



Protective Factors and Social Risk Factors for Hospitalization and Mortality among Young Men

Anders Romelsjö,^{1,2} George A. Kaplan,³ Richard D. Cohen,⁴ Peter Allebeck,⁵ and Sven Andreasson⁵

The association between presumed protective factors and social risk factors for hospitalization and mortality was studied during a 14-year follow-up period in a cohort of 8,168 Swedish men aged 18–20 years at baseline. Using Cox regression analysis, the authors found that five protective factors (high social class, home well-being, school well-being, good emotional control, and self-perceived good health) were associated with lower risks of hospitalization and death. Four social risk factors (contact with police or child welfare authorities, running away from home, having divorced parents, and ever using narcotics) were significantly associated with increased risk of hospitalization and mortality. The relative hazard decreased with the number of protective factors and increased with the number of social risk factors, almost linearly. The relative hazard was 0.24 for hospitalization among those with six protective factors and 0.24 for mortality for those with five or six protective factors. The relative hazard for hospitalization was 3.09 among those with five social risk factors compared with those with none, while for mortality the relative hazard among those with four or five social risk factors was 5.74 compared with those with none. While these results indicate strong cumulative effects for both the social risk factors and the protective factors, the associations of individual factors with the two outcome measures were generally reduced in models which simultaneously adjusted for all factors, which presumably indicates collinearity among the factors. There was only limited support for a buffering, or interacting, effect between the risk factors and the protective factors. *Am J Epidemiol* 1992;135:649–58.

alcohol drinking; cohort studies; health promotion; hospitalization; men; mortality; risk factors; socioeconomic factors

Numerous studies have shown an association between low socioeconomic status, weak social networks, and psychosocial factors and risk of ill health (1, 2). While these studies have been largely restricted to middle-aged and older individuals, a far smaller number of studies in children and

young people indicate that psychosocial factors may be associated with adverse health effects in younger persons as well (3–5). On the basis of these studies and perspectives from developmental psychiatry and social work, it is reasonable to ask whether adverse social circumstances in childhood constitute

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Abbreviations: ICD-8, *International Classification of Diseases*, Eighth Revision.

¹Department of Social Medicine, Karolinska Institute, S-172 83 Sundbyberg, Sweden.

²Alcohol Research Group, School of Public Health, University of California, Berkeley, CA.

³Human Population Laboratory, California Department of Health Services, Berkeley, CA.

⁴Human Population Laboratory, California Public Health Foundation, Berkeley, CA.

⁵Department of Medicine, Section for Community Medicine, Karolinska Institute, Huddinge University Hospital, Huddinge, Sweden.

Reprint requests to Dr. Anders Romelsjö, Department of Social Medicine, Karolinska Institute, S-172 83 Sundbyberg, Sweden.

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risk factors for ill health at a later date. For example, problems at home or in school, the experience of one's parents' divorce, narcotics use, and trouble with the police may all be part of a cascading series of events which later result in adverse health effects.

However, it is clear that many persons who fit into these high-risk groups manage to maintain high levels of health and functioning. Thus, it is important to identify factors which are in themselves protective or which lower the risk associated with other risk factors, acting as effect modifiers or buffers (1, 6). Researchers in developmental psychology and psychiatry, such as Garmezy and Rutter (4), have stressed the need for studies of protective factors and "invulnerable children" and have expressed regret that so little work has been done in this area (4, 7, 8). Despite the paucity of studies, there are a few suggestions of what might constitute protective factors in childhood. Garmezy and Neuchterlein (7) suggest that good emotional control is associated with decreased vulnerability. It is generally accepted that a stable, loving, and secure home situation is very important for the development of good mental health in children and young people (4). Garmezy and Rutter (4) have found that school can be a positive influence even for children living under conditions of psychosocial disadvantage. Social support, good health, and high social class may also be protective (2, 3).

The present study addresses these issues with respect to the risk of hospitalization and death in a cohort of 8,168 Swedish military conscripts aged 18–20 years. Previous studies of this cohort indicated a number of social risk factors that were associated with an increased risk of death (9) or hospitalization (10): parents having been divorced, having run away from home, truancy, having had contact with the police or child welfare authorities, and having ever used narcotics. In this study, we focused on potentially protective factors that were identified as possibly important in the literature cited above and for which data were available in this data set.

We tried to answer the following questions:

- 1) Are good emotional control, having friends to confide in, getting along well at home and in school, self-perceived good health, and high social class protective factors associated with a reduced risk of hospitalization and mortality?
- 2) If there is a protective effect, does this effect increase with the number of protective factors?
- 3) Do protective factors modify or buffer the impact of social risk factors for hospitalization and mortality?

MATERIALS AND METHODS

The study was based on data obtained from 50,465 Swedish men who were conscripted for compulsory military service in 1969–1970, as described in previous reports (9, 10). The present study was restricted to those 8,168 men residing in Stockholm County at the time of conscription and born in 1950–1952, thus covering 96.3 percent of the total cohort of 8,483 men from Stockholm. Only 5–6 percent of Swedish men were exempted from conscription.

At conscription, all men were given two questionnaires. The first concerned social background, upbringing, school adjustment, and personality traits. The second dealt specifically with use of drugs, alcohol, inhalants, and tobacco. All conscripts were seen by a psychologist for a structured interview. The percentage of nonrespondents was between 1 and 4 for most items.

Questionnaire data were linked to the Swedish Cause of Death Register and to the Stockholm County Inpatient Care Register for a 14-year follow-up (1970–1983) by use of the unique individual Swedish personal identification number (9). The Stockholm County Inpatient Care Register contains data on almost all hospital admissions in Stockholm County, a metropolitan area which includes the Swedish capital and has approximately 1.5 million inhabitants. The percentage of admissions reported to the Stockholm County Inpatient Care Register

rose successively from 92 percent in 1970 to more than 97 percent in 1973, and has been above 98 percent since 1980 (11). Diagnoses were recorded according to the Swedish edition of the *International Classification of Diseases, Eighth Revision (ICD-8)* (12), during the study period.

For the purposes of this study, the following endpoints were selected:

1) *First inpatient hospitalization* ($n = 2,795$). We excluded those who were examined but were found to be without disease ($n = 27$). The most frequent main diagnostic categories were accidents, poisonings, and other external causes of injury (ICD-8 codes 800-999), with 704 cases (25.2 percent); diseases of the digestive system (ICD-8 codes 520-577.9), with 377 cases (13.5 percent); symptoms and ill-defined conditions (ICD-8 codes 780-789.9), with 307 cases (11.0 percent); and diseases of the respiratory system (ICD-8 codes 460-519.9), with 300 cases (10.7 percent).

2) *Mortality from all causes* ($n = 105$). Eighty-three deceased persons (79.0 percent) had accidents, poisonings, and other external causes (ICD-8 codes 800-999.9) as the underlying cause of death. Twenty-five of those men (23.8 percent) had suicide (ICD-8 codes E950-E959 and E980-E989) as the underlying cause of death. Seven conscripts (6.7 percent) died of cancer (ICD-8 codes 140-239.9), and six (5.7 percent) died of cardiovascular disease (ICD-8 codes 390-458.9).

Social risk factors

The following variables were included as social risk factors: having divorced parents; having ever run away from home; contact with police or child welfare authorities at least twice; truancy about once per week or more often; and having ever used narcotics. These variables were dichotomized on the basis of content and distribution, with the high-risk group coded as 1. The prevalence of these social risk factors is presented in table 1. Pearson correlation coefficients between the undichotomized social risk factors ranged from 0.11 to 0.28.

TABLE 1. Prevalence (%) of protective factors and social risk factors for hospitalization and mortality (and confounders) in 8,168 Swedish conscripts aged 18-20 years in 1969-1970

Variable	%
Protective factors	
Social class I	31.2
Home well-being	80.0
School well-being	86.4
Having friends to confide in	97.1
Good emotional control	71.4
Self-perceived good health	79.8
Social risk factors	
Contact with police or child welfare authorities at least twice	4.9
Having ever run away from home	5.1
Truancy once per week or more often	5.5
Having divorced parents	16.2
Having ever used narcotics	22.8
Confounders	
Alcohol consumption of >250 g of 100% ethanol/week	3.5
Smoking >20 cigarettes/day	4.4

Protective factors

Potentially protective factors were chosen on the basis of previous findings in this material and in the literature (1, 3, 4, 6-8). Those factors were coded 1 if they were present and 0 if they were absent. The following variables were included as protective factors:

1) *Father in the highest social class*. Social class was categorized from I (highest, mainly including occupations with a high education or a high income) to III (lowest, mainly including manual workers and nonmanual employees at a lower level). Social classes II and III were combined for the reference category.

2) *Home well-being*. Those who reported that they got along "excellently" or "very well" at home were coded 1.

3) *School well-being*. Those who responded that they got along "rather well" or "very well" in school were coded 1.

4) *Having friends to confide in*. This item was constructed from a question about num-

ber of friends and the question "Do you have intimate talks with friends?" Those who had at least two friends and who talked intimately with friends "often" or "sometimes" were coded 1.

5) *Good emotional control.* Each conscript had a structured interview with a trained psychologist, who then combined questionnaire and interview data for a rating of emotional control. The variables were assessed on a scale of 1–9 with a normal (Gaussian) distribution, which was collapsed to a scale with five levels in a second step. The assessments were performed by a few trained psychologists, whose ratings were regularly checked for interrater reliability to maintain the quality of the selection procedure (13). Good or very good emotional control was the potentially protective category, including three of five categories, and was coded 1.

6) *Self-perceived good health.* This was based on a question with five categories, from "very good" to "very poor." Those who thought their health was "very good" or "rather good" constituted the potentially protective category, coded 1, and the others comprised the reference category.

Comparisons between self-rated adjustment at home and at school and ratings by psychologists were available for 5,983 of the 8,168 conscripts. The Pearson correlation coefficient was 0.39 for adjustment at school and 0.32 for adjustment at home. The correlation coefficient between self-perceived health and various somatic and psychosomatic complaints ranged from 0.25 to 0.40. The Pearson correlation coefficients between the undichotomized protective factors ranged from 0.03 to 0.37.

Confounders

High alcohol consumption and heavy smoking were considered as confounders. Alcohol consumption was calculated by combining data on quantity and frequency of consumption of beer, wine, and spirits and was expressed in terms of grams of 100 percent ethanol per week. Information on the average alcohol content in 1970 of all alcoholic beverages available in Sweden was

obtained from the Swedish state-owned alcohol retailer (unpublished data). Consumption of more than 250 g of 100 percent ethanol per week was considered high, in accord with recommendations in Sweden and other countries (14, 15). Heavy smoking was defined as smoking more than 20 cigarettes per day.

Analysis

Because of the rather long follow-up period of 14 years and the high prevalence of hospitalization, we used the Cox proportional hazards regression model (16, 17). The estimated relative hazard is a measure that can be interpreted as the approximate instantaneous relative risk associated with a particular risk factor. The dependent variable was time to first hospital admission or to death. For hospitalization and mortality separately, we fitted models for each factor measuring social risk and then added each potentially protective factor. Then we added the interaction term between each social risk factor and each variable measuring a hypothesized protective effect. Use of an interaction term between the social factors and the protective factors allowed us to estimate whether or not the hypothesized protective factor modified the impact of risk factors on hospitalization and mortality. Lastly, high alcohol consumption and heavy smoking were added to the models as possible confounders.

Additionally, we analyzed models based on two composite indices which separately counted the number of risk factors present and the number of protective factors present and included an interaction term. We also calculated the etiologic fraction for all risk factors summed and the prevented fraction for all protective factors summed, using formulas suggested by Miettinen (18). The prevented fraction is the proportion of potential new cases that would have occurred in the absence of the protective factors but did not occur. The relative hazard estimation from the Cox model was used for the incidence density ratio in these formulas. We also performed multivariate analyses which simul-

taneously involved all social risk factors, all protective factors, and confounders.

RESULTS

For the social risk factors, relative hazards of hospitalization and death were significantly increased for all variables in the univariate analysis, except for truancy in relation to mortality (table 2). The relative hazards were generally higher for mortality than for hospitalization. The greatest difference between hospitalization and mortality was for those who reported that their parents were divorced. The hypothesized protective factors were all associated with a reduced relative hazard. The only protective factor that was significantly reduced for mortality was school well-being, with a relative hazard of 0.37 (95 percent confidence interval 0.24–0.59). For hospitalization, the reduction was statistically significant for all protective factors except having friends to confide in, which was marginally significant. High alcohol consumption (>250 g of ethanol/week or approximately 35 g/day) was associated

with an increased relative hazard for hospitalization, as was smoking more than 20 cigarettes per day.

When finer categorization of the social risk factors and protective factors was used, there was a positive gradient for alcohol consumption and an inverse gradient for number of friends to confide in and self-perceived health, for both hospitalization and mortality (data not shown). There was also a positive gradient for the association between smoking and hospitalization. All tests for trend were statistically significant ($p < 0.05$), except those for numbers of friends to confide in with either outcome and for self-perceived health with mortality.

We analyzed separate models for each of the social risk factors with each of the protective factors and found only small changes in the relative hazards for the variables, which indicates little confounding. There was little additional confounding from high alcohol consumption and heavy smoking. There was only limited evidence for effect modification in most models. On the basis of the number of risk factors (five) and the

TABLE 2. Relative hazards of hospitalization and mortality according to various protective and social risk factors in 8,168 Swedish conscripts aged 18–20 years in 1969–1970: univariate analyses

Variable	Hospitalization		Mortality	
	RH*	95% CI*	RH	95% CI
Protective factors				
Social class I	0.78	0.71–0.86	0.70	0.41–1.17
Home well-being	0.78	0.71–0.86	0.69	0.40–1.18
School well-being	0.73	0.67–0.80	0.37	0.24–0.59
Having friends to confide in	0.87	0.73–1.03	0.89	0.36–2.11
Good emotional control	0.81	0.73–1.89	0.65	0.39–1.08
Self-perceived good health	0.74	0.68–0.81	0.68	0.43–1.08
Social risk factors				
Contact with police or child welfare authorities at least twice	2.10	1.10–2.45	3.50	1.86–6.63
Having ever run away from home	1.56	1.31–1.85	2.18	1.00–4.75
Truancy once per week or more often	1.54	1.20–1.81	1.58	0.69–3.64
Having divorced parents	1.22	1.09–1.37	2.73	1.67–4.45
Having ever used narcotics	1.37	1.25–1.51	2.10	1.32–3.33
Confounders				
Alcohol consumption of >250 g of 100% ethanol/week	1.76	1.46–2.10	1.93	0.80–4.80
Smoking >20 cigarettes/day	1.24	1.20–1.51	1.00	0.32–3.18

* RH, relative hazard; CI, confidence interval.

number of protective factors (six), we examined 30 models. For hospitalization, the *p* values for interaction terms were less than or equal to 0.20 in seven models and were less than 0.05 in three models (table 3). The relative hazard was higher for those from social class I who were known by the police or juvenile authorities than for those from social classes II and III. Having ever used narcotics showed interaction with three protective factors. The lowest *p* value for an interaction term in the models for mortality was 0.10 between school well-being and having ever used narcotics.

The results of analyses based on a model which examined the composite indices of social risk and protective factors are shown in table 4. The models, which allowed the relative hazard for each level of risk and protective factors to be estimated independently, showed that the gradients were close to linear. (Categories were collapsed for mortality because of fewer cases.) Persons who had five risk factors were at a 3.09-fold increased risk of hospitalization compared with those who had none (table 4). Persons who had four or five risk factors were at a 5.74-fold increased risk of death compared with those who had none. For protective factors, persons with six protective factors had 0.24 times the risk of hospitalization as those with none, and those with five or six protective factors had 0.24 times the risk of death of those with no protective factors.

Because the associations between number of social risk factors present and number of protective factors present and the outcome measures appeared to be linear, we constructed a model in which we used a continuous variable for social risk factors and for protective factors, plus an interaction term between them, in order to estimate the overall modifying effect of the protective factors taken together. There was no interaction in those models.

The relative hazards were closer to 1.00 in multivariate analyses with all protective factors, social risk factors, and confounders included in the model (table 5). The relative hazard was generally decreased for the pro-

TABLE 3. Relative hazard of hospitalization in models containing various combinations of social risk factors, protective factors, and interaction terms: 8,168 Swedish conscripts aged 18–20 years in 1969–1970*

Variables entered into model	RH†	95% CI†	<i>p</i>
Contact with police or child welfare authorities at least twice			
Father in social class I	2.93	2.05–4.19	0.03
Father in social class II/III	1.88	1.58–2.24	
Having divorced parents			
School well-being	1.06	0.90–1.22	0.03
Not school well-being	1.37	1.16–1.62	
Having ever used narcotics			
Good emotional control	1.23	1.08–1.40	0.14
Not good emotional control	1.42	1.23–1.66	
Having ever used narcotics			
≥2 friends to confide in	1.35	1.22–1.49	0.20
0–1 friends to confide in	1.72	1.29–2.48	
Having ever used narcotics			
Self-perceived good health	1.28	1.15–1.49	0.12
Not self-perceived good health	1.52	1.27–1.83	
Truancy			
Self-perceived good health	1.25	0.99–1.58	0.04
Not self-perceived good health	1.79	1.41–2.27	
Having ever run away from home			
School well-being	1.18	0.86–1.62	0.14
Not school well-being	1.57	1.28–1.93	

* Only models with *p* values for interaction that are less than or equal to 0.20 are presented.

† RH, relative hazard; CI, confidence interval.

protective factors. The protective effect for hospitalization maintained significance for social class I and good emotional control, and was decreased and marginally significant for home and school well-being and perceived good health. The previously protective association for having friends to confide in was reversed, but the 95 percent confidence interval included 1.

Having divorced parents continued to be associated with a significantly increased risk of mortality and a marginally increased risk of hospitalization. Having ever used narcotics remained significantly associated with hospitalization but was no longer associated with risk of death. Truancy, in these models containing all of the variables, was only marginally associated with risk of hospitalization. Having ever run away from home was

TABLE 4. Relative hazards of hospitalization and mortality according to numbers of social risk factors and protective factors in 8,168 Swedish conscripts aged 18–20 years in 1969–1970

No. of factors in model	No. of conscripts	Hospitalization		Mortality	
		RH*	95% CI*	RH	95% CI
Protective factors					
0	31	1.00		1.00	
1	73	0.57	0.35–0.96	0.59	0.21–1.64
2	175	0.47	0.29–0.76	—†	
3	846	0.42	0.26–0.68	0.45	0.19–1.08
4	2,477	0.33	0.21–0.53	—†	
5	3,167	0.32	0.20–0.51	0.24	0.10–0.59
6	773	0.24	0.15–0.39	—†	
Social risk factors					
0	4,216	1.00		1.00	
1	1,814	1.29	1.17–1.43	2.08	1.30–3.33
2	606	1.45	1.26–1.68	—†	
3	190	2.03	1.61–2.56	4.32	1.69–11.04
4	73	2.70	1.92–3.78	5.74	1.76–18.70
5	29	3.09	1.66–5.76	—†	

* RH, relative hazard; CI, confidence interval.

† Same as above (two categories combined).

TABLE 5. Relative hazards of hospitalization and mortality according to various protective and social risk factors in 8,168 Swedish conscripts aged 18–20 years in 1969–1970: multivariate analyses

Variable	Hospitalization		Mortality	
	RH*	95% CI*	RH	95% CI
Protective factors				
Social class I	0.82	0.75–0.90	0.88	0.52–1.49
Home well-being	0.91	0.81–1.02	0.96	0.54–1.71
School well-being	1.01	0.96–1.06	0.82	0.60–1.12
Having friends to confide in	0.93	0.77–1.12	1.43	0.45–4.57
Self-perceived good health	0.93	0.84–1.04	0.86	0.48–1.52
Good emotional control	0.88	0.80–0.97	0.94	0.56–1.60
Social risk factors				
Contact with police or child welfare authorities at least twice	1.31	1.19–1.44	2.50	1.51–4.12
Having ever run away from home	1.00	0.83–1.21	0.98	0.40–2.42
Truancy once per week or more often	1.17	0.97–1.41	0.84	0.32–2.24
Having divorced parents	1.09	0.96–1.22	2.22	1.32–3.74
Having ever used narcotics	1.15	1.04–1.27	1.36	0.81–2.24
Confounders				
Alcohol consumption of >250 g of 100% ethanol/week	1.39	1.14–1.71	1.36	0.51–3.63
Smoking >20 cigarettes/day	0.93	0.76–1.15	0.62	0.19–2.06

* RH, relative hazard; CI, confidence interval.

no longer associated with risk for either outcome.

The etiologic fraction associated with all social risk factors was 12.1 percent for hos-

pitalization and 31.8 percent for mortality. The total prevented fraction was 65.0 percent for hospitalization and 62.9 percent for mortality.

DISCUSSION

We found support for the existence of protective factors for our two measures of ill health among young men in univariate analyses, but weaker support in multivariate analyses. The estimated effect sizes were higher for mortality than for hospitalization but were more imprecise. There was a decreasing gradient of risk for the number of protective factors and an increasing gradient of risk for the number of social risk factors. There was limited indication of interaction or "buffering" for any of the hypothesized protective factors.

Our data were based on group questionnaires that were answered voluntarily by military conscripts, with a high response rate. The validity of the answers may have been affected by several factors, including social desirability. Considerable underreporting of alcohol consumption has been shown in several studies (9, 19, 20). However, other studies of Swedish military conscripts have found support for sufficient validity of self-reported alcohol consumption (9, 19, 21, 22). Underreporting of other events, such as having had contact with police or juvenile authorities, would lead to a reduction of the relative hazards. It is also possible that some gave a positive answer to questions about their opinion of home or school because this may have seemed more desirable for social or psychological reasons. This could have led to an underestimation of the effect of protective factors. While the correlations between self-reports and clinical ratings of functioning at home and at school were low, the clinical ratings were available for only 73 percent of the cohort, and it is not clear which ratings are more valid.

We do not have data on exposures that could have changed during the follow-up period. A certain proportion of young people may reduce their alcohol consumption after adolescence or stop using narcotics or tobacco (23). It is also possible that some conscripts started using narcotics, drinking alcohol heavily, and smoking more than 20 cigarettes per day after conscription. The resultant misclassification would have led to

error in our estimation of the real relative hazards associated with those factors.

The use of hospitalization as a measure of morbidity could be questioned, since a variety of factors, such as economic barriers, can influence hospitalization. However, there are few economic barriers to inpatient, outpatient, and preventive care in Sweden (24). The similarities between the hospitalization results and the mortality results suggest that nonmorbidity factors were not important and that hospitalization really measured more severe morbidity. It is possible that different patterns of association might be found if severity of hospitalizations or number of hospitalizations were considered. Future analyses should consider specific causes of hospitalization and death.

In conclusion, the possible inaccuracies in exposure and outcome data would generally have led to a reduction of the relative hazards. We do not believe that systematic error seriously distorted our findings.

As in many other studies, we were obliged to analyze data collected for other reasons with current research questions in mind. Are our measures, especially for the protective factors, really adequate, considering current knowledge? From the literature cited above, we believe we have captured to a limited extent some of the important protective factors related to school, home, social support, emotional state, social class, and health status. The measure of having friends to confide in was the one with the weakest protective effect. It is possible that a spouse replaced friends as the most important source of support for a large proportion of the cohort during the 14-year follow-up period. Stronger results might be obtained in a study using measures specifically designed to observe protective effects.

There was only limited support for a buffering effect of protective factors (table 3). The relatively increased relative hazard of hospitalization for conscripts from social class I among those who were known by juvenile authorities and the police may be due to a higher threshold for registration of subjects from social class I, who then on average have more severe problems at reg-

istration. The interaction between having ever used narcotics and protective factors (table 3) may indicate that protective factors can positively influence the life course of young men who have used narcotics.

The risk gradients for the social risk factors and protective factors examined in these analyses may not be developmentally independent. For example, boys with divorced parents may be at greater risk of truancy, drug use, or social isolation. Nevertheless, the substantial lack of confounding and the linear gradient with number of protective factors and social risk factors, respectively, suggest that these factors are acting rather independently. The additive, almost linear change associated with the number of social risk factors is consistent with other studies in young people (8). However, we have seen no other similar study of effects related to number of protective factors.

The results of multivariate models in which all factors were included suggest that there was some collinearity between individual factors. This could mean that within the domains of these social risk factors and protective factors, the various factors are measuring the same underlying situation with some uncorrelated error. Alternatively, it is possible that the cross-sectional nature of the measurement of these factors obscures causal temporal pathways which relate them. For example, in the extreme, truancy, narcotics use, and having ever run away from home could all be sequelae of divorce. As in all epidemiologic analyses where there is only cross-sectional measurement of the risk factors, it is impossible to examine this possibility. Studies which examine the timing of events would be valuable in examining such pathways. Despite the collinearity, the linear relation with both the number of protective factors present and the number of social risk factors present suggests that there are some risk or protective components which are being independently assessed, and that clustering of these factors may characterize strata of particularly increased or decreased risk.

From a public health point of view, the risk gradients suggest that a deletion of one

risk factor in the life of an individual exposed to many risk factors can lead to a general reduction in risk of ill health. Our findings showing a protective gradient suggest that an alternative focus on efforts to increase and strengthen protective factors might also be effective. Such a general health promotion approach should involve community and environmental interventions in addition to those which focus on the individual. The public health effects may be substantial, as indicated by the high prevented fractions.

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