Trends in Risk Factors for Lifestyle-Related Diseases by Socioeconomic Position in Geneva, Switzerland, 1993–2000: Health Inequalities Persist

Bruna Galobardes, MD, MPH, Michael C. Costanza, PhD, Martine S. Bernstein, MD, Cecile Delhumeau, MPH, and Alfredo Morabia, MD, PhD

Objectives. We report on trends in risk factors for lifestyle-related diseases among socioeconomic position (SEP) groups.

Methods. We continuously surveyed the adult population of Geneva, Switzerland, for 8 years (1993–2000) with independent, cross-sectional surveys of representative samples (4207 men and 3987 women aged 35–74 years). Age-adjusted linear regression slopes estimated annual risk factor trends. Interaction terms were tested for trend differences between SEP groups.

Results. Overall, low-SEP persons had the worst risk factor profiles. Eight-year trends indicate that (1) number of pack-years smoked decreased by half a pack-year among high-SEP female current smokers only; (2) obesity prevalence more than doubled from 5% to 11% among high-SEP men only; (3) systolic and diastolic blood pressures decreased similarly in all SEP groups; (4) unsaturated-to-saturated dietary fat ratio declined in the low-SEP group only; and (5) physical inactivity and current/former cigarette smoking prevalences remained unchanged in all SEP groups.

Conclusions. Smoking, obesity, high blood pressure, and physical inactivity are more prevalent among low-SEP persons. Most socioeconomic risk factor differences remained stable in the 1990s. Thus, social inequalities in chronic disease morbidity and mortality will persist in the next decades. (*Am J Public Health.* 2003;93:1302–1309)

Chronic lifestyle-related diseases, such as cardiovascular diseases and cancer, account for millions of deaths each year and are the leading causes of mortality in industrialized countries.[1] Overall mortality rates have decreased in most industrialized countries,[2] and trends in risk factors explain part of this general decrease.[2–4] However, concurrent social inequalities in mortality rates have increased.[5] The paradox is that social disparities in mortality rates do not seem to be paralleled by increasing gaps at the risk factor level.[6–9]

The latency period between exposure to risk factors and changes in mortality rates can explain part of the apparent discrepancy in their trends, but other methodological issues are also to likely play a role. Most health surveillance systems have long time spans between surveys, limiting their ability to disentangle small risk factor changes from seasonal and sampling fluctuations. A thorough understanding of the relation between risk factors and disease requires long-term commitments to surveillance and monitoring efforts.[10,11]

The objective of this study was to assess whether trends in the main risk factors for lifestyle-related diseases differed by socioeconomic position (SEP) in Geneva, Switzerland, in the last decade. A continuous surveillance system enabled us to report reliable trends in risk factors from 1993 through 2000.

METHODS

The Bus Santé is an ongoing, community-based surveillance project designed to monitor chronic disease risk factors continuously since 1993.[12] The Swiss canton of Geneva has a primarily French-speaking population of about 420 000 persons distributed over 242 km^2 of land. Subjects for this study were selected independently throughout each year from 1993 through 2000 to represent the canton's approximately 90 000 male and 100 000 female noninstitutionalized residents aged 35 to 74 years. Eligible subjects are identified using a standardized procedure using an annual residential list established by the local government. This listing includes all potential eligible participants except persons living illegally in the country. The only information from the list used in the survey (gender, age, and whether the person is of Swiss origin) is highly accurate. Stratified random sampling based on the list by gender within 10-year age strata is proportional to the corresponding population distributions.

Selected subjects are mailed an invitation to participate, and, if they do not respond, up to 7 telephone attempts are made at different times on various days of the week. If telephone contact is unsuccessful, 2 more letters are mailed. Each subject's recruitment lasts a minimum of 2 weeks to a maximum of 2 months, after which the subject is dropped from the recruitment process. Subjects not reached (15% of men and 19% of women) are replaced using the same selection protocol. A previous internal investigation had shown that these subjects no longer resided in the canton, so were not eligible for the study. Subjects who refuse to participate are not replaced. Participating subjects are not eligible in future surveys. Annual participation rates have ranged from 57% to 65%.

Each participant receives several self-administered, standardized questionnaires covering the risk factors for the major lifestyle chronic diseases, sociodemographic characteristics, educational and occupational histories (for up to 3 occupations held at different times), and reproductive history for women. A semiquantitative food frequency questionnaire, developed and tested in the

target population, is also filled out.[13] The questionnaire asks about serving sizes and consumption frequencies of 80 food items organized by food groups during the 4 previous weeks. This information is converted into daily energy, nutrient, and alcohol intakes in the analyses.

During a scheduled appointment at the mobile epidemiology clinic (housed in a special bus), the questionnaires are checked for completeness by trained interviewers, and a physical examination is performed. Weight is measured while lightly dressed without shoes using a medical scale (precision = 0.5 kg), and standing height in sock feet is measured using a medical gauge (precision = 1 cm). Systolic and diastolic blood pressures (SBP and DBP, respectively) are measured in the sitting position using a sphygmomanometer with the cuff placed on the left arm. Total nonfasting cholesterol is measured in plasma from capillary blood taken from the fingertip. The blood analysis equipment is checked each morning and calibrated every 3 months. Quality controls are performed monthly by the Swiss Center for Quality Control in Clinical Chemistry and Hematology.

SEP Groups

SEP was characterized by either occupation or education, separately. Occupations were grouped into 3 categories using the British registrar general's scale: high (I and II, professional and intermediate professions), medium (III-N, skilled nonmanual occupations), and low (III-M, IV, and V, manual or lower occupations). We used current occupation for those working at the time of the survey and the longest occupation ever held for those not working at the time of the survey. Years of formal education were grouped as high (≥13, including the Swiss baccalaureate), medium (9–12), and low (≤ 8).

Risk Factors

Hypertension was defined as SBP of 140 mm Hg or higher or DBP of 90 mm Hg or higher or taking hypertensive medication. Severe hypertension was defined as SBP of 160 mm Hg or higher or DBP of 95 mm Hg or higher or taking hypertensive medication. Body mass index (BMI) was calculated as weight divided by height squared (kg/m^2). Overweight was defined as BMI from 25 up to (but not including) 30, obese as BMI of 30 or more. Hypercholesterolemia was defined as total cholesterol greater than or equal to 6.5 mmol/L (approximately equal to 250 mg/dL) or receiving treatment for high cholesterol. Ever-smokers had smoked at least 100 lifetime cigarettes, current smokers reported smoking during the year before their interview, and former smokers reported having quit for at least 1 year. Physical inactivity (data for 1994–1999 only) was defined as a negative answer to the question "Do you perform, at least weekly, a physical activity that makes you sweat (e.g., walking, running, bicycling)?" Dietary fiber intake and the ratio of unsaturated-to-saturated fat were calculated from the food frequency questionnaire.

Statistical Analyses

All analyses were stratified by gender. The overall, occupational, and educational group-specific mean ages were compared with analyses of variance. Linear regression models applied to the individual participant (unaggregated) data were used to estimate age-adjusted annual risk factor prevalences/means by SEP group. Linear estimates for the prevalence data were reported for consistency; almost all of the risk factor prevalences provided excellent approximations to the technically correct logistic model estimates. The survey year regression slope measured the age-adjusted annual change in risk factor prevalence/mean. The associated *P* value was used to test the null hypothesis that the slope equals 0 (no trend). Occupation and education each were coded as 2 dummy variables (low, medium; high = reference level). *P* values for the overall interaction between the occupation or education dummy variables and survey year were used to test the null hypothesis that the SEP group slopes were equal (no trend interaction effects). Annual risk factor trends in the prevalences of obesity and hypertension (age-adjusted regression lines based on individual participant data), together with quarterly prevalence (age-adjusted aggregated) estimates indicating seasonal and sampling background fluctuations, were depicted graphically.

Overall, 4228 men and 4190 women were surveyed. The relatively small numbers of persons who had never worked for monetary compensation (3 men, 80 women) or who had missing data on current and longest occupation (18 men, 123 women) were excluded from the analyses because they could not be studied in detail, yielding net sample sizes of 4207 men and 3987 women.

RESULTS

The mean ± SD ages in years (men: 52 ± 11; women: 51 ± 10) did not differ appreciably by survey year for either gender (annual data not shown). Similarly, the mean ages by occupation group (high-, medium-, low-group men, respectively: 52 ± 11, 51 ± 11, 52 ± 11; high-, medium-, low-group women, respectively: 49 ± 9, 51 ± 10, 53 ± 11) and by education group (high-, medium-, low-group men, respectively: 51 ± 11, 52 ± 11, 54 ± 10; high-, medium-, low-group women, respectively: 49 ± 10, 52 ± 10, 54 ± 10) remained fairly constant by survey year for both genders (annual data not shown). For both genders, the percentages with low occupations were stable, whereas the percentages with low education tended to decrease (Table 1).

Risk factor trends among SEP groups were similar whether occupation or education was used as the SEP indicator. Because the distributions of occupation were more evenly spread than those of education, the results below apply specifically to the occupational classification.

Prevalence of current smoking among nonparticipants fluctuated around 26.5% in women and 36% in men, with no indication of trends.

Overall 1993 Baseline Risk Factor Levels by SEP (Occupation) Groups

Most risk factors were more adverse among low-SEP men and women at baseline (Table 2). The behavioral risk factor SEP differences were particularly significant among women. The numbers of pack-years

TABLE 1—Distribution (%) of Socioeconomic Position Among Men (N = 4207) and Women (N = 3987) Aged 35–74 years, by Year of Survey: Geneva, Switzerland, 1993–2000[a]

	Men							
	1993 (n = 402)	1994 (n = 367)	1995 (n = 454)	1996 (n = 577)	1997 (n = 604)	1998 (n = 605)	1999 (n = 621)	2000 (n = 577)
Occupation								
High	46.3	51.5	48.5	49.2	49.0	48.6	54.9	44.5
Medium	24.1	21.8	20.5	26.3	21.5	24.6	19.3	26.2
Low	29.6	26.7	31.1	24.4	29.5	26.8	25.8	29.3
Education								
High	37.8	36.1	33.9	34.8	33.8	38.0	38.5	36.6
Medium	52.5	51.7	58.6	58.4	57.5	56.0	55.1	56.7
Low	9.7	12.2	7.5	6.8	8.8	6.0	6.4	6.8
	Women							
	1993 (n = 287)	1994 (n = 373)	1995 (n = 440)	1996 (n = 553)	1997 (n = 621)	1998 (n = 577)	1999 (n = 556)	2000 (n = 580)
Occupation								
High	24.0	31.4	30.0	30.9	32.4	32.6	34.0	32.2
Medium	54.0	55.0	53.9	53.0	52.5	54.1	52.9	50.7
Low	22.0	13.7	16.1	16.1	15.1	13.3	13.1	17.1
Education								
High	34.5	37.0	33.9	35.4	33.8	34.5	38.1	36.4
Medium	52.3	51.5	57.5	57.1	59.6	59.6	55.6	58.3
Low	13.2	11.5	8.6	7.4	6.6	5.9	6.3	5.3

[a]We excluded study participants who never worked for monetary compensation (3 men, 80 women) or with missing data for occupation (18 men, 123 women).

for female current smokers were inversely related to decreasing occupational level ($P<.07$), and there was a lower percentage of former smokers among low-SEP women ($P<.0009$). Physical inactivity was high, especially among low-SEP men (55%) and women (64%). Hypercholesterolemia was equally prevalent in all 3 SEP groups. An exception was the unsaturated-to-saturated dietary fat ratio, which was more favorable for low- versus medium- and high-SEP men (both $P<.0001$), and for low- versus medium-SEP women ($P<.009$).

1993–2000 Annual Trends in Risk Factors by SEP (Occupation) Groups

Behavioral risk factors. Among both men and women, prevalences of current ($P \geq .11$) and former ($P \geq .20$) cigarette smoking and physical inactivity ($P>.08$) remained fairly stable throughout the decade, regardless of SEP group (Table 3). However, the number of pack-years smoked declined significantly among high-SEP women only (slope $P<.04$; interaction $P<.03$). Although low-SEP men and women had the highest ratios of unsaturated-to-saturated dietary fat among all SEP groups in 1993, their dietary fat profiles worsened significantly by the end of the decade (slope $P<.005$; interaction $P \leq .05$).

Biological risk factors. Among men, cholesterol levels were stable, although there were significant increases in the prevalences of hypercholesterolemia treatment for the low- and high-SEP groups ($P<.02$; Table 4). Among women, mean cholesterol increased significantly in all SEP groups ($P<.05$), and the prevalence of hypercholesterolemia treatment increased in the low-SEP group only (slope $P<.0007$; interaction $P=.06$).

Among men in all SEP groups, mean SBP and DBP decreased significantly ($P<.001$), despite hypertension treatment prevalences remaining fairly constant (11%–15%). Among women, mean SBP and DBP also decreased significantly for all SEP groups ($P<.04$), and hypertension treatment prevalence increased only for the medium-SEP group (slope $P<.004$; interaction $P<.03$).

BMI ($P<.0002$), as well as the prevalences of overweight ($P<.02$) and obesity ($P<.03$), increased significantly only for high-SEP men (respective interaction $P=.09$, $P=.72$, $P<.04$). Among women, BMI did not change significantly over the decade, except for overweight in the medium-SEP group ($P=.05$).

Obesity and hypertension. Figure 1 shows examples of age-adjusted annual trends based on individual participant data relative to aggregated quarterly data background variation for obesity and hypertension among SEP groups. Among men, obesity prevalence increased significantly only in the high-SEP group (slope $P<.03$; interaction $P<.04$; Figure 1). Among women, neither the slopes ($P>.20$) nor the apparent differences in obesity trends between the low- versus medium- and high-SEP groups were statistically significant (interaction $P=.53$; Figure 1).

In both genders, hypertension decreased significantly for the high- and medium-SEP groups ($P<.02$), but not for the low-SEP groups ($P \geq .09$; Figure 1). However, neither gender-specific test for interaction by SEP was statistically significant.

DISCUSSION

By the year 2000, low-SEP adult men and women from Geneva, Switzerland, had worsened or at best maintained the worst risk factor profiles they began with in 1993. We summarize the findings and compare these 8-year trends with the available literature reports.

Number of pack-years smoked decreased by half a pack-year among high-SEP women currently smoking. This smoking–SEP interaction is consistent with trends observed in Denmark,[14] Spain,[15] and 5 Italian national health surveys,[16] but was observed only

TABLE 2—Risk Factor Prevalences and Measures for Men and Women, by Occupation Level: Geneva, Switzerland, 1993–2000

	Men					
	Occupation Level			*P*[a]		
	High (n = 2067)	Medium (n = 972)	Low (n = 1168)	High vs Medium	Medium vs Low	High vs Low
Behavioral Risk Factors						
Current smokers, %	24.1	30.5	35.4	.0003	.011	<.0001
No. pack-years	17.6[b]	20.8[b]	21.7[b]	.013	.58	.0007
Former smokers, %	37.4	35.5	34.8	.29	.74	.13
No. pack-years	10.3[b]	11.6[b]	11.7[b]	.16	.90	.10
Physical inactivity, %[c]	37.1	42.2	55.1	.022	<.0001	<.0001
Unsaturated-to-saturated dietary fat ratio	41.8	41.4	44.9	.63	<.0001	<.0001
Dietary fiber (g/day)	14.9[b]	14.4[b]	14.5[b]	.076	.74	.14
Biological Risk Factors						
Cholesterol (mmol/L)	5.71	5.67	5.71	.39	.42	.95
Hypercholesterolemia, %	27.7	28.5	27.0	.65	.47	.70
Cholesterol treatment, %	8.1	8.2	7.7	.88	.68	.74
SBP (mm Hg)	129.2	129.6	131.5	.48	.0085	.0001
DBP (mm Hg)	82.1	82.1	82.6	.93	.24	.14
Moderate hypertension, %[d]	24.4	22.5	27.1	.27	.015	.082
Severe hypertension, %[d]	19.7	23.0	23.5	.037	.75	.0091
Hypertension treatment, %	10.8	14.3	13.1	.0044	.37	.050
BMI (kg/m^2)	25.7	25.6	26.6	.23	<.0001	<.0001
Overweight, %	42.7	43.4	43.6	.71	.95	.64
Obese, %	10.8	10.2	18.2	.70	<.0001	<.0001
	Women					
	Occupation Level			*P*[a]		
	High (n = 1254)	Medium (n = 2116)	Low (n = 617)	High vs Medium	Medium vs Low	High vs Low
Behavioral Risk Factors						
Current smokers, %	23.2	26.0	23.7	.074	.24	.85
No. pack-years	12.0[b]	13.6[b]	16.9[b]	.066	.023	.0007
Former smokers, %	24.1	23.5	17.1	.65	.0010	.0008
No. pack-years	5.9[b]	5.7[b]	5.0[b]	.64	.37	.25
Physical inactivity, %[c]	46.6	48.3	64.3	.38	<.0001	<.0001
Unsaturated-to-saturated dietary fat ratio	46.6	45.9	48.4	.31	.0084	.087
Dietary fiber (g/day)	14.9[b]	14.0[b]	14.0[b]	.0008	.84	.027
Biological Risk Factors						
Cholesterol (mmol/L)	5.60	5.64	5.60	.95	.39	.41
Hypercholesterolemia, %	20.8	21.7	22.4	.55	.70	.43
Cholesterol treatment, %	3.3	4.2	4.9	.23	.46	.12
SBP (mm Hg)	121.5	124.1	125.8	<.0001	.022	<.0001

Continued

among men in northern Italy[7] and in the Minnesota Heart Survey.[8] However, current and former cigarette smoking prevalences remained unchanged.

Obesity prevalence more than doubled from 5% to 11% only among high-SEP men. This was surprising, as overweight and obesity, on the rise in most industrialized societies,[2,8] have increased primarily among low-education groups.[17] However, not all surveys show trend inequalities between social classes.[7]

SBP and DBP decreased similarly in all SEP groups, as seen in other populations,[7] but the trends did not correlate with those of hypertension treatment, suggesting that primary prevention must have played a role.

Unsaturated-to-saturated dietary fat ratio significantly declined in both genders only in the low-SEP group. This is interesting because, compared with medium- and high-SEP persons, low-SEP persons had more favorable baseline dietary fat profiles before losing them, in part, by the end of the decade.

Leisure-time physical inactivity remained stable in all SEP groups. It cannot therefore explain the observed rise in obesity in high-SEP men. However, the indicator available for 6 of the 8 survey years did not capture *overall* sedentariness. We cannot rule out that differential trends in occupational and domestic sources of energy expenditures[18] may have occurred. Of note, physical inactivity has increased in high-SEP Catalan men,[15] and decreased among both men and women of low SEP in the Minnesota Heart Survey,[8] as well as among low-SEP Australian men.[6]

Cholesterol levels did not change among men, but increased significantly among women in all SEP groups. With some exceptions,[7] blood cholesterol levels have tended to decline in all age, gender, and SEP categories in Western populations. This tendency has been noted in the US National Health and Nutrition Examination Survey,[19] the Atherosclerosis Risk in Communities Study,[20] and the Northern Sweden MONICA Study.[21]

Some risk factors with statistically significant adverse trends already were close to

TABLE 2—*Continued*

DBP (mm Hg)	76.7	78.0	79.2	.0004	.0086	<.0001
Moderate hypertension, %[d]	14.1	16.0	17.7	.14	.30	.043
Severe hypertension, %[d]	12.6	16.2	20.1	.0033	.013	<.0001
Hypertension treatment, %	8.1	10.7	13.4	.013	.040	.0002
BMI (kg/m^2)	23.3	23.9	26.1	<.0001	<.0001	<.0001
Overweight, %	19.2	24.2	31.3	.0010	.0003	<.0001
Obese, %	6.4	8.3	19.4	.07	<.0001	<.0001

Note. Pooled data for 1993–2000 (except where noted), age-adjusted. SBP = systolic blood pressure; DBP = diastolic blood pressure ; BMI = body mass index.
[a]F tests.
[b]Geometric means.
[c]Data for 1994–1999 only.
[d] Hypertension is defined as SBP of 140 mm Hg or higher or DBP of 90 mm Hg or higher or taking hypertensive medication. Severe hypertension is defined as SBP of 160 mm Hg or higher or DBP of 95 mm Hg or higher or taking hypertensive medication.

TABLE 3—Trends in Behavioral Risk Factors for Men and Women, by Occupational Level: Geneva, Switzerland, 1993–2000

	Men									
	High Occupation			Medium Occupation			Low Occupation			
Risk Factor	1993	Slope[a]	*P*[a]	1993	Slope[a]	*P*[a]	1993	Slope[a]	*P*[a]	Interaction *P*[b]
Current smokers, %	30.1	–0.50	.27	36.0	–0.23	.72	31.4	0.93	.11	.15
No. pack-years[c]	15.4	–0.001	.98	21.1	–0.01	.64	20.7	0.01	.68	.81
Former smokers, %	35.6	–0.56	.24	31.0	–0.19	.79	32.4	0.06	.92	.72
No. pack-years[c]	15.1	–0.05	.015	16.5	–0.07	.029	15.3	–0.03	.32	.61
Physical inactivity, %[d]	29.7	1.05	.16	35.8	2.03	.086	53.1	0.56	.59	.64
Unsaturated-to-saturated dietary fat ratio	43.6	–0.09	.66	38.1	0.13	.66	47.7	–0.76	.0044	.051
Dietary fiber (g/day)[c]	15.9	0.001	.85	13.2	–0.002	.81	14.4	–0.001	.87	.94

	Women									
	High Occupation			Medium Occupation			Low Occupation			
Risk Factor	1993	Slope[a]	*P*[a]	1993	Slope[a]	*P*[a]	1993	Slope[a]	*P*[a]	Interaction *P*[b]
Current smokers, %	24.2	0.50	.39	31.6	–0.20	.65	11.6	0.45	.56	.56
No. pack-years[c]	20.5	–0.06	.031	11.0	0.03	.10	10.5	0.03	.51	.022
Former smokers, %	20.2	–0.56	.33	22.1	–0.34	.43	11.5	0.98	.20	.23
No. pack-years[c]	8.2	–0.06	.083	4.0	0.03	.26	9.3	–0.02	.77	.12
Physical inactivity, %[d]	35.0	0.61	.53	45.0	–0.41	.59	37.9	2.45	.097	.21
Unsaturated-to-saturated dietary fat ratio	44.7	0.23	.41	46.8	–0.09	.68	54.4	–1.12	.0032	.014
Dietary fiber (g/day)[c]	16.2	–0.001	.87	13.6	0.012	.028	14.1	–0.001	.94	.27

[a]Slope = annual rate of linear change in risk factor; F-tests of H_0: slope = 0.
[b]F test of H_0: equality of slopes across socioeconomic status groups.
[c]Log-scale for slope (geometric means for 1993 shown).
[d]1994–1999 only; 1994 value shown.

or outside recommended levels in 1993. For example, the 1993 cholesterol means were above 5.2 mmol/L (approximately equal to 200 mg/dL) among both men and women in all SEP groups. Significant cholesterol increases occurred only among women in all SEP groups, with annual slopes ranging from .02 to .05 mmol/L (approximately equal to 1–2 mg/dL). By 2000 the mean cholesterol values for all groups were greater than or equal to 5.76 mmol/L (approximately equal to 222 mg/dL). Based on the Framingham coronary heart disease risk factor prediction chart,[22] this corresponds, for example, to an absolute excess of 1% (from 9% to 10%) in 10-year coronary heart disease risk for a 56- to 60-year-old female smoker. Thus, although not large, the risk increase is not negligible at a population level. Similarly, for men in all SEP groups and for low-SEP women, mean BMI levels in 2000 exceeded 25, the lower limit of overweight.

Our results indicate that trends in chronic disease risk factors are consistent with increasing social inequalities in mortality rates. However, there are methodological limitations that hamper the possibility of fully relating these trends. Changes at the risk factor level are likely to be of smaller magnitude and thus more difficult to measure than mortality rate changes, which result from the contributing effects of all risk factors combined. In addition, neither occupation nor education alone completely characterizes a person's true SEP.[23–25] Thus, using a single measure of SEP most likely underestimates the burden of SEP disparities. Finally, seasonal and sampling variations are 2 sources of background "noise" that may blur trend signals, especially when trend estimates are based on a small number of time points.

In conclusion, the continuous and detailed monitoring of risk factors by the surveillance system established in Geneva enabled us to identify trends and interactions with SEP despite background fluctuations. These trends reported are probably conservative estimates of the future burdens of lifestyle-related diseases, whose impacts in the present decade and beyond (absent pub-

TABLE 4—Trends in Biological Risk Factors for Men and Women, by Occupational Level[a]: Geneva, Switzerland, 1993–2000

	Men									
	High Occupation			Medium Occupation			Low Occupation			
Risk Factor	1993	Slope[a]	*P*[a]	1993	Slope[a]	*P*[a]	1993	Slope[a]	*P*[a]	Interaction *P*[b]
Cholesterol (mmol/L)	5.67	0.01	.24	5.53	0.002	.89	5.41	0.01	.45	.86
Hypercholesterolemia, %	22.3	0.71	.13	21.9	0.64	.33	14.6	1.01	.091	.90
Cholesterol treatment, %	6.0	0.74	.0069	4.3	0.28	.47	5.2	0.89	.013	.49
SBP (mm Hg)	130.5	−0.86	<.0001	129.3	−0.88	.0002	133.5	−0.91	<.0001	.98
DBP (mm Hg)	82.6	−0.36	.0005	82.9	−0.56	.0002	83.4	−0.45	.0009	.53
Moderate hypertension, %[c]	27.0	−1.09	.014	17.2	−1.61	.011	25.5	−0.50	.38	.43
Severe hypertension, %[c]	24.4	−0.80	.049	23.3	−0.69	.24	27.1	−0.32	.54	.77
Hypertension treatment, %	13.0	0.18	.58	15.0	−0.37	.42	11.1	0.27	.53	.54
BMI (kg/m^2)	24.6	0.15	.0001	24.8	0.02	.66	26.0	0.04	.44	.090
Overweight, %	29.3	1.28	.014	30.4	1.38	.062	38.1	0.68	.31	.72
Obese, %	4.9	0.79	.023	10.7	−0.72	.15	14.4	−0.003	.995	.039
	Women									
	High Occupation			Medium Occupation			Low Occupation			
Risk Factor	1993	Slope[a]	*P*[a]	1993	Slope[a]	*P*[a]	1993	Slope[a]	*P*[a]	Interaction *P*[b]
Cholesterol (mmol/L)	5.49	0.04	.0034	5.60	0.02	.047	5.42	0.05	.0027	.19
Hypercholesterolemia, %	21.2	0.60	.28	21.6	0.71	.085	15.8	1.97	.0077	.27
Cholesterol treatment, %	0.6	0.30	.27	3.2	0.29	.14	2.2	1.23	.0006	.061
SBP (mm Hg)	125.8	−0.93	<.0001	125.5	−0.88	<.0001	126.9	−0.63	.038	.71
DBP (mm Hg)	78.2	−0.48	.0005	78.7	-0.55	<.0001	82.6	−0.63	.0008	.81
Moderate hypertension, %[c]	13.9	−0.84	.093	19.1	−1.41	.0002	13.1	−0.61	.37	.47
Severe hypertension, %[c]	16.5	−0.62	.19	13.4	0.33	.35	28.4	−0.73	.26	.17
Hypertension treatment, %	6.6	−0.10	.79	5.2	0.86	.0038	14.2	−0.58	.28	.027
BMI (kg/m^2)	22.6	−0.03	.65	23.3	0.03	.47	24.6	0.13	.10	.29
Overweight, %	15.9	−0.23	.70	17.4	0.87	.052	23.3	1.01	.21	.28
Obese, %	2.8	−0.02	.97	8.5	0.03	.93	14.4	0.69	.21	.53

Note. SBP = systolic blood pressure; DBP = diastolic blood pressure ; BMI = body mass index.

[a]Occupational level based on British registrar general's scale.

[b]Slope = annual rate of linear change in risk factor; F tests of H_0: slope = 0.

[c]F test of H_0: equality of slopes across SEP groups.

[d]Hypertension is defined as SBP of 140 mm Hg or higher or DBP of 90 mm Hg or higher or taking hypertensive medication. Severe hypertension is defined as SBP of 160 mm Hg or higher or DBP of 95 mm Hg or higher or taking hypertensive medication.

lic health interventions) are likely to remain worst among low-SEP persons. ■

About the Authors

At the time of the study, all of the authors were with the Division of Clinical Epidemiology, Geneva University Hospitals, Switzerland.

Requests for reprints should be sent to Alfredo Morabia, MD, PhD, Division of Clinical Epidemiology, Geneva University Hospitals, 25, rue Micheli-du-Crest, CH-1211 Geneva 14, Switzerland (e-mail: alfredo.morabia@hcuge.ch).

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Contributors

B. Galobardes, M.C. Costanza, M.S. Bernstein, and A. Morabia conceived the present study, supervised and interpreted the statistical analyses, and wrote the article. C. Delhumeau contributed to the data analysis and drafting of the article. A. Morabia designed and directed the Bus Santé, and M.S. Bernstein was responsible for its data collection.

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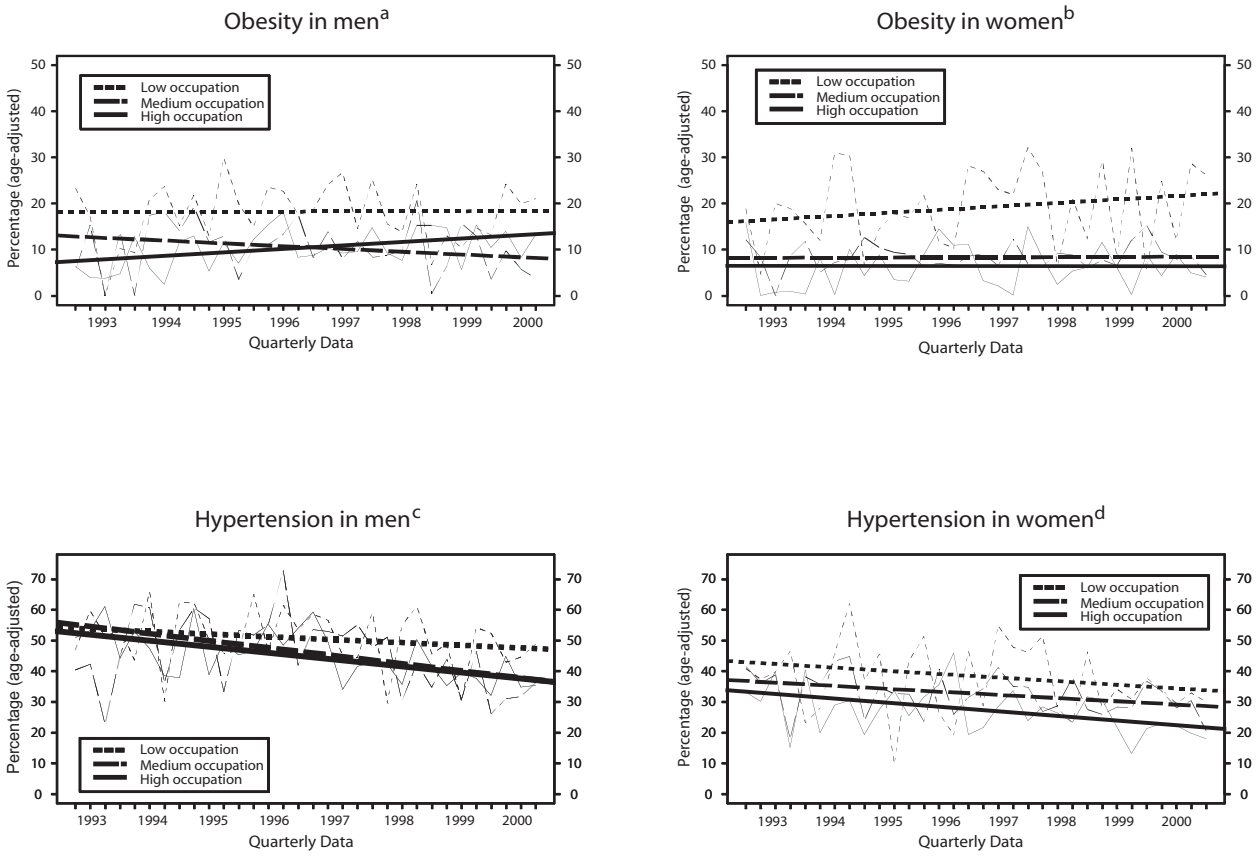
Human Participant Protection

All study subjects provided informed, written consent to participate in the study, which was approved by a University of Geneva ethics committee.



Note. Obesity is defined as body mass index of 30 or more. Hypertension is defined as systolic blood pressure or 140 mm Hg or higher or diastolic blood pressure of 90 mm Hg or higher or treatment.

[a]Obesity in men. Low: slope = –0.003, $P = .995$; medium: slope = –0.72, $P = .15$; high: slope = 0.79, $P = .023$; interaction $P = .039$

[b]Obesity in women. Low: slope = 0.69, $P = .21$; medium: slope = 0.03, $P = .93$; high: slope = –0.02, $P = .97$; interaction $P = .53$

[c]Hypertension in men. Low: slope = –0.82, $P = .19$; medium: slope = –2.30, $P = .0009$; high: slope = –1.89, $P = .0001$; interaction $P = .24$

[d]Hypertension in women. Low: slope = –1.34, $P = .091$; medium: slope = –1.08, $P = .015$; high: slope = –1.46, $P = .013$; interaction $P = .87$

FIGURE 1—Age-adjusted annual trends in obesity and hypertension prevalence amidst seasonal and sampling background fluctuations, by occupation groups: Geneva, Switzerland, 1993–2000.[a]

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