Trends in Risk Factors for Lifestyle-Related Diseases in Geneva, Switzerland (1993-2004) by Socioeconomic Position Groups: Final Report

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Contents

Introduction

Purpose of Our Study

Do you know what the leading cause of death is in industrialized countries today? In a world of high living standands, lifestyle-related chronic diseases cause about 5.5 million deaths each year [1]. Although mortality rates from some chronic diseases like stroke and colon cancer have decreased in the past years, mortality rates from other conditions like lung cancer and diabetes are increasing [1]. With an overall declining mortality rates in most developed countries, mortality rates caused by lifestyle-related chronic disease varies in people with different socioeconomic backgrounds [2]. In order to evaluate the impact of biological and behavioral risk factors affecting lifestyle-related chronic diseases, we want to look at the trends in risk factors for lifestyle-related diseases by socioeconomic position.

Introduction of Target Sponsor

Our target sponsor is Populational Epidemiology Unit (PEU) of the University Hospitals of Geneva, Switzerland. This project would be particularly appealing to them because their main tasks are research and education on cancer and cardiovascular diseases (chronic diseases). The PEU monitors risk factors among their population, studies the impact of environmental and genetic risk factors, as well as trains students and professionals [3]. The PEU is working on multiple projects currently with national and international collaboration: conducting interventional studies on chronic diseases, constructing a population database for research purposes, and promoting health among the population [3]. The PEU's employees include medical staff like physicians and nurses, scientists and trainees, and administrative personnel and our results will be relevant to both clinicians and researchers [3].

Relevance to Sponsor

The data used for this project were collected as part of Geneva Health Bus Project, one of PEU's studies. Levels of risk factors in the Geneva population were measured from 1993 to 2004 to monitor the change of risk factor levels ove rtime as well as provide information for chronic diseases developed after exposure to risk factors [3]. Upon finishing this project, the PEU could compare our results using data from three additional years to previous findings to see if they are consistent. They will be able to observe and quantify changes in people's lifestyles and their effects on people's health. Medical professionals of the PEU could incorporate our findings into the prevention and treatment of chronic diseases. Researchers affiliated with PEU will have a better understanding of general trends of the risk factors they are or will be studying.

Summary of Previous Findings

Statistical analyses have been done previously on data collected from 1993 to 2000. It was found that the levels of most risk factors (smoking, obesity, high blood pressure and physical inactivity) are highest in low socioeconomic groups compared with medium and high socioeconomic groups [2]. The disparity remained relatively stable from 1993-2000 [2]. Findings from our analysis indicate that most risk factors are still more adverse in low socioeconomic groups. In addition, we also found a significant increase in physical inactivity and lack of decrease in systolic blood pressure (where it had decreased in the previous 1993-2000 study).

Methodology

Subjects For the Study

The subjects were selected independtly throughout each year from 1993 to 2004 aged 35 to 74 years from an annual residential list established by the local government, except persons living illegally in the country. Subjects that were selected but could not be reached would be replaced using the same selection protocol.

Collecting Data

Stratified random sampling on the list by gender within 10-year strata was proportional to the corresponding population distribution. Subjects having missing data were excluded from analyses. Participants received several standardized questionnaires covering the risk factors for major lifestyle-related chronic diseases, sociodemographic characteristics, and educational and occupational histories. A semiquantitative food frequency questionnaire asked about serving sizes and consumption frequencies of 80 food items during the 4 previous weeks.

During a scheduled appointment at the mobile epidemiology clinic ("Health Bus"), a physical examination was performed. Weight and height were measured without shoes using a medical gauge. Systolic (SBP) and diastolic (DBP) blood preesures were measured in the sitting position using a sohygmomanometer with the cuff placed on the left arm. Total nonfasting cholesterol was measured in plasma from capillary blood taken from the fingertip.

Variables

SEP: Used to divide subjects into different socioeconomic position groups and compare the trend of each risk factor among the groups. SEP groups were charaterized by occupation and education which were divided into 3 categories: high, medium and low (for occupation, based on the British registrar general's scale, and for education, based on years of formal education). Occupation groups were used to characterize SEP for the statistical analyses.
Risk Factors: Used as the dependent variables in regression models to obtain their trend.
BMI was calculated as weight divided by height squared.
Overweight and obese were defined as BMI from 25 up to 30 and 30 or more, respectively.
Hypercholesterolemia was defined as total cholesterol greater than or equal to 605 mmol/L.
Hypertension was defined as SBP of 140 mm Hg or higher or DBP of 90 mm Hg or higher or taking hypertensive medication.
Dietary fiber was calulated as the grams taken per day.
Physical inactivity was obtained by combining the physical inactivity data collected in the surveys from the years 1994-1996 and the sedentarity data collected from years 1997-2004.
Current smokers were people who were smoking during the year before interviews, and former smokers were people who had quit smoking for at least 1 year.
Severe hypertension was defined as SBP of 160 mm Hg or higher or DBP of 95 mm Hg or higher or taking hypertensive medication.

Statistical Analyses

All analyses were stratified by gender. The overall, occupational, and educational group-specific mean ages were compared with analyses of variance (ANOVA) to see whether age adjustment was necessary for the further trends analyses. Descriptive statistics and pairwise t-tests were used to measure and compare the prevalences of risk factors among different occupation groups.

Linear regession models of the age-adjusted prevalence of risk factors versus survey years were applied to estimate the age-adjusted annual risk factor prevalences/means of the risk factors among different occupation groups. For each risk factor, two regression models were built: 1) to get the trends of the risk factor in each occupation group, and 2) to test if the trends in the different occupation groups were the same. Occupation levels were coded into 3 binary ("dummy") variables (coded 1 if a person fell into a specific level, 0 if not). The survey year regression slope in the first models measured the age-adjusted annual change in risk factor prevalence/mean for each occupation group. The corresponding p-values were used to test the hypothesis that there was no trend. The p-value for the overall interaction between occupation levels and survey year in the second model was used to test the hypothesis that there was no trend difference among occupation groups.

Results

The mean ± SD of ages in years (men: 52 ± 11, women: 51 ± 11) did not differ appreciably over the survey years for either gender in a practical sense (analysis of variance results and annual data not shown). Similarly congruent results were obtained for the mean ages by occupation group (high, medium, and low men, respectively: 52 ± 11, 51 ± 11, 52 ± 11; high, medium, and low women, respectively: 49 ± 10, 51 ± 11, 53 ± 11) and by education group (high, medium, and low men, respectively: 50 ± 11, 52 ± 11, 55 ± 10; high, medium, and low women, respectively: 49 ± 10, 52 ± 11, 54 ± 11) over the survey years. However, the regression analyses further on in the report were age-adjusted to be extra cautious.

For both genders, the percentages of people with low occupations were stable throughout the years, whereas the percentages with low education tended to decrease throughout the years. Most men fell into the high occupation and medium education categories, whereas most women fell into the medium occupation and education categories (see Table 1 below).

Table 1: Distribution (%) of Socioeconomic Position Among Men (n=6,688) and Women (n=6,647) Aged 35-74 years, by Year of Survey: Geneva, Switzerland, 1993-2004

Men												
Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Occupation												
High	45.9	52.9	48.5	49.2	49.0	48.6	54.9	44.5	44.3	47.5	52.7	50.1
Medium	24.2	21.3	20.5	26.3	21.5	24.6	19.3	26.2	25.2	21.6	19.2	22.7
Low	29.9	25.8	31.1	24.4	29.5	26.8	25.8	29.3	30.4	30.8	28.1	27.2
Education												
High	37.6	35.4	33.8	34.8	33.9	37.9	38.4	36.6	36.0	33.1	40.8	41.6
Medium	51.9	54.5	58.5	58.4	57.3	56.2	55.1	56.7	58.2	60.0	54.5	52.1
Low	10.5	10.2	7.7	6.7	8.7	5.9	6.5	6.8	5.8	6.9	4.8	6.3
Women												
Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Occupation												
High	24.5	31.5	30.0	30.9	32.4	32.6	34.0	32.2	30.9	32.3	32.4	37.4
Medium	55.0	54.2	53.9	53.0	52.5	54.4	53.1	50.7	55.9	53.6	52.1	53.0
Low	20.4	14.3	16.1	16.1	15.1	13.0	12.9	17.1	13.2	14.1	15.5	9.6
Education												
High	33.5	35.1	32.6	35.3	34.3	33.8	37.2	35.4	38.9	40.3	41.2	40.6
Medium	54.7	54.1	58.5	56.2	59.2	60.2	56.6	58.6	55.0	53.8	53.2	52.9
Low	11.7	10.8	8.9	8.6	6.5	6.0	6.2	5.9	6.1	6.0	5.7	6.5

Overall Risk Factor Levels by SEP (Occupation) Groups (Table B.1)

Most risk factors were more adverse among low-SEP men and women overall. For men, the prevalence of current smokers and number of pack-years were significantly different among SEP groups (P-values <0.009 and 0.01, respectively, excluding medium vs. low SEP for pack-years). Analagous results were obtained for women except the difference in current smokers was not significant among high vs. low SEP, and former smoking prevalence was significantly different among medium and high vs. low SEP. Physical inactivity was high among all groups in both genders and differed significantly across SEP groups (all P's < 0.014). Unsaturated-to-saturated dietary fat ratio was more favorable for low-SEP in both genders, and the ratios differed significantly for low vs. medium and high SEP in both genders (all P's < 0.0007). All biological risk factors were significantly different across SEP groups for women, and most were for men as well with the exception of cholesterol, hypercholesterolemia and cholesterol treatment (all P's > 0.10) and a few others were not significantly different between high and medium-SEP men.

1993–2004 Annual Trends in Risk Factors by SEP (Occupation) Groups

Behavioral Risk Factors (Table B.2)

For both men and women in all SEP groups, prevalences of current smoking remained fairly stable throughout the survey years (all slope P's > 0.22, results not shown). The prevalence of former smoking decreased among high-SEP men (slope P =0.04, interaction P=0.05). The number of pack-years (=number of 20-cigarette packs $\times$ number of years smoked) among current smokers increased significantly among medium-SEP women only (slope P=0.03), and the number of pack-years among former smokers decreased significantly for both genders in the medium SEP group (slope P's < 0.02). For men, the ratio of unsaturated to saturated dietary fat consumed was highest within the low SEP group, but their dietary fat ratio was the only one that declined significantly throughout the years (slope P « .0001), and analogously for medium-SEP women (slope P=0.05). For both genders, physical inactivity increased significantly regardless of SEP group (slope P's « .0001) except in low-SEP men (p=0.26, interaction P $<$ .0001).

Biological Risk Factors (Table B.3)

In all SEP groups, prevalences of high cholesterol (men), high systolic blood pressure (both genders), severe hypertension (both genders), hypertension treatment (women) and obesity (women) remained stable throughout the survey years (all slope P's > 0.05). There were significant increases in cholesterol among women in all SEP groups (all slope P's < 0.06), and significant increases in cholesterol treatment among all SEP groups for men (all slope P's $<$ .0003) and among medium and low-SEP groups for women (all slope P's $<$ .0008, interaction P=0.02). Diastolic blood pressure (DBP) decreased significantly among medium and high-SEP men (slope P's <.0001 and 0.02, respectively), and for all women (all slope P's $<$ .0001, interaction P=0.08). Moderate hypertension also decreased significantly among medium and low-SEP men (slope P's=0.02 and 0.0002, respectively) and among all women (slope P's < 0.04). BMI increased significantly among high and medium-SEP men and among just low-SEP women (all slope P's < 0.01, women interaction P=0.009), although all mean BMI's for the sample were relatively high. Obesity increased significantly only for high-SEP men (slope P=0.03).

Overweight and Hypercholesterolemia (Figures B.1 - B.4)

The annual trends for overweight and hypercholesterolemia prevalence were plotted for men (figures B.1 - B.2) and women (figures B.3 - B.4), respectively. The prevalence of overweight in men increased for all SEP groups but only significantly for the high and medium-SEP groups (slope P's=0.002 and 0.03, respectively) even though low-SEP men had the highest overweight prevalence consistently throughout the survey period. In women, the increase in prevalence was only significant for the low and medium-SEP groups (slope P's=0.04 and 0.008, respectively, interaction P=0.008). The low-SEP women maintained a much higher overweight

prevalence than the other groups throughout the years. For hypercholesterolemia in men, the annual trends were quite similar between all the SEP groups (most likely due to low sample sizes within these groups). The increases in prevalence were fairly significant among all groups (slope P's all <0.06). For women, the low-SEP group had the lowest hypercholesterolemia prevalence in 1993 but the prevalence increased most significantly throughout the time period (slope P=0.0002). The medium and high-SEP trend lines were almost identical but the overall increase was only significant in medium-SEP women (slope P=0.02).

Discussion

Here we summarize the findings, compare the 12-year trends with the previous 8-year PEU study and interpret the differences, and address some of the limitations of both studies.

From 1993-2004, low-SEP adult men and women from Geneva, Switzerland had worsened or at best maintained the worst risk factors profiles they started with in 1993, as in the previous 1993-2000 PEU study.

The prevalence of current smokers remained the same as in the 1993-2000 study, but some differences were that former smokers decreased among high-SEP men, the number of currently-smoked pack-years increased among medium-SEP women and the number of pack-years for former smokers also decreased in medium-SEP men and women as opposed to just high SEP women.

A noteworthy difference in the results of this study compared to the 1993-2000 study was with physical inactivity among both men and women in all SEP groups - the trend was a largely significant increase throughout the 12-year period. This may have been due to the fact that we used (when possible) a more comprehensively-measured physical inactivity variable ("sedentarity") from 1997-2004 (instead of just the single physical inactivity variable from 1994-1996) that the previous study did not use. Nonetheless, the results indicate that physical inactivity is quickly becoming a common lifestyle, and it could possibly explain the increase in prevalences of other risk factors for diseases such as overweight/obesity.

BMI, overweight, and obesity prevalences remained mostly the same as in the previous study (although BMI had more significant increases in medium and high-SEP men). It is still surprising that obesity only increased significantly among higher SEP men since obesity has been on the rise primarily among low-SEP groups in industrialized societies. However, the prevalence of the overweight risk factor increased significantly among both the low and medium-SEP groups in this study. Due to the limitation that the overweight and obesity variables were measured from just BMI in this study (which is known to not be the best indicator of whether or not someone is overweight), it is possible that the results might not have been as accurate as they would have been if another weight benchmark was used such as body fat percentage.

The unsaturated to saturated dietary fat ratio results in this study did not change from the previous study; the result that the low-SEP groups had the most favorable dietary fat profiles but lost them most significantly over the decade still remains surprising. This could perhaps be due to what the food industry is offering to the public for consumption. It would be valuable for food companies to assess whether they are doing enough to combat the rising trends in overweight/obesity.

SBP remained constant throughout the years (which was different than in the previous study where it decreased), and DBP and moderate hypertension decreased similarly among both men and women in all SEP groups. Hypertension treatment increased for men and remained the same for women (which were different results than the previous study where it either decreased slightly or remained stable), which could indicate that it played a role in the DBP and moderate hypertension decreases.

All results considered, it is still important to mention the limitations in this (and the previous) study. A large portion of the variables in this study were discrete or binary, but we wanted to predict their prevalence trends. Although logistic regression would have been better suited (in terms of required

assumptions) for analyzing the odds ratios (OR) for those variables, the corresponding OR results are less interpretable than actual prevalence results.[4] Other potential limiations in this study include the survey data collection method, which can be prone to bias (especially if the data is self-reported), and the way SEP was characterized (just 3 levels might have been too general, and more than just occupation and education levels can factor into one's true SEP).

In conclusion, the risk factors with adverse trends in the previous study remained adverse in this extension to that study, with the addition of the significant increase in physical inactivity and the lack of decrease in SBP. It was important that we continued monitoring the risk factor trends for lifestyle-related diseases for the additional 4 years because the PEU now has this extra information on trend changes that they might not have had before their next survey/study. The continuous monitoring of risk factors by the surveillance system established in Geneva enabled us to identify trends and interactions with SEP. The impacts of lifestyle-related diseases in the upcoming decades are likely to remain worst among low-SEP groups, and the reported trends from this study are most likely conservative estimates of those impacts.

Appendix A

Glossary

PEU: Populational Epidemiology Unit of the University Hospitals of Geneva, Switzerland.
SEP: Socioeconomic position groups, by either occupation or education. Based on the British registrar general's scale, professional and intermediate professions, skilled nonmanual occupations, and manual or lower occupations are assigned high, medium, and low occupational groups. Samples with $\geq$ 13, 9–12, and $\leq$ 8 years of education are categorized into high, medium, and low educational groups.
SBP: Systolic blood pressure, the maximum pressure during each heartbeat. It is measured as the first sounds when medical staff were measuring blood pressure.
DBP: Diastolic blood pressure, the minimum pressure during each heartbeat. It is measured as the last sounds when medical staff were measuring blood pressure.
OR: Odds ratio, the ratio of the odds of an event occurring in one group to the odds of it occurring in another group. If the probabilities of the event in each of the groups are p_1 (first group) and p_2 (second group), then the odds ratio is $\frac{p_1/(1-p_1)}{p_2/(1-p_2)}$.
ANOVA: Analysis of variance, statistical tests that analyze differences of means and variations among different components. It is particularly useful for comparing data with two or more components, e.g. our data has three educational and occupational groups, respectively.
Stratification: Dividing the population into subgroups. In our project, the samples were stratified into females and males.
Linear Regression: A mathematical model that looks for a linear relationship between a dependent and an independent variable from a number of data points. There could be one (Simple Linear Regression) or more independent variables (Mutiple Linear Regression). Interactions of independent variables could also be included in the model.
P-values: The probability of obtaining a test statistic as or more extreme than the a given value assuming a null hypothesis is true. We reject the null if p-values are smaller than a certain threshold value (0.05 or 0.01 are usually used) and fail to reject the null otherwise.

Appendix B

Tables and Figures

Table B.1: Risk Factor Prevalences and Measures for Men and Women, by Occupation Level: Geneva, Switzerland, 1993-2004

	Men					
	Occupation Level			P		
	High	Medium	Low	H vs. M	M vs. L	H vs. L
Behavioral Risk Factors						
Current smokers, %	23.9	30.3	34.4	<.0001	0.009	<.0001
No. pack-years	25.8	28.1	29.7	0.01	0.25	0.002
Former smokers, %	36.1	33.7	35.0	0.13	0.49	0.41
No. pack-years	18.6	18.6	19.6	0.92	0.36	0.32
Physical inactivity, %	57.3	61.3	73.5	0.0003	<.0001	<.0001
Unsaturated/saturated fat	41.4	41.5	43.8	0.886	0.0007	<.0001
Dietary fiber(g/day)	16.9	16.3	16.8	0.04	0.84	0.10
Biological Risk Factors						
Cholesterol(mmol/L)	5.69	5.67	5.74	0.70	0.10	0.12
Hypercholesterolemia, %	27.8	28.1	27.3	0.80	0.65	0.79
Cholesterol treatment, %	9.73	9.76	9.34	0.98	0.69	0.65
SBP (mm Hg)	130.2	130.1	133.2	0.69	<.0001	<.0001
DBP (mm Hg)	81.8	82.1	82.8	0.35	0.06	0.001
Moderate hypertension, %	21.6	20.4	23.9	0.31	0.02	0.08
Severe hypertension, %	20.2	22.6	25.2	0.06	0.08	<.0001
Hypertension treatment, %	12.0	14.1	14.9	0.05	0.48	0.003
BMI (kg/m^2)	25.8	25.9	26.7	0.61	<.0001	<.0001
Overweight, %	53.9	55.3	64.4	0.33	<.0001	<.0001
Obese, %	11.2	12.0	18.4	0.50	<.0001	<.0001
	Women					
	Occupation Level			P		
	High	Medium	Low	H vs. M	M vs. L	H vs. L
Behavioral Risk Factors						
Current smokers, %	23.2	25.7	22.6	0.043	0.048	0.679
No. pack-years	18.2	20.1	23.8	0.04	0.001	<.0001
Former smokers, %	27.7	23.8	16.2	0.43	<.0001	<.0001
No. pack-years	10.2	11.0	11.3	0.20	0.82	0.32
Physical inactivity, %	57.3	61.3	57.0	0.014	<.0001	<.0001
Unsaturated/saturated fat	45.7	45.3	48.7	0.51	<.0001	0.0003
Dietary fiber(g/day)	16.4	16.1	16.4	0.12	0.23	0.96
Biological Risk Factors						
Cholesterol(mmol/L)	5.57	5.63	5.70	0.06	0.002	0.06
Hypercholesterolemia, %	19.4	22.0	25.8	0.03	0.01	<.0001
Cholesterol treatment, %	3.20	5.23	6.48	0.0007	0.10	<.0001
SBP (mm Hg)	119.8	123.3	127.1	<.0001	<.0001	<.0001
DBP (mm Hg)	75.9	77.2	79.0	<.0001	<.0001	<.0001
Moderate hypertension, %	12.2	13.8	17.3	0.10	0.005	0.0002
Severe hypertension, %	10.4	15.9	21.2	<.0001	<.0001	<.0001
Hypertension treatment, %	7.1	11.2	15.1	<.0001	0.0004	<.0001
BMI (kg/m^2)	23.3	24.1	26.4	<.0001	<.0001	<.0001
Overweight, %	25.1	33.1	53.6	<.0001	<.0001	<.0001
Obese, %	6.5	8.8	20.0	0.006	<.0001	<.0001

Table B.2: Trends in Selected Behavioral Risk Factors for Men and Women, by Occupation Level: Geneva, Switzerland, 1993-2004

Men										
	High Occupation			Medium Occupation			Low Occupation			
Risk Factor	1993	Slope	P	1993	Slope	P	1993	Slope	P	Interaction P
Former smokers, %	34.4	-0.51	0.04	20.3	-0.23	0.536	30.9	0.31	0.34	0.05
No. pack-years	14.2[1]	-0.02[2]	0.07	15.0	-0.05	0.008	16.6	-0.009	0.53	0.68
Physical inactivity, %	29.5[3]	2.2	<.0001	35.8	1.9	<.0001	53.1	0.44	0.26	0.0006
Unsaturated/ saturated fat	43.1	-0.002	0.11	38.4	0.001	0.48	47.9	-0.006	<.0001	0.06
Women										
	High Occupation			Medium Occupation			Low Occupation			
Risk Factor	1993	Slope	P	1993	Slope	P	1993	Slope	P	Interaction P
Current No. pack-years	22.6[1]	-0.02[2]	0.27	12.6	0.02	0.03	12.5	0.01	0.51	0.09
Former No. pack-years	8.3[1]	-0.02[2]	0.23	4.4	0.03	0.02	9.8	0.008	0.81	0.07
Physical inactivity, %	34.2[3]	2.0	<.0001	45.2	2.2	<.0001	38.8	2.9	<.0001	0.26
Unsaturated/ saturated fat	44.4	-0.002	0.11	46.2	0.002	0.05	55.2	-0.004	0.07	0.52
Dietary fiber(g/day)	16.2[1]	-0.007[2]	0.05	13.8	0.003	0.30	14.5	0.001	0.78	0.09

[1] Geometric means.
[2] Used the log of this variable in its regression model.
[3] Prevalence from 1994 used.

Table B.3: Trends in Selected Biological Risk Factors for Men and Women, by Occupation Level: Geneva, Switzerland, 1993-2004

Men										
	High Occupation			Medium Occupation			Low Occupation			
Risk Factor	1993	Slope	P	1993	Slope	P	1993	Slope	P	Interaction P
Hypercholesterolemia, %	19.1	0.62	0.01	20.0	0.72	0.05	15.4	0.60	0.06	0.99
Cholesterol Treatment	5.3	0.78	<.0001	2.7	0.77	<.0001	4.4	0.74	0.0003	0.87
DBP (mm Hg)	82.6	-0.26	<.0001	83.5	-0.19	0.02	83.7	-0.15	0.39	0.24
Moderate hypertension, %	23.9	-0.03	0.90	17.2	-1.0	0.002	23.5	-1.1	0.0002	0.89
Hypertension treatment, %	12.0	0.53	0.002	13.6	0.17	0.50	11.7	0.70	0.002	0.70
BMI (kg/m^2)[1]	24.7	0.02	0.006	24.9	0.03	0.0007	26.2	0.003	0.16	0.75
Overweight, %	34.4	0.81	0.002	44.4	0.84	0.03	55.9	0.85	0.13	0.92
Obese, %	5.7	0.40	0.03	8.2	0.51	0.06	14.0	0.02	0.92	0.25
Women										
	High Occupation			Medium Occupation			Low Occupation			
Risk Factor	1993	Slope	P	1993	Slope	P	1993	Slope	P	Interaction P
Cholesterol(mmol/L)	5.47	0.02	0.006	5.60	0.01	0.06	5.56	0.02	0.05	0.76
Hypercholesterolemia, %	14.1	0.50	0.08	15.4	0.52	0.02	15.4	1.6	0.0002	0.09
Cholesterol Treatment	0.0	0.17	0.24	2.8	0.38	0.0008	3.1	0.81	0.0002	0.02
DBP (mm Hg)	77.7	-0.29	<.0001	78.5	-0.47	<.0001	83.0	-0.46	<.0001	0.08
Moderate hypertension, %	12.8	-0.48	0.04	15.4	-1.2	<.0001	12.3	-0.73	0.04	0.21
BMI (kg/m^2)[1]	22.7	0.02	0.59	23.3	0.03	0.14	24.7	0.09	0.03	0.34
Overweight, %	20.5	0.13	0.68	22.9	0.49	0.04	36.9	1.2	0.008	0.11

[1] Used regression-calibrated BMI.

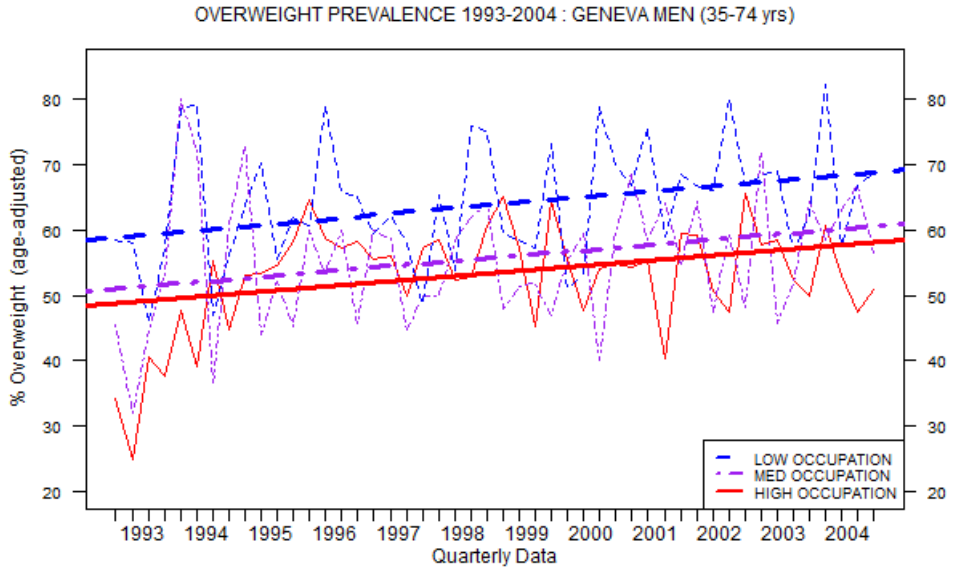

Figure B.1: Age-adjusted trends in overweight prevalence in men amidst seasonal and sampling background fluctuations, by occupation groups: Geneva, Switzerland, 1993-2004

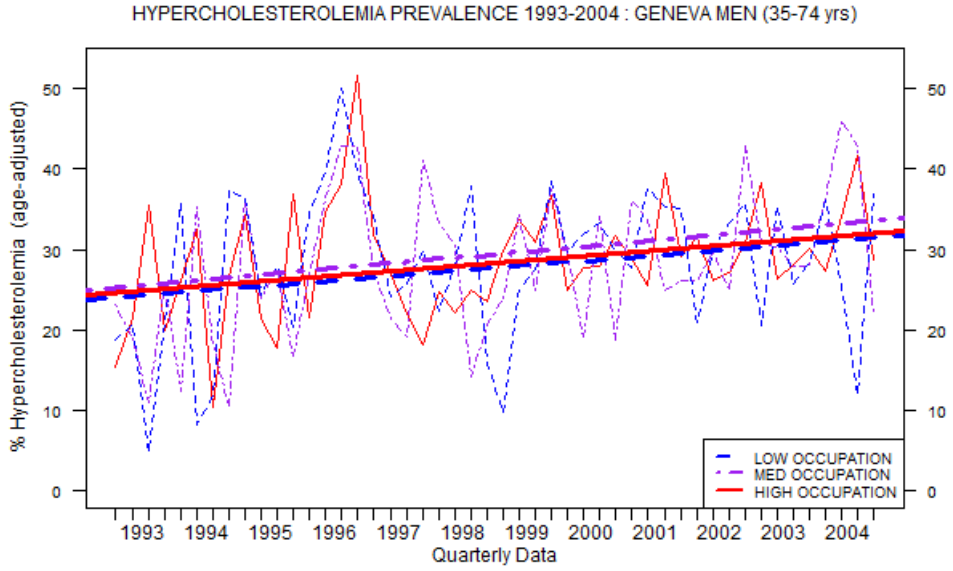

Figure B.2: Age-adjusted trends in hypercholesterolemia prevalence in men amidst seasonal and sampling background fluctuations, by occupation groups: Geneva, Switzerland, 1993-2004

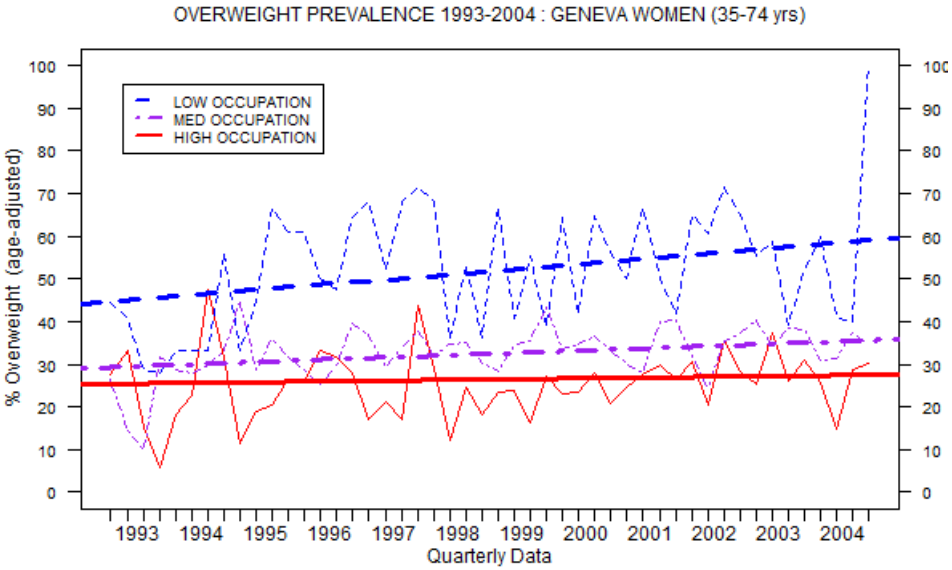

Figure B.3: Age-adjusted trends in overweight prevalence in women amidst seasonal and sampling background fluctuations, by occupation groups: Geneva, Switzerland, 1993-2004

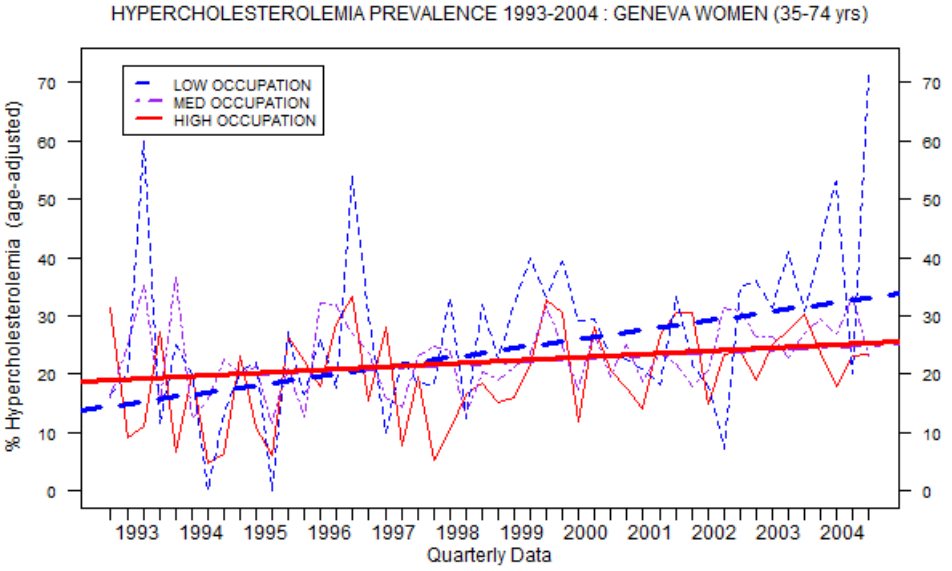

Figure B.4: Age-adjusted trends in hypercholesterolemia prevalence in women amidst seasonal and sampling background fluctuations, by occupation groups: Geneva, Switzerland, 1993-2004

Appendix C

Model Selection

In this section, the model that predicts the trend of the age-adjusted log of the currently-smoked pack-years for medium-SEP women over the survey period that was chosen in this study will be diagnosed (model with the red heading in Table C.3). We will consider the model that predicts the raw pack-years data (with a highly skewed distribution, see Figure C.1 below) over time by separately for both occupation and education as the SEP indicators to see if using the log was in fact a good decision, and also the log of the pack-years by education to see if education is a better predictor than occupation for the trend differences by SEP group.

Figure C.1: Histogram of Currently-Smoked Pack-Years Among Medium Occupation Women, Geneva, Switzerland, 1993-2004

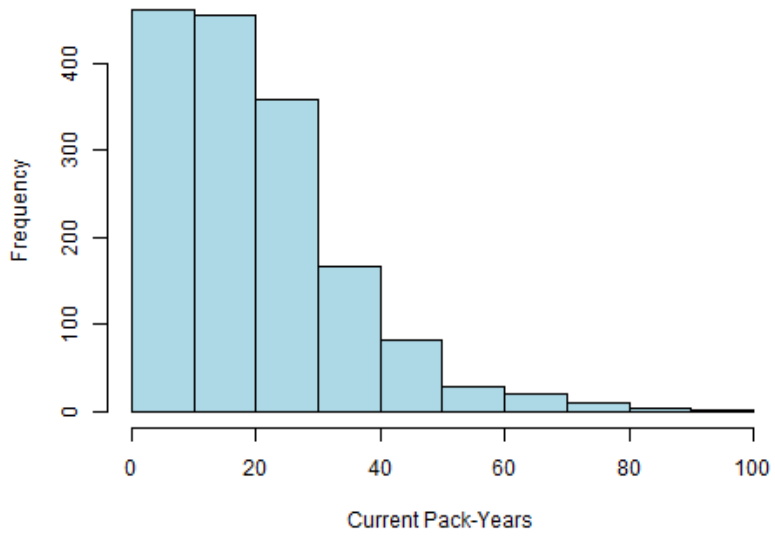

Table C.1: Model Predicting Raw Pack-Years Data, with Occupation as SEP

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-7.9570	2.1464	-3.71	0.0002
AGE	0.5316	0.0380	14.01	0.0000
Y_SURVEY	0.3472	0.1474	2.35	0.0187
ALL_UKBL	1.8130	2.6627	0.68	0.4960
ALL_UKBH	3.9607	1.9855	1.99	0.0462
Y_SURVEY:ALL_UKBL	0.1693	0.3484	0.49	0.6271
Y_SURVEY:ALL_UKBH	-0.7383	0.2585	-2.86	0.0043
Model AIC Score	12531.62			

Table C.2: Model Predicting Raw Pack-Years Data, with Education as SEP

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-5.6703	2.0898	-2.71	0.0067
AGE	0.5172	0.0370	13.98	0.0000
Y_SURVEY	0.2625	0.1426	1.84	0.0659
NEDUC3L	-1.0709	3.8671	-0.28	0.7819
NEDUC3H	-1.4797	1.8354	-0.81	0.4203
Y_SURVEY:NEDUC3L	-0.0285	0.5469	-0.05	0.9584
Y_SURVEY:NEDUC3H	-0.2110	0.2371	-0.89	0.3735
Model AIC Score	12970.97			

Table C.3: Model Predicting the Log of Pack-Years Data, with Occupation as SEP

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	1.2296	0.1430	8.60	0.0000
AGE	0.0268	0.0025	10.58	0.0000
Y_SURVEY	0.0219	0.0098	2.23	0.0260
ALL_UKBL	0.2135	0.1774	1.20	0.2290
ALL_UKBH	0.1040	0.1323	0.79	0.4321
Y_SURVEY:ALL_UKBL	-0.0081	0.0232	-0.35	0.7280
Y_SURVEY:ALL_UKBH	-0.0376	0.0172	-2.19	0.0290
Model AIC Score	4199.484			

Table C.4: Model Predicting the Log of Pack-Years Data, with Education as SEP

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	1.3820	0.1410	9.80	0.0000
AGE	0.0252	0.0025	10.08	0.0000
Y_SURVEY	0.0158	0.0096	1.64	0.1016
NEDUC3L	0.1152	0.2610	0.44	0.6589
NEDUC3H	-0.1492	0.1239	-1.20	0.2286
Y_SURVEY:NEDUC3L	-0.0284	0.0369	-0.77	0.4411
Y_SURVEY:NEDUC3H	-0.0076	0.0160	-0.48	0.6327
Model AIC Score	4398.553			

For both the models predicting the raw pack-years data and the log of the pack-years data, using occupation as the SEP predictor resulted in more significant trends in the risk factor over the years, as well as better model AIC scores (p-value for the years' ("Y SURVEY") slope=0.019 for raw data using occupation (see Table C.1), 0.026 for log data using occupation (see Table C.3)), so we will narrow our model choice down to just those 2 models. Even though 2 other predictors' (involving high occupation, "ALL UKBH") slope contributions were more significant in the model in Table C.1, it is a clear that our chosen model (in Table C.3) was correct because its AIC score was lowest among all other models by far. This model selection (using occupation as SEP) was most likely the best one for all of the other models in this study as well, or at least for the 5 others that predicted the log of a risk factor variable.

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