

What about healthy participants? The improvement and deterioration of self-reported health at a 10-year follow-up of the Västerbotten Intervention Programme

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Aim: The Västerbotten Intervention Programme (VIP) addresses cardiovascular disease and diabetes in the middle-aged population of Västerbotten County, Sweden. Self-reported health (SRH) is one of the risk factors for both conditions. The aim of this study was to analyse the development patterns of SRH among the VIP participants.

Methods: Cross-sectional data from 1990 to 2007 were used to analyse the prevalence of poor SRH among 101,396 VIP participants aged 40–60 years. Panel data were used to study the change in SRH among 25,695 persons aged 30–60 years, who participated in the VIP twice within a 10-year interval.

Results: Prevalence of poor SRH fluctuated between 1990 and 2007 in Västerbotten County. There was a temporary decline around 2000, with SRH continuously improving thereafter. The majority of panel participants remained in good SRH; over half of those with poor or fair SRH at baseline reported better SRH at follow-up. SRH declined in 19% of the panel participants, mostly among those who had good SRH at the baseline. The decline was common among both women and men, in all educational, age and marital status groups.

Conclusions: The SRH improvement among those with poor and fair SRH at baseline suggests that VIP has been successful in addressing its target population. However, the deterioration of SRH among 21% of the individuals with good SRH at baseline is of concern. From a public health perspective, it is important for health interventions to address not only the risk group but also those with a healthy profile to prevent the negative development among the seemingly healthy participants.

Keywords: *self-reported health; intervention; Västerbotten; Sweden*

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Self-reported health (SRH) is a valid (1) and reliable (2) predictor of various health outcomes, including mortality (3), development of functional decline and numerous chronic conditions (3–5), particularly cardiovascular disease (CVD) (6–10). By virtue of this, a question on SRH is included in the Västerbotten Intervention Programme (VIP) survey, part of an intervention programme designed to prevent CVD and diabetes among the population in Västerbotten County, Sweden (11).

It has been demonstrated earlier that public health interventions influence individual's SRH. In the North

Karelia study, the SRH ratings have improved significantly more in the intervention than in the reference area and the perceived risk of developing CVD decreased (12). Similarly, the evaluation of the Norsjö intervention programme (13) has shown a reduction in a CVD risk factor load and an improvement in the SRH ratings in the intervention area. Hence, the SRH was suggested as a suitable outcome measure for the evaluation of public health interventions (13).

The evaluation of the VIP is ongoing. The development of the risk factor burden among the VIP participants is being studied through the assessment of the

change in health behaviours (14) and the biometrical measurements such as cholesterol, blood sugar, body mass index, etc. (manuscripts are under development). The aim of this study was to assess the development of the SRH among the VIP participants. The specific objectives were (1) to describe the SRH development over time by using VIP data from 1990 to 2007 and (2) to analyse the patterns of the SRH change in individuals who participated twice in the VIP.

Methods

All Västerbotten residents are invited to participate in the VIP upon becoming 40, 50 or 60 years old, thus having a chance to participate in the VIP once every 10 years. Individuals aged 30 were also invited to participate until 1995. The participation is voluntary and the participation rate is typically about 60%. VIP is conducted by medical personnel at local healthcare centres. First, some biometrical measurements are taken and then the participants fill in a questionnaire concerning their socioeconomic status, SRH, life satisfaction, social support, lifestyle (eating habits, alcohol intake and smoking, physical activity), personal history and family history of CVD and diabetes. Finally, individual counselling by means of a motivational interview based on the results of the medical examination and the questionnaire takes place regarding individual's risk factors and required lifestyle changes. A more detailed description of the VIP survey design can be found elsewhere (11).

The current study was based on the VIP questionnaire data obtained during 1990–2007 and analysed both cross-sectionally and longitudinally (a 10-year panel).

Participants

Cross-sectional sample

The cross-sectional sample included 101,396 individuals who were 40, 50 or 60 years old and participated in the VIP at least once during 1990–2007. The 30-year olds were excluded since data were not available for the entire study period.

Panel sample

The panel analysis included all 25,695 individuals aged 30, 40 or 50 years at the initial survey (1990–1997) who participated in a 10-year follow-up study when they turned 40, 50 or 60 years, respectively, during 2000–2007.

Classification of variables

SRH was determined by response to the question 'How would you describe your health status during the past year: very good, rather good, fair, rather poor or poor?' Individuals who responded 'very good' or 'rather good' were considered to have 'good' SRH. Those who responded 'fair' were considered to have 'fair' SRH and

those who responded 'rather poor' or 'poor' were considered to have 'poor' SRH.

SRH at follow-up was compared with SRH at baseline. Those who reported the same SRH at follow-up as at baseline were categorised as 'remained'; those who reported poorer SRH at follow-up were categorised as 'deteriorated'; and those who reported better SRH at follow-up were categorised as 'improved.'

Sex was categorised as 'man' or 'woman.'

Age was categorised as '30', '40', '50' or '60' years.

Educational level was categorised into 'basic' (elementary and comprehensive compulsory school), 'mid-level' (residential college for adult education or high school) and 'high' (college or higher) educational levels.

Marital status was dichotomised into 'married/cohabiting' with or without children or 'single' with or without children. The latter group also included divorced, separated or widowed individuals.

Marital status at follow-up was compared with marital status at baseline. Respondents were categorised accordingly into 'remained married/cohabiting,' 'remained single,' 'became single' or 'became married/cohabiting.'

Statistical analyses

Prevalence of good, fair and poor SRH was determined over 18 years of observations in the cross-sectional sample ($n=101,396$). Ten-year changes in SRH were evaluated using the panel data ($n=25,695$). Individuals with incomplete information on SRH and/or the demographic variables of interest listed earlier comprised approximately 2% of the samples and were excluded. All tables and figures were adjusted for sex, age, educational level and marital status, unless otherwise stated. The differences between the groups were assessed with the Pearson's chi-square test ($p < 0.05$). Data analyses were performed using STATA Version 10.1 (15).

Ethical considerations

This study was approved by the Regional Research Ethics Board in Umeå, Sweden (Dnr 08-131 M). Individuals provided written consent prior to each survey and health screening.

Results

The results of the cross-sectional and panel data analyses are presented separately in the following sections. The descriptive characteristics of both samples are presented in Table 1.

Cross-sectional data

On average, 71% of individuals reported good SRH, 22% reported fair SRH and 7% reported poor SRH in 1990–2007 (Table 1). Poor SRH was more likely to be reported by women than men, older than younger adults, single

Table 1. Descriptive characteristics of the cross-sectional and panel samples

Sample characteristics	Cross-sectional sample (N = 101,396)	Panel sample baseline (N = 25,695)	Panel sample follow-up (N = 25,695)
Sex			
Men	48.2% (48,917)	46.7% (11,997)	46.7% (11,997)
Women	51.8% (52,479)	53.3% (13,698)	53.3% (13,698)
Age (years)			
30	–	19.4% (4,992)	–
40	33.9% (34,392)	40.4% (10,375)	19.4% (4,992)
50	35.7% (36,205)	40.2% (10,328)	40.4% (10,375)
60	30.4% (30,799)	–	40.2% (10,328)
Marital status			
Married/cohabiting	81.3% (82,440)	84.2% (21,629)	82.4% (21,184)
Single	18.7% (18,956)	15.8% (4,066)	17.6% (4,511)
Education			
High	25.0% (25,359)	21.2% (5,436)	19.9% (5,113)
Mid-level	49.1% (49,766)	54.8% (14,071)	52.9% (13,582)
Basic	25.9% (26,271)	24.1% (6,188)	27.2% (7,000)
Self-reported health			
Good	71.3% (72,256)	78.4% (20,145)	71.2% (18,303)
Fair	21.6% (21,929)	16.8% (4,325)	21.6% (5,549)
Poor	7.1% (7,211)	4.8% (1,225)	7.2% (1,843)

than married individuals and by those in the lowest educational category (Table 2).

There was deterioration in SRH around 2000 for both men and women of all educational levels. The deterioration remained significant after adjustment for age and marital status (Fig. 1). The fall in good SRH was most

Table 2. Distribution of good, fair and poor self-reported health in the cross-sectional sample (N = 101,396) during 1990–2007

Sample characteristics	Self-reported health (%)		
	Good	Fair	Poor
Sex*			
Men	73.5	20.8	5.7
Women	69.2	22.4	8.4
Age* (years)			
40	75.0	18.8	6.2
50	72.7	20.2	7.1
60	65.4	26.5	8.1
Marital status*			
Married/cohabiting	72.7	20.7	6.6
Single	64.9	25.9	9.2
Education*			
High	75.7	17.9	6.5
Mid-level	71.9	21.2	6.9
Basic	65.5	26.4	8.1

*Significant difference between the groups ($p < 0.05$).

pronounced among women with basic education. The recovery was gradual, and in 2007, the prevalence of good SRH was still lower than in 1990 among all groups.

Panel data

At follow-up, 70% of respondents reported the same SRH as at baseline, 19% reported poorer SRH and 11% reported better SRH. The most pronounced deterioration was among persons with good SRH at baseline (Table 3). In general, 21% ($n = 4,236$) of individuals with baseline good SRH had poorer SRH at follow-up (fair or poor). On the other hand, 71% of those with poor SRH at baseline reported better SRH at follow-up. However, this group constituted only 3% (869) of the panel sample.

The deterioration of SRH was significantly ($p < 0.05$) more prevalent in women than in men, in older than in younger adults, among those with basic education than among those with high- or mid-level education at baseline (Table 4).

Over 3,500 persons had changed their marital status during the follow-up period. We, therefore, analysed the association between SRH deterioration and change in marital status. Change in marital status was associated with change of SRH. Interestingly, any change of marital status (becoming married/cohabiting or single/divorced) was associated with a greater deterioration of SRH than remaining in the same marital status at follow-up. As shown in Fig. 2, becoming single was associated with greater deterioration in younger than in older adults, and in women more than men. However,

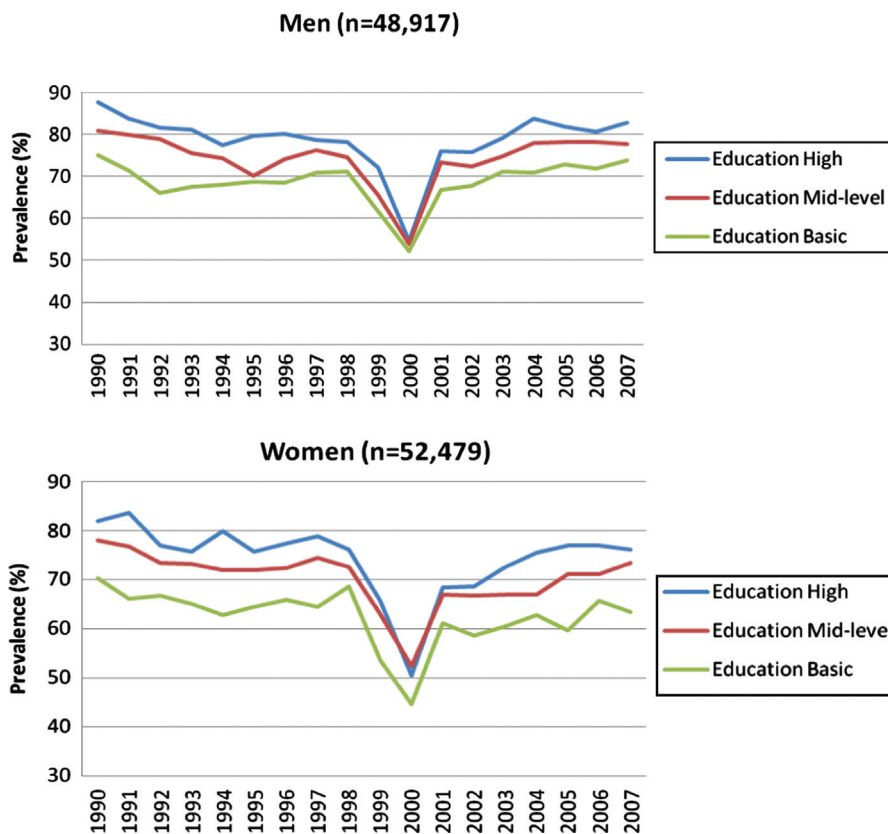


Fig. 1. Self-reported health in men and women by educational level, Västerbotten County, 1990–2007 (the cross-sectional sample N = 101,396). The figure is adjusted for age and marital status.

even a change to being married/cohabiting was associated with greater deterioration of SRH in men who turned 60 at follow-up.

Discussion

SRH of middle-aged men and women fluctuated between 1990 and 2007 in Västerbotten County. There was a temporary deterioration in the overall SRH around 2000, but this trend reversed, and SRH continuously improved thereafter. Panel data showed that the majority of the VIP participants remained in good SRH at follow-up and over half of those with poor or fair SRH at baseline reported better SRH at follow-up. SRH declined in 19%

of participants, mostly among those who had good SRH at baseline. The decline was common among both women and men, in all educational, age and marital status groups.

The overall SRH level observed in the cross-sectional data (71% good, 22% fair and 7% poor) corresponded well with national figures. According to Swedish National Statistical Bureau, 75% of adults aged 18–84 years had good SRH and 6% had poor SRH in Sweden during 1996–2005 (16). Also, in line with previous research (17, 18), women, individuals with basic education, single and older persons had poorer SRH than their comparison groups.

Table 3. Change in the self-reported health at 10-year follow-up, stratified by self-reported health at baseline (the panel sample N = 25,695)*

Self-reported health at baseline	Self-reported health at 10-year follow-up, % (n)		
	Remained	Deteriorated	Improved
Good	79.0% (15,909)	21.0% (4,236)	–
Fair	39.5% (1,706)	13.6% (590)	46.9% (2,029)
Poor	29.1% (356)	–	70.9% (869)

*Significance p < 0.05.

Table 4. Deterioration of self-reported health at 10-year follow-up by sample characteristics (the panel sample $N = 25,695$)

Baseline characteristics	Prevalence of deteriorated self-reported health, % (n)
Sex*	
Men	16.7% (2,002)
Women	20.6% (2,824)
Age* (years)	
30	18.2% (908)
40	17.8% (1,845)
50	20.1% (2,073)
Marital status	
Married/cohabiting	18.7% (4,048)
Single	19.1% (778)
Education*	
High	17.2% (1,064)
Mid-level	18.5% (2,596)
Basic	21.5% (1,166)

*Significant difference between the groups ($p < 0.05$).

The SRH deterioration around 2000 was not unique for Västerbotten County. A similar temporary decline in SRH was observed in Stockholm County (19, 20) and at the national level (21). According to the National Board of Health and Welfare, self-reported prevalence of psychological problems, pain, sleeping problems and long-standing illness also increased during the same period across the whole country (21). An increase in the number of people on long-term sickness pension, disability pension and sickness allowance in Sweden and in Västerbotten County, in particular, were also seen at this time (22–24). However, the causality behind this decline

and the consequent improvement of SRH are yet to be understood. These questions are addressed in detail elsewhere by Blomstedt et al (25).

The panel data showed that the majority of the VIP participants remained in the same SRH at follow-up as at baseline. Moreover, 71% of those with poor SRH and 47% of those with fair SRH at baseline experienced improvement in their SRH. In total, 11% ($n = 2,898$) of the sample ($n = 25,695$) had better SRH at follow-up. This is in line with a previous study of SRH changes in a sub-sample of the VIP population followed between 1986 and 1996 (13).

The panel data also revealed a deterioration of SRH among 17% of men and 21% of women over a 10-year period. The deterioration was common for all respondents, but was more pronounced among the 50 years old and those with the basic educational level at baseline. The change of marital status was also associated with the change in SRH. Becoming single was associated with a decline in SRH among younger persons (30 years old at baseline), and surprisingly, becoming married/cohabiting was also associated with a decline in SRH, mainly in older men (50 years at baseline).

The decline of SRH with age is well-known and has been widely discussed in the literature (26, 27). In line with our observations, other follow-up studies in European populations have also shown a decline of SRH with time (28, 29). A previous 10-year follow-up study of a VIP sub-sample ($n = 174$) found the same deterioration rate. Nineteen percent of those with good SRH at baseline in 1986 reported fair or poor SRH in 1996 (13).

SRH at baseline is usually the strongest predictor of SRH at follow-up (30). Unexpectedly, in our study, the proportion of participants with poorer SRH at follow-up was higher among those who had good rather than fair SRH at baseline (21% vs. 14%). This is a concern and

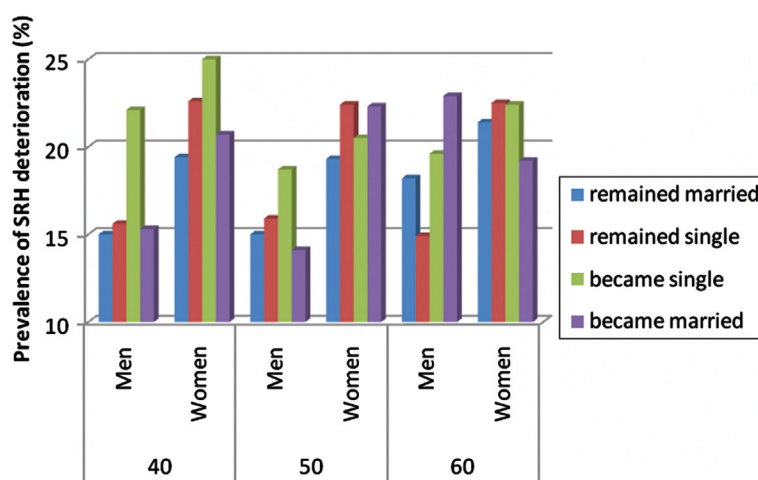


Fig. 2. Deteriorated self-reported health at 10-year follow-up (the panel sample $N = 25,695$). This figure is stratified by follow-up sex, age and change in marital status and is adjusted by educational level at follow-up.

suggests the possibility that those who were healthier at the baseline did not benefit from the intervention programme as much as those who were less healthy.

Poor SRH is a risk factor itself, as well as one that accompanies CVD and diabetic conditions. Being designed to target persons at risk for developing or already having CVD or diabetes, VIP is successful in helping persons to reduce their risk factor burden and improve their SRH (13, 31–34). This is also confirmed in the current study by the improvement in SRH of the majority of those with poor SRH and almost half of those with fair SRH at baseline. Since 2009, the healthcare personnel within VIP have been specifically educated to give particular attention to persons who have poor or fair SRH along with other CVD risk factors. This recommendation is based on findings from Weinehall et al (35) and Emmelin et al (36), which show that poor SRH dramatically increases the risk for acute myocardial infarction and stroke among persons with other CVD risk factors. However, such focus on CVD risk factors and poor SRH may cause an unforeseen and undesired side effect. Those with good SRH at baseline might feel left out and exhibit deterioration in their SRH at follow-up.

These results should not undermine the success of VIP in addressing the target population as illustrated in earlier studies (13, 31–34). Moreover, earlier VIP studies have shown that SRH deterioration among VIP participants is slower than in the reference area (37). Nevertheless, our findings raise the question of how to best design a health intervention to reach the whole population of a defined geographical area.

According to our analysis, 21% of those with good SRH at baseline deteriorate over 10 years. Since poor SRH is a proxy of general health and may reflect preclinical manifestations of disease (38, 39), we need to consider whether it is possible to prevent this negative development among seemingly healthy participants as part of the VIP.

Our analysis also illustrated that other factors (e.g. marital status) influence SRH. This shows that deterioration of SRH is not only associated with lifestyle risk factors or chronic conditions such as CVD or diabetes, even if lifestyle is a strong predictor of a future SRH (28). Therefore, it is important to emphasise that from a public health perspective, VIP should use its influence to target not only those who are clearly at risk for developing CVD or diabetes and have poor SRH but also those with good SRH at baseline. The methods of addressing such participants (e.g. confirmation, encouragement) are not discussed here, but should be considered elsewhere. This argument is supported by a qualitative sub-study of VIP participants done in 1995–1996. That study found a desire among the participants to be seen and confirmed by the VIP personnel even if they did not have any of the

risk factors that VIP was designed to target. Otherwise, they felt disappointed and left out – feelings that increase their risk of moving from a low to high CVD risk factor load (13).

Conclusion

The analysis of the SRH development among the VIP participants during 1990–2007 in Västerbotten County, Sweden, suggested a positive effect of the VIP. The majority of the VIP participants remained in good SRH, and the majority of those with fair or poor SRH at baseline revealed improvement in their SRH at 10-year follow-up. Nevertheless, a fifth of the VIP participants, mostly those with good SRH at baseline, had deterioration in SRH at a 10-year follow-up. These findings raise a question of how to best design a health intervention to reach the whole population of a defined geographical area. From a public health perspective, it is important to support health maintenance and prevention of future disease in those with a healthy profile as well as the high-risk individuals.

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