishes as greater risk is taken. (When nonmarket health risks are at issue, it is assumed here that the value of psychic returns also exhibit diminishing marginal returns.

To summarize, let *m(p)* be the market offer curve, and:

(3) $m = m(p) \qquad where \ \frac{dm}{dp} > 0 \quad and \ \frac{d^2 m}{d p^2} < 0.$

Figure 1 illustrates the person's market offer curve in the m/p plane, holding his social capital constant. As in Viscusi [2], the equilibrium occurs as a point of tangency (Point *E*) between the market offer curve and the highest indifference curve attainable.

In contrast to the conventional value-of-life model, my point here is to draw inferences

on the person's behaviors toward risk from observing the effects of perturbations to his social capital.

Figure 1 About Here

At *E*, his marginal rate of substitution between risk and material return equals the market rate of transformation of risk into material return. His indifference curves slope upward as is appropriate when one commodity is a bad.

Contrast Figure 2 where an exogenous increase in the individual's social capital causes a perturbation from the initial equilibrium, *E*. In this context, the effect to be observed on the *m/p* plane can be predicted. By Equation (2), applying the implicit value function rule and recalling that $U(S,m)-U(0,0,DB) > 0$, the indifference curve slope is

$$(4)\quad \frac{dm}{dp} = \frac{U(S,m) - U(0,0,DB)}{(1-p)U_m} > 0.$$

Differentiating once more by S, gives the direction of change in slope:

$$(5)\quad \frac{\partial^2 m}{\partial p, S} = \frac{U_S(1-p)U_m - (1-p)U_{m,S}[U(S,m) - U(0,0,DB]}{\left[(1-p)U_m\right]^2} > 0.$$

The sign of each substantive term in (5) is positive, except for the cross-partial $U_{m,S}$. If *S* and m are gross substitutes, then this term is negative, a reasonable assumption for risky

health choices such as smoking, excessive drinking, and virtually any risky activity where the return consists entirely of a psychic valuation, that is, $U_{m,S} < 0$. This is a sufficient (though not a necessary) condition for Equation (5) to be positive.

Under this interpretation, the indifference curve through E would be observed as if to rotate in the m/p plane due to the gain in social capital. As shown in Figure 2, this change implies that a new equilibrium will occur at a lower level of risk. He now chooses p_2 over p_1, thus he selects a lesser equilibrium degree of risk.

Figure 2 About Here

The predictions of the model can be stated plainly. The individual's social capital, when enhanced, will reduce the equilibrium acceptable risk he chooses. Since health status is determined substantially be such individual behaviors, his health status will be improved.

Specifically, these hypotheses are proposed:

(H1): Marriage, *ceteris paribus*, implies greater social capital and consequently less risky health behaviors and better health.

(H2): Children, *ceteris paribus*, imply greater social capital and consequently less risky health behaviors and better health.

(H3): Greater community social capital, *ceteris paribus*, implies less risky health behaviors and better health.

Several risky health behaviors can be identified: (a) cigarette smoking; (b) excessive drinking; (c) AIDS related behaviors; (d) cocaine ingestion; (e) overweight; (f)

and sedentary lifestyle. Each of these hypotheses are investigated in two main ways. First, related literature provides micro-level direct tests though from different contexts. Second, original empirical analyses applying multivariate regression on state aggregate data study each of the above named health risks.

III. Evidence from Other Economic Studies

A. DeLeire and Levy

When investigating gender differences in the choice of risky jobs, DeLeire and Levy [34] reported comparisons involving marriage and children. Table 1 presents their conditional logit coefficients estimated from equations that were designed to predict the probabilities of risky versus nonrisky job choice. Those negative coefficients with greater absolute value indicate greater reluctance to accept risk.

Table 1 About Here

Does one consider one's children when choosing among jobs with various risks? These data show that among singles, especially for women, responsibility for children strongly discourages the choice of a job that entails risks to life. However, marriage, in these data, either has little effect or causes even an increase in risk taking. Though these authors did not speculate as to why this latter result occurs, perhaps it is that having a spouse provides an insurance that one's children will be cared for in the event of a life-threatening accident.

B. Akerlof

George Akerlof [21] investigated the social and economic consequences of the increased average age of first marriage among men in the United States. His findings, which describe the effects of both marriage and children on work experience and health habits, are ideal for the present purpose. Table 2 presents the predicted change in the probability of each outcome based on the man's status as husband and father. Akerlof's data corroborate the proposition that there is a marriage premium in the labor market. They also support the case made here, which I have called the responsibility interpretation; both marriage and children increase the practices to stay at work and to avoid alcohol abuse.

Table 2 About Here

C. Bradford

Studying the effects of pregnancy on the demand for cigarettes, Bradford [35] also estimated the effects of marriage and of number of children on this demand. His results show a strong and significant response to marriage, married participants reveal a distinctively lower demand for cigarettes. His results for the number of children in the family, however, run counter to the present hypothesis in a puzzling way. More children had no significant effect on smoking participation; and, in equations predicting the level of smoking (as opposed to the probability of any smoking), children had a weakly positive effect. Further, and somewhat puzzling, interacting pregnancy with the number

of children, Bradford found that pregnancy elicits less reduction in smoking among mothers who have more children.

IV. The Data for the Empirical Analysis

The needed data for the empirical work in what follows include primarily the social capital measures: married rates, average family size, and Putnam's social capital index. That index is composed of 14 data elements described in detail in Appendix A1. The primary data represent approximately the year 1994, which year was chosen to correspond to the availability of Putnam's index. Variables for risky health behaviors include, each as a rate per population: AIDS cases, cigarette smoking, cirrhosis mortality, cocaine use, inactive life style, obesity, all illicit drugs except marijuana, heroin use, crime, heart mortality and cancer mortality. In several instances, needed data with age breakdowns were available at first for 1999, these were: cigarette smoking, cocaine use, and inactive lifestyle. For these cases, all other variables were retaken from 1999 data, except Putnam's index, which was available only for 1994. The descriptive statistics for all variables used in the study are presented in Table 3A, while Table 3B presents extended definitions of these variables.

Tables 3A and 3B About Here

Two versions of each equation were applied. First, the risky behavior rates were regressed on the three social capital measures alone. Second, three socioeconomic variables were added to each equation: percent of population holding the baccalaureate

degree (BA); personal income per capita; and, the poverty rate. In this context, the BA represents better information about health risks, a factor predicting less risky behaviors; per capita income represents the opportunity to preserve more substantial material gains through preserving life, and it should relate negatively to risky behaviors; and the poverty rate represents people in desperate economic conditions which may be associated with risky choices. Note that these three socioeconomic variables are common to many health economic studies and offer an exploration into possible weaknesses of the social capital hypotheses: Do socioeconomic measures conflict with or alternatively explain the role of social capital variables?

V. The Regression Results

A. The central results from the 50 states regressions:

Tables 4 through 6 present pairs of regressions for each health risky behavior. The performance of Putnam's social capital index is mixed but predominantly supportive of the hypothesis. It enters with a statistically significant coefficient that has the appropriate negative sign in 10 of the 18 regressions, and it is negative with an absolute t value greater than unity in 13 of the regressions. The married rate and average family size often alternate in performance. However, at least one of these enters with the appropriate negative sign and an absolute t value greater than unity in 15 of the 18 regressions.

The most conspicuous misses for the social capital hypothesis are heroin (though the married rate is significant in one) and binge drinking. Although I believe that binge drinking is risky behavior at the individual level, in these state aggregate data it is the

Tables 4 through 6 About Here

only one of the chosen risky behaviors that is significantly and positively correlated with *good* health. That is, state level binge drinking rates are negatively correlated with total age-adjusted mortality rates and positively correlated with life expectancy, both correlations are strong. It is also strongly and positively correlated with Putnam's social capital index.

Table 7 presents regressions on Crime Rate, Heart Mortality and Cancer Mortality. Each has behavioral components that are plausibly related to social capital; though, in each case it can be questioned whether the substantial roles are not exogenous to the model. Nevertheless, Putnam's index performs well on crime rates, and the married rate and average family size are strongly supportive of the hypotheses in several cases.

Table 7 About Here

Overall, these regressions provide a strong initial case in favor of the social capital model. Putnam's community level social capital index performs the best of the three theoretic variables, but the supporting social capital concepts of marriage and family also do reasonably well.

B. Tests to distinguish the model from others.

Let us agree that Putnam's social capital index is a negative predictor of health risky behaviors. Does its performance, however, alternatively derive from a nurturing model instead of a social capital model? Do friends and neighbors in the community, like family members, also provide a nurturing influences? Surely, Putnam's index is less likely than the marriage relationship to entail nurturing relationships; and, this can be demonstrated at least in part.

Consider two related tests regarding this issue. First, replace Putnam's index with only those index elements that most clearly entail no nurturing role; two candidates seem likely: a) frequency of involvement in community projects; and b) frequency of attending club meetings. In Table 7, the product of these two measures were entered as the variable "*Community*" and used to replace the Putnam index. The product was taken as an expedient means to avoid problems of different scales between the two variables. Of the three regressions shown, each reveals *Community* to have a negative influence on risky health behaviors, significant in two of them. This much is consistent with my social capital model.

Table 8 About Here.

Second, compare the explanatory power of the social capital variables in equations predicting youth (age 12 to 17) versus adult (age 26 and older) behaviors toward health risks. The model predicts that one values one's social capital higher on attaining marriage, children, and community participation, this in turn encourages more

responsible health behaviors. If the model is correct, the social capital variables should explain adult behavior well but not youth behavior.

Table 9 presents the results for cocaine ingestion and cigarette smoking, and both of these support the theory reasonably well. The coefficient of determination drops for the youth regressions and the social capital variables perform best in the adult regressions. An anomaly is that average family size performs well in both versions of the cigarette equations.

Table 9 About Here

VI. Discussion and Conclusion

If the present model of how social capital works to promote health is correct, it also offers a conceptually simple method for measuring it. As a public good, the theory of demand for public goods can be applied directly. Each relationship conceptually places an altruistic value on the individual's safety, which by reflection implies a higher social capital for that decision maker. Trading the pleasures of risk taking off for this gain, the person chooses lower risks and thus better health.

However, the problems of measurement are deeper and their discussion makes the limitations of reduced form estimates clearer. Data on friends and individual community responsibilities will be difficult to find and in some cases hard to define. For example, suppose that, counter to this model, membership in a community group has effects

directly on one's preferences over risk. Or, consider that community involvement might entail an extremely complex network of relationships. These problems threaten the feasibility of social capital studies in some cases, and in others they, at a minimum, bring new and constraining econometric restrictions on further research [36].

The issue of causality also is not easy to resolve empirically, especially by aggregate data. It is simple work to sketch alternative scenarios, for example, one may find that happier and healthier people are the ones to self-select for marriage. However, further study of longitudinal data on individuals, such as applied by Akerlof [21], could resolve many of these kinds of questions

Overall, it is hard to imagine that a valid, individual social capital effect that is important to future health policy would exist and yet not show up in reduced form state data such as these. The fact that it does show significant effects in these data makes the case that it is worth pursuing. The results provide a sufficiency of evidence, not that we know yet with confidence that social capital theory is correct or that its effects will at some time prove material to health policy in developed countries, but that current findings within the nexus of population health and social capital offer these possibilities.

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Table 1. Coefficients in a Conditional Logit Model Predicting Choice of Job Given Levels of Risk to Life and Health, Data from DeLeire and Levy (2001).

Jobs risk	Single men wo/kids	Single men w/kids	Married men wo/kids	Married men w/kids
Fatal	-47.6 (2.9)	-64.4 (10.0)	-42.8 (4.1)	-46.2(2.3)
Nonfatal	0.056 (0.003)	0.048 (.007)	0.068 (0.004)	0.067(0.002)
	Single women wo/kids	Single women w/kids	Married women wo/kids	Married women w/kids
Fatal	-96.6 (10.0)	-165.2 (13.8)	-64.5 (12.6)	-126.15 (9.1)
Nonfatal	0.038 (0.005)	0.074 (0.006)	0.038 (0.007)	0.064 (0.004)

Note: The cells contain the logit coefficients on the named column variable in an equation designed to predict membership in the given job risk category.

Table 2. Change in the Probability of the Identified Work or Health Behavior Due to Being Married and Having Children, Data from Akerlof (1998).

Dependent Variable	Married (dummy)	Child (dummy)
Full time worker	0.047*	0.031*
Year round worker	0.115*	0.011
Marijuana use	-0.154*	0.080*
Overdrinking	-0.077*	-0.029*

Note: The probability change is the measured effect of a change in the marriage or child dummy variable from zero to one. * Indicates the probability change value was based on a coefficient significant at the 5 percent level or better.

Table 3A. Descriptive Statistics on the Econometric Model Variables, with State Data

Variable	Mean	Stand. Dev.	Min	Max
1) Soccap (Putnam)	0.020	0.781	-1.43	1.71
2) Married pct. 94	56.34	2.763	49.86	62.18
3) Married pct 99	52.52	2.462	45.80	57.30
4) Ave. Fam Size 94	3.144	0.126	2.900	3.670
5) Ave. Fam Size 99	3.089	0.138	2.800	3.570
6) BA pct 94	21.64	4.266	11.40	30.10
7) BA pct 99	24.95	4.297	15.30	34.60
8) Persinc Cap 94	20954	2935.6	15848	29404
9) Persinc Cap 99	28224	4305.3	20993	40640
10) Poverty Rate 94	7.118	3.562	2.074	15.152
11) Poverty Rate 99	11.320	3.212	5.700	20.700
12) Cirrhosis 94	6.976	1.7425	3.70	12.80
13) Binge 99	13.887	3.875	4.75	23.05
14) Cocaine young 99	1.682	0.647	0.800	4.000
15) Cocaine 26&up 99	1.218	0.458	0.600	2.600
16) Cigarette young 99	16.368	3.046	9.000	23.500
17) Cigarette 26up 99	25.328	2.792	19.000	31.400
18) Heart mortality 94	273.0	59.587	88.00	377.00
19) Cancer mortality 94	202.8	34.006	93.00	263.00
20) Crime 94	4952.1	1269.4	2528	8250
21) AIDSpop 94	33.42	27.01	4.187	133.9
22) AIDSpop 99	22.15	18.63	1.753	100.6

Table 3B. Variable Descriptions and Sources

1). Soccap (Putnam): Robert Putnam's Social Capital Index for each state ca 1994, from his book Bowling Alone (2000).
2) & 3) Married pct. 94 & Married 99: Percent of the population, in 1994 and 1999 respectively, who are married and not separated. Census Bureau.
4) Ave. fam. size 94: Average number of parents and children in families composed on one or both parents and children. Census Bureau.
5) Ave. fam. size 99. Census Bureau.
6) & 7) BA 94 & BA 99: Percent of the population, in 1994 and 1999 respectively, who had completed college. Statistical Abstract of the United States
8) & 9) Persinc. cap. 94: Personal income per capita. Statistical Abstract of the United States.
9) Persinc. cap. 99: Personal income per capita. Statistical Abstract of the United States.
10) & 11) Poverty rate 94 & Poverty rate 99: Percent of population under the official poverty level in 1994 and 1999 respectively. Statistical Abstract of the United States.
12) Cirrhosis 94: Mortality rate for major liver disease and cirrhosis, age-adjusted rate per 100,000 population. National Vital Statistics Report.
13) Binge 99: Reported binge drinking (5 drinks or more within a couple of hours) among people 26 years or older in percent. Substance Abuse and Mental Health Services Administration.
14) Cocaine yng 99: Percentage of cocaine use among persons 12 to 17 years old. Substance Abuse and Mental Health Services Administration.
15) Cocaine 26up 99: Percentage of cocaine use among persons 26 years or older. Substance Abuse and Mental Health Services Administration.
16) Cigarette yng 99: Percent of population 12 to 17 years old who reported smoking cigarettes during the past month. Substance Abuse and Mental Health Services Administration.
17) Cigarette 26up 99: Percent of population 26 years or older who reported smoking cigarettes during the past month. Substance Abuse and Mental Health Services Administration.
18) Heart mortality 94: Mortality rate in 1994 for heart disease, crude rate per 100,000 persons. National Vital Statistics Reports.
19) Cancer mortality 94: Mortality rate in 1994 for cancer, crude rate per 100,000 persons. National Vital Statistics Reports.
20) Crime 94: Crime rate, offenses per 100,000 people. FBI, Crime in the United States.
21) & 22) AIDSpop 94 & AIDSpop 99: Reported AIDS cases in 1994 and in 1999 respectively, cases per 1000 population ages 18 to 64 years old. Statistical Abstract of the United States.

Table 4. Determinants of Risky Behaviors: Cocaine, Cirrhosis, and AIDS.

Variable	Cocaine Use Rate		Cirrhosis Mortality.		AIDS Cases Rate	
Constant	3.160 (2.09)	0.084 (0.05)	19.080 (2.37)	32.027 (2.72)	177.6 (2.58)	79.84 (1.01)
Soccap (Putnam)	-0.309 (5.63)	-0.332 (5.61)	-0.785 (2.56)	-0.431 (1.01)	-6.55 (2.67)	-7.70 (2.63)
Married Percent	-0.043 (2.41)	-0.009 (0.47)	-0.009 (2.23)	-0.332 (2.55)	-4.276 (5.09)	-3.18 (3.38)
Average family size	0.098 (0.31)	-0.008 (0.03)	-0.427 0.22)	-1.145 (0.57)	22.75 (1.55)	19.49 (1.37)
BA pct	--	0.001 (0.08)	--	-0.026 (0.31)	--	-0.22 (0.38)
Pers. Inc per Cap		0.0001 (3.15)	--	-0.0001 (0.54)	--	0.002 (2.73)
Poverty rate	--	0.030 (2.01)	--	0.112 (1.43)	--	0.747 (0.99)
R Square	0.544	0.645	0.264	0.271	0.559	0.613
p value of F	0.000	0.000	0.001	0.003	0.000	0.000

Note: The cells present the regression coefficients with the absolute t values in parentheses.

Table 5. Determinants of Risky Behavior: Cigarettes, Inactivity, and Obesity

Variable	Cigarette use rate*		Inactivity rate*		Obesity percent	
Constant	50.861 (4.57)	59.613 (4.54)	53.971 (10.90)	68.517 (5.35)	14.169 (1.35)	37.365 (3.04)
Social capital Index (Putnam)	-2.043 (4.99)	-1.447 (2.97)	-5.917 (4.58)	-5.644 (3.57)	-0.983 (2.547)	0.033 (0.09)
Married rate	0.152 (1.13)	-0.005 (0.03)	--	--	0.133 (1.17)	-0.189 (1.56)
Average family size	-10.854 (4.62)	-9.471 (4.01)	-5.843* (2.49)	-5.818* (2.23)	-2.202 (0.92)	-1.000 (0.54)
BA percent	--	-0.179 (1.81)	--	-0.170 (0.49)	--	-0.284 (3.70)
Personal income per capita	--	-0.0001 (0.22)	--	-0.0001 (0.83)	--	-0.0001 (1.63)
Poverty rate	--	0.0186 (0.15)	--	-0.162 (0.39)	--	0.143 (2.09)
R Squared	0.479	0.508	0.352	0.350	0.091	0.542
p value	0.000	0.000	0.000	0.000	0.070	0.000

Note: Cells present the regression coefficients with absolute t values in parentheses.
*Cigarette consumption rates for persons 26 years and older; inactivity rates for persons 65 years and older. For the regression on the inactivity rate only, the starred numbers are the coefficients for a variable defined as the ration of young people to the number of people 65 and over.

Table 6. Determinants of Risky Behavior: Heroin, Binge Drinking, and Illicit Drugs

Variable	Heroin use percent		Binge drinking		All illicit drugs*	
Constant	733.11 (1.02)	-1253.2 (1.60)	29.629 (2.43)	18.106 (1.32)	1.102 (0.47)	-0.754 (0.28)
Social capital Index (Putnam)	28.173 (1.05)	-1.905 (0.07)	1.947 (4.40)	2.585 (5.07)	-0.122 (1.43)	-0.126 (1.30)
Married rate	-20.493 (2.38)	-3.491 (0.44)	-0.168 (1.16)	-0.119 (0.72)	-0.032 (1.16)	-0.013 (0.44)
Average family size	137.54 (0.91)	219.24 (1.63)	-0.633 (0.24)	0.368 (0.14)	0.851 (1.73)	0.836 (1.76)
BA Percent	--	-3.003 (0.61)	--	-0.179 (1.79)	--	-0.025 (1.32)
Personal income per capita	--	0.022 (4.47)	--	0.0001 (2.31)	--	0.0001 (2.67)
Poverty rate	--	2.816 (0.46)	--	0.293 (2.24)	--	0.004 (0.17)
R Square	0.095	0.499	0.264	0.344	0.141	0.249
p value	0.062	0.000	0.001	0.001	0.021	0.005

Note: The cells present the regression coefficients with absolute t values in parentheses. "All illicit drugs" has been defined here so that it does not include marijuana.

Table 7. Determinants of Crime and Ill Health: Total Crime Rate, Heart and Cancer Mortality Rates

Variable	Crime Rate		Heart Mortality		Cancer Mortality	
Constant	3930.9 (0.63)	11547.4 (1.33)	1043.8 (4.04)	1232.4 (3.78)	882.9 (7.64)	898.69 (5.93)
Social capital index (Putnam)	-573.7 (2.42)	-363.5 (1.15)	-12.828 (1.31)	2.730 (0.23)	-4.091 (0.93)	0.716 (0.13)
Married rate	-71.744 (1.08)	-153.59 (1.59)	-1.789 (0.65)	-5.577 (1.55)	-2.149 (1.75)	-3.035 (1.81)
Average family size	1603.86 (1.09)	930.54 (0.63)	-211.9 (3.49)	-167.7 (3.03)	-177.25 (6.52)	-156.5 (6.02)
BA Percent	--	-0.917 (0.01)	--	-6.100 (2.66)	--	-2.356 (2.21)
Personal income per capita	--	0.005 (0.06)	--	-0.0001 (0.13)	--	0.0001 (0.24)
Poverty Rate	--	-139.6 (2.50)	--	3.704 (1.77)	--	1.7111 (1.76)
R Square	0.175	0.257	0.202	0.417	0.479	0.585
p value of F	0.009	0.005	0.004	0.000	0.000	0.000

Note: The cells present the regression coefficients with absolute t values in parentheses.

Table 8. Community Activity as a Determinant of Risky Behavior

Variable	Cirrhosis	AIDS	Cocaine
Constant	22.328 (2.81)	217.97 (3.01)	4.870 (2.84)
Community	-0.0901 (2.19)	-0.435 (1.22)	-0.0286 (3.35)
Married Rate	-0.221 (2.65)	-4.844 (5.64)	-0.062 (3.09)
Average family size	-0.3914 (0.23)	21.834 (1.39)	0.0389 (0.11)
R Square	0.238	0.504	0.375
p value of F	0.001	0.000	0.000

Note: *Community* is defined as the product of two elements of the social capital index which suggest community responsibilities rather than the nurturing relationships. The two are "Attended how many club meetings in the past year" and "Participated in how many community projects during the past year".

Table 9. Do Young and Old Share the Same Determinants of Risky Behavior?

Variable	Cig Young	Cig Old		Cocaine Yng	Cocaine Old
Constant	43.679 (3.30)	50.861 (4.53)		-2.087 (0.57)	3.1607 (2.09)
Social capital index (Putnam)	-0.425 (0.88)	-2.0430 (4.99)		0.0955 (0.71)	-0.309 (5.63)
Married Rate	0.2579 (1.64)	0.1523 (1.13)		-0.001 (0.02)	-0.043 (2.41)
Average family size	-13.239 (4.81)	-10.854 (4.62)		1.241 (1.61)	0.0984 (0.31)
R Square	0.375	0.479		0.002	0.544
p value of F	0.000	0.000		0.384	0.000

Note: Young means 12 to 17 years old; Old means 26 years old and up.

Figure 1. The Initial Equilibrium Where the Individual Chooses Point E Representing Constrained Utility Maximization

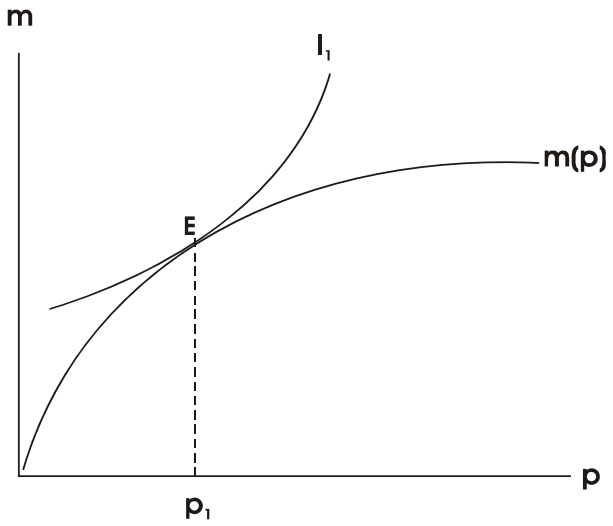
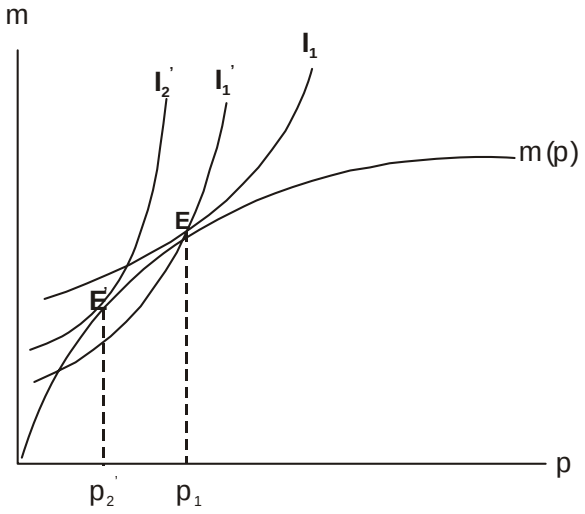


Figure 2. Increased Social Capital Causes the Individual to Reevaluate the Tradeoffs Between Risk and Reward so that Lesser Risk is Chosen



Appendix Table A1. The Elements of Putnam's Social Capital Index

Variable name	Extended variable definition
Served on committee	Served on committee of local organization in the past year (percent)
Served as officer	Served as officer of some club or organization in last year (percent)
Organizations per capita	Civic and social organizations per 1,000 population
Mean club meetings	Mean number of club meetings attended in last year
Mean group memberships	Mean number of group memberships
Turnout	Turnout in presidential elections, 1988 and 1992
Attended public meetings	Attended public meetings on town or school affairs in last year (pct)
Number of nonprofits	Number of nonprofit (501c3) organizations per 1,000 population
Mean community proj.	Mean number of times worked on community project in last year
Volunteered	Mean number of times did volunteer work in last year
Visited friends	Agree that "I spend a lot of time visiting friends"
Entertained	Mean number of times entertained at home in last year
People can be trusted	Agree that "Most people can be trusted"
People are honest	Agree that "Most people are honest"

Source: Robert Putnam, Bowling Alone, 2000, p. 291. Putnam applied factor analysis finding that these variables loaded on a single factor, which he identified as social capital of the community.