ORIGINAL ARTICLE

Prevalence Trends in Lifestyle-Related Risk Factors

Two Cross-Sectional Analyses With a Total of 8728 Participants From the Study of Health in Pomerania From 1997 to 2001 and 2008 to 2012

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SUMMARY

Background: The regional prevalence of risk factors can vary over time. The Study of Health in Pomerania (SHIP) addresses prevalence trends for common risk factors in a region in northeast Germany.

Methods: A longitudinal study was carried out from 1997 to 2001 (SHIP-0, with 4308 subjects), and a second, independent random sample of the population in the same region was studied from 2008 to 2012 (SHIP-Trend, with 4420 subjects). All data were standardized with post-stratification weighting derived from the adult population of the state of Mecklenburg-West Pomerania.

Results: SHIP reveals a marked decline of mean alcohol consumption in the adult population, from 5.57 g/day (95% confidence interval, 5.51–5.63) to 3.12 g/day (95% CI 3.09–3.15). The percentage of active smokers among men declined from 38.6% (95% CI 36.0–41.2) to 34.3% (95% CI 32.1–36.6). Simultaneously, however, there was a rightward shift of the BMI distribution, with a marked increase in the prevalence of obesity, from 24.7% to 32.0%. There was a corresponding increase in the prevalence of diabetes, from 9.1% to 13.8%. Compared to eleven years ago, the amount of exercise taken during free time has risen among the elderly, but fallen among young women.

Conclusion: Tobacco and alcohol consumption have declined over the past decade, although this study may have overestimated these trends through a combination of selection bias and reporting bias. Meanwhile, the northeast German population now has a worse metabolic risk profile, as indicated by the increased prevalence of obesity and diabetes. Society as a whole must take measures to combat this trend.

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The disease burden in the German population shows considerable regional variation (1). After the reunification of Germany it was found that life expectancy was substantially lower in the east than in the west. Moreover, there were geographical differences within the old East Germany, with the lowest life expectancy in the northeast (2).

Against this backdrop, a research center for community medicine was set up at the University of Greifswald in the mid-1990s (3). The population project Study of Health in Pomerania (SHIP) investigates to what extent the high mortality in the northeastern German population can be explained by the risk-factor profile in that part of the country. The SHIP investigators did indeed find a pronounced cardiometabolic risk factor and disease burden in the region. The following risk factors and diseases were higher than in any other part of Germany and occupied alarmingly high positions in international comparisons (4–10):

- Alcohol consumption
- Obesity
- Metabolic syndrome
- Diabetes mellitus
- Arterial hypertension
- Gallstone disease

Social trends in recent years can be expected to impact on age- and sex-specific prevalence of risk factors and diseases in northeastern Germany. Unemployment has gone down and medical care structures have been improved (11). At the federal level, laws to protect non-smokers have been enacted and taxes on tobacco have been raised. Furthermore, various programs are promoting increased physical exercise, healthy nutrition, and reduction of other behaviors that are deleterious to health (12). It would be interesting to discover to what extent these developments have affected the prevalence of common risk factors and diseases in northeastern Germany.

Following analysis of the data from a first population sample between 1997 and 2001 (SHIP-0), a second, independent sample of the population of West Pomerania (SHIP-Trend) was investigated a decade later. One of the central goals of SHIP-Trend was to identify the trends in prevalence of common risk

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TABLE 1

Absolute numbers and proportions of men and women in the age strata of SHIP-0 (1997–2001) and SHIP-Trend (2008–2012)

Age in years	Men							Women						
	20–29	30–39	40–49	50–59	60–69	≥70	Total	20–29	30–39	40–49	50–59	60–69	≥70	Total
SHIP-0														
Number	275	357	354	370	422	338	2116	318	408	399	421	370	276	2192
Proportion (%)	13.0	16.9	16.7	17.5	19.9	16.0	100	14.5	18.6	18.2	19.2	16.9	12.6	100
SHIP-Trend														
Number	190	309	414	456	408	368	2145	194	388	465	475	435	318	2275
Proportion (%)	8.9	14.4	19.3	21.3	19.0	17.2	100	8.5	17.1	20.4	20.9	19.1	14.0	100

SHIP, Study of Health in Pomerania

factors and diseases in northeastern Germany. This article focuses both on harmful behaviors such as smoking, alcohol consumption, and physical inactivity and on obesity and diabetes mellitus.

Methods

Study population

The area covered by the study is the whole of West Pomerania with the exception of the islands Usedom and Rügen. The samples were obtained from local registration offices or from the associated data processing center of the state administration in the city of Schwerin. The inclusion criteria were registered principal residence in the study area, age between 20 and 79 years, and German nationality. Participants in SHIP-0 were excluded from SHIP-Trend. Because the registration system was still decentralized in the mid-1990s, a two-level stratified cluster sample was surveyed for SHIP-0 (13, 14). For SHIP-Trend, in contrast, a random age- and sex-stratified sample was drawn from the meanwhile centralized registry data of the state of Mecklenburg–West Pomerania (3).

In both studies the invitation procedure comprised three stages (15): First, at least two written invitations were sent. If there was no reply, attempts were made to contact the persons selected by telephone. If that also failed, they were visited at home to try and convince them to take part. The net sample for SHIP-0 was 6265 persons, of whom 4308 (2192 women) took part in the baseline examination. In SHIP-Trend, over and above the standard invitation procedure temporary study centers with a shortened investigation program were set up in the main towns of the region (Stralsund, Anklam, Wolgast, Grimmen, and Tribsees) to lower the distances travelled by the participants. All data underlying the trends reported below were therefore acquired both by means of the standard invitation procedure and in the temporary study centers. The net sample for SHIP-Trend was 8826 persons, of whom 4420 (2275 women) took part in the baseline examination.

Data acquisition

The instruments used for measurement in SHIP-0 and SHIP-Trend were largely identical, with the aim of

maximizing comparability. Data on tobacco consumption and diabetes mellitus were acquired in a standardized computer-assisted personal interview. The medications taken in the previous 7 days were categorized according to the Anatomical Therapeutic Chemical (ATC) classification. Participants who exercised for less than an hour a week in their leisure time, summer and winter, were classified as physically inactive. Participants were classified as having diabetes if they:

- Confirmed at interview that a physician had diagnosed diabetes mellitus
- Were taking antidiabetic medication (ATC code A10)
- Had an HbA_{1c} level $\geq 6.5\%$ or
- Displayed a blood glucose concentration of ≥ 11.1 mmol/L

Height and weight were measured and the body mass index (BMI) calculated. BMI of ≥ 25 kg to <30 kg/m² was defined as overweight, ≥ 30 kg/m² as obesity.

One difference in methods between SHIP-0 and SHIP-Trend should be borne in mind when interpreting the results: information on alcohol consumption was obtained via a questionnaire in SHIP-0 and during an interview in SHIP-Trend. In both surveys alcohol consumption was determined in terms of drinking behavior in the previous month (9). To obtain the daily intake of pure alcohol (g/day), the average consumption of beer, wine, and spirits was calculated: (number of days on which alcohol was consumed) $\times$ (average number of alcoholic drinks consumed on these days)/30. The result was multiplied by a standard alcohol content of 4.8% for beer, 11.0% for wine, and 33.0% for spirits (9). A mean intake of >20 g for women and >30 g for men was defined as dangerous alcohol consumption (9). The potential impact of the prevalence trends on the average cardiovascular mortality risk of the population was estimated with the aid of the European Systematic Coronary Risk Evaluation (SCORE) (16).

Thirty-one percent of the SHIP-Trend non-participants completed a questionnaire with information on the following:

- Family status
- Smoking behavior
- Visit to doctor

TABLE 2

Prevalences of alcohol consumption, smoking behavior, physical inactivity, overweight/obesity, and diabetes in SHIP-0 (1997–2001) and SHIP-Trend (2008–2012)

	Total population			Men			Women		
	SHIP-0	SHIP-Trend	p*	SHIP-0	SHIP-Trend	p*	SHIP-0	SHIP-Trend	p*
Alcohol (g/day)	5.57 (5.51; 5.63)	3.12 (3.09; 3.15)	<0.05	11.6 (11.5; 11.8)	7.69 (7.59; 7.78)	<0.05	3.02 (2.96; 3.08)	1.45 (1.43; 1.47)	<0.05
Dangerous alcohol consumption (%)	14.1 (13.0; 15.3)	7.0 (6.2; 7.8)	<0.05	22.6 (20.5; 24.9)	11.7 (10.4; 13.2)	<0.05	5.9 (4.9; 7.2)	2.4 (1.8; 3.2)	<0.05
Beer consumption in previous 7 days (%)	51.8 (50.2; 53.4)	49.8 (48.3; 51.3)	0.09	77.1 (75.0; 79.0)	73.8 (71.7; 75.8)	<0.05	27.6 (25.4; 29.9)	27.1 (25.1; 29.2)	0.72
Wine consumption in previous 7 days (%)	56.0 (54.2; 57.9)	52.7 (51.1; 54.4)	<0.05	41.3 (38.7; 44.0)	39.3 (37.1; 41.6)	0.22	70.1 (67.9; 72.2)	65.5 (63.2; 67.8)	<0.05
Spirits consumption in previous 7 days (%)	38.6 (37.0; 40.4)	35.4 (33.9; 36.9)	<0.05	50.6 (48.0; 53.1)	47.9 (45.5; 50.2)	0.12	27.2 (25.3; 29.3)	23.5 (21.6; 25.6)	<0.05
Current smoker (%)	32.9 (31.3; 34.6)	29.7 (28.2; 31.1)	<0.05	38.6 (36.0; 41.2)	34.3 (32.1; 36.6)	<0.05	27.5 (25.6; 29.5)	25.3 (23.4; 27.2)	0.13
Cigarettes per day in smokers (n)	15.0 (14.5; 15.5)	15.0 (14.8; 15.2)	1.00	18.0 (17.6; 18.4)	15.0 (14.3; 15.7)	<0.05	10.0 (9.9; 10.1)	10.0 (9.3; 10.7)	1.00
Physical inactivity (%)	55.8 (54.2; 57.4)	50.1 (48.5; 51.8)	<0.05	56.7 (54.3; 59.1)	50.0 (47.7; 52.3)	<0.05	55.0 (52.7; 57.2)	50.2 (47.9; 52.6)	<0.05
Body mass index (kg/m ²)	26.7 (26.6; 26.7)	27.5 (27.5; 27.5)	<0.05	27.1 (27.1; 27.2)	27.8 (27.8; 27.88)	<0.05	26.0 (26.0; 26.0)	27.0 (27.0; 27.01)	<0.05
Overweight (%)	39.4 (37.9; 41.0)	38.0 (36.4; 39.6)	0.20	47.7 (45.2; 50.2)	43.7 (41.4; 46.0)	<0.05	31.5 (29.5; 33.5)	32.6 (30.5; 34.7)	0.47
Obesity (%)	24.7 (23.3; 26.1)	32.0 (30.5; 33.5)	<0.05	23.9 (21.9; 26.0)	31.8 (29.8; 34.0)	<0.05	25.5 (23.6; 27.5)	32.2 (30.0; 34.4)	<0.05
Diabetes mellitus (%)	9.1 (8.2; 10.0)	13.8 (12.7; 15.0)	<0.05	9.7 (8.5; 11.1)	14.4 (12.9; 16.0)	<0.05	8.5 (7.4; 9.7)	13.3 (11.7; 15.1)	<0.05

Continuous variables are expressed as median and 95% confidence interval, dichotomous variables as proportion in % and 95% confidence interval. All analyses are weighted with poststratification weights or with the product of poststratification weights and inverse probability of participation weights (SHIP-Trend). * p-value for prevalence differences (quantile regression for continuous variables, Poisson regression for dichotomous variables); SHIP, Study of Health in Pomerania

- General health
- Diabetes mellitus
- Myocardial infarction
- Stroke

Compared with non-participants, participants were on average

- Younger
- More often male
- Less often diagnosed with diabetes
- Better educated and
- Subjectively in better general health

Statistical analysis

All data were standardized using poststratification weighting because of the different ways of obtaining the samples in SHIP-0 and SHIP-Trend (17). The factors included in the poststratification weighting were age, sex, and the data of the local registration office. Based on the data of the non-responder survey, the probability of participation in SHIP-Trend was estimated by means of logistic regression. The resulting inverse probability weights were multiplied by the poststratification weights (18).

Continuously distributed traits were described in terms of median with 95% confidence interval (CI), categorical traits in terms of relative frequency as an estimation of prevalence with 95% CI. A p-value <0.05 was taken to indicate a statistically significant difference. The p-values should be viewed with caution and interpreted only in combination with the mean estimator and the confidence interval. Stata 13.1 (Stata Corporation; College Station, USA) was used for all analyses.

Results

The average age of the participants in SHIP-0 was 50 years, in SHIP-Trend 52 years. The proportion of men in SHIP-0 was slightly lower than in SHIP-Trend (49.1% versus 48.5%). Younger men and women made up a higher proportion of the total study population in SHIP-0 than in SHIP-Trend (Table 1). The response rate was 68.8% in SHIP-0 but only 50.1% in SHIP-Trend.

In comparison with SHIP-0, the median consumption of alcohol in SHIP-Trend went down by around one third in men and was approximately halved in

FIGURE 1

Prevalence trend in leisure-time physical inactivity for men (blue) and women (red). The data for the SHIP-0 survey were obtained between 1997 and 2001, for SHIP-Trend between 2008 and 2012; SHIP, Study of Health in Pomerania

women (Table 2). The differences between SHIP-0 and SHIP-Trend were particularly great in younger adults. The prevalence of dangerous alcohol consumption was halved in both men and women. The decrease in the amount of alcohol consumed applied to almost all categories of alcoholic drinks. In men the greatest reduction was seen for the prevalence of beer drinking, in women for wine and spirits (Table 2).

The proportion of participants who reported they were current smokers also showed a downward trend (Table 2). The reduction was somewhat greater in men than in women. Among smokers, the average number of cigarettes smoked decreased in men but remained unchanged in women.

In the study population as a whole, the proportion of persons who did not exercise in their leisure time decreased. For women, in particular, this trend was strongly age dependent: Mainly older age groups reported increased physical activity. Younger persons, in contrast, showed a reduction in exercise (Figure 1).

The increase in median BMI between SHIP-0 and SHIP-Trend was greater in the female than the male study population (Table 2, Figure 2). While the prevalence of overweight went down slightly in men and remained relatively stable at a high level in women, the prevalence of obesity increased considerably in both sexes. The greatest increase in the prevalence of obesity was seen in men >50 (Figure 3).

The prevalence of diabetes mellitus increased distinctly in both men and women (Table 2). In men mainly the older age groups were affected, in women principally younger groups (Figure 4).

The potential consequences of the changes in the risk-factor profile were estimated with the aid of a scoring system (16). Thus calculated, the mean cardiovascular 10-year mortality risk was 2.4% (95% CI 2.3–2.5) for SHIP-0 and 2.9% (95% CI 2.7–3.0) for SHIP-Trend.

Discussion

The SHIP project shows clear trends in the prevalence and manifestation of lifestyle-related risk factors in a region of northeastern Germany over the period of a decade. The marked reduction in the average amount of alcohol consumed by adults is gratifying. The proportion of current smokers decreased, particularly in men. While a greater number of older people were physically active during their free time in the second survey than 11 years previously, leisure-time exercise decreased in younger women.

Less gratifying is the trend towards obesity. The SHIP project shows increasing BMI values; in particular, the prevalence of obesity went up. The consequences of the obesity epidemic for health economics are shown by the equally marked increase in the prevalence of diabetes. The treatment costs for diabetes mellitus type 2 were already immense over a decade ago: the annual costs per patient in eight European countries were estimated at € 2834 (19). It must be assumed that the increasing prevalence of obesity will constitute a growing economic burden on healthcare systems. The mean cardiovascular mortality risk also increased over the observation period. The present data underline the urgent need for measures to prevent chronic nutrition-related disease.

The trends towards reduced consumption of alcohol and tobacco can be attributed partly to reinforced efforts across society as a whole to prevent health-endangering behavior (20). Laws have enacted to protect non-smokers, restrictions on advertising have been introduced, and taxes on tobacco have been raised. These measures are designed to promote a decrease in smoking (21). A parallel decrease in per capita consumption of alcohol has been observed (22).

The general improvement in the socioeconomic situation in Mecklenburg–West Pomerania and the sharp decrease in unemployment may also help to explain the

FIGURE 2

Displacement of the body mass index distribution to the right for men (blue) and women (red). The data for the SHIP-0 survey were obtained between 1997 and 2001, for SHIP-Trend between 2008 and 2012; SHIP, Study of Health in Pomerania

trends observed. The increased employment may be partly responsible for the decrease in alcohol consumption. The reduction in leisure-time exercise in young adults could be explained by increased integration at work and in the family. Changes in lifestyle and increased use of consumer electronics may also promote physical inactivity.

The prevalence trends described here correspond with the findings of other studies. Obesity and diabetes mellitus are on the increase in Germany and across the world (23, 24). As early as 1998, the German National Health Survey (DEGS) showed an increase in physical activity among younger adults compared with 1991; for older age groups, however, the trend was in the opposite direction (25). Preventive measures have helped to reduce smoking in Germany (26) and in other European countries (27). Decreasing consumption of beer and spirits in Germany is shown by the annual World Health Organization surveys (28) and confirmed by national statistics (22, 29). The consumption has gone down to only around two thirds of the level in the 1970s.

The findings presented here show that the adult population of northeastern Germany should no longer be viewed as having a more pronounced risk-factor profile than inhabitants of other parts of the country. Rather, lifestyle-related health risks in northeastern Germany seem to be moving closer to the national average. This is also indicated by the fact that the life expectancy of the population of Mecklenburg–West Pomerania now hardly differs from the average in Germany as a whole. Thus, the mortality rate among women in the age group 65 to 69 years during the period 1992 to 1994 was 16.5 per 1000 person-years in eastern Germany and 13.2 per 1000 person-years in the west. By the period 2005 to 2009, however, the mortality was similar in east and west, at 9.3 per 1000 person-years (30).

The strengths of the SHIP project are the population-based approach and the strong similarity in methods between the two cross-sectional surveys SHIP-0 and SHIP-Trend. One weakness is the difference in the proportion of selected persons who actually took part in the survey: 68.8% in SHIP-0, but only 50.1% in SHIP-Trend. Willingness to participate in population studies has decreased in Western industrialized nations over the past few decades. In the first MONICA study in Denmark, conducted between 1982 and 1984, 79% of those invited agreed to take part, but only 36% were willing to participate in the Health 2000 study, although the invitation procedure was almost identical (11). Similarly, 61% of those contacted agreed to take part in the DEGS in 1998 (12), but in 2010 only 42% were willing (31). The authors of SHIP-Trend reacted to the initially low readiness to take part in their survey in that they supplemented the invitation procedure for SHIP-0 by the establishment of temporary study centers to reduce the distances the participants would have to travel. Particularly young parents and older persons took advantage of this service.

The shrinking response does not necessarily mean that more recent population studies are less representative. On the contrary, the Danish studies—despite the marked decrease in response—showed broadly constant relative mortality of the non-participants compared with those who participated in the population studies. (11). No such data are available for the SHIP project. To avoid distortion of the results, the data for age, sex, and sampling method were weighted. Moreover, in SHIP-Trend the results for non-response were weighted, in that health-related information about non-participants was integrated into the weighting.

If the results were nevertheless distorted, the direction of deviation would be difficult to determine. On one hand, people with a pronounced risk profile

FIGURE 3

Prevalence trend in obesity (body mass index ≥ 30 kg/m²) for men (blue) and women (red). The data for the SHIP-0 survey were obtained between 1997 and 2001, for SHIP-Trend between 2008 and 2012; SHIP, Study of Health in Pomerania

might avoid participation in a study. This would, for example, distort the estimation of trends in alcohol and tobacco consumption and thus particularly the decrease in alcohol consumption would be overestimated (32, 33). On the other hand, it can be suspected that healthy, employed people are particularly likely to have no time or be less interested in taking part in a population study. This would counteract the tendencies just mentioned.

The sharp decrease in alcohol intake could be explained at least in part by details of the methods. Although the survey instruments were identical in the two analyses, the information regarding alcohol consumption was obtained from a self-completed questionnaire in SHIP-0 and via interview in SHIP-Trend. In general, alcohol intake as stated at interview

is lower than with questionnaires (34); however, the literature is inconsistent in this respect. For example, one study showed that participants' statements regarding their alcohol consumption were comparable in a self-completed questionnaire and at interview (35). While the extent of the drop in alcohol consumption in SHIP could have been underestimated owing to this methodological weakness, other surveys confirm decreasing alcohol intake in Germany (22, 27-29).

Summary

The risk-factor profile of the northeast German population has changed in the past decade. On one hand there has been a fall in the consumption of tobacco and alcohol, although the decrease may have been overestimated

FIGURE 4

Prevalence trend in diabetes mellitus for men (blue) and women (red). The data for the SHIP-0 survey were obtained between 1997 and 2001, for SHIP-Trend between 2008 and 2012; SHIP, Study of Health in Pomerania

owing to selection and information bias. On the other hand, the rise in the prevalence of obesity and diabetes mellitus points to an augmented metabolic risk profile. On balance, the risk of cardiovascular mortality has increased. The data support other reports of a widening epidemic of obesity and associated disease. Efforts across society as a whole are required to counteract this trend.

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Conflict of interest statement

The authors declare that no conflict of interest exists.

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REFERENCES

1. Kroll LE, Lampert T: [Regionalization of health indicators. Results from the GEDA-Study 2009]. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz 2012; 55: 129–40.
2. Wiesner G, Bittner EK: [Life expectancy, potential years of life lost (PYLL), and avoidable mortality in an East/West comparison]. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz 2004; 47: 266–78.
3. Volzke H, Alte D, Schmidt CO, et al.: Cohort profile: the Study of Health in Pomerania. Int J Epidemiol 2011; 40: 294–307.
4. Volzke H, Baumeister SE, Alte D, et al.: Independent risk factors for gallstone formation in a region with high cholelithiasis prevalence. Digestion 2005; 71: 97–105.
5. Volzke H, Robinson DM, Kleine V, et al.: Hepatic steatosis is associated with an increased risk of carotid atherosclerosis. World J Gastroenterol 2005; 11: 1848–53.
6. Meisinger C, Heier M, Volzke H, et al.: Regional disparities of hypertension prevalence and management within Germany. J Hypertens 2006; 24: 293–9.
7. Stang A, Doring A, Volzke H, et al.: Regional differences in body fat distributions among people with comparable body mass index: a comparison across six German population-based surveys. Eur J Cardiovasc Prev Rehabil 2011; 18: 106–14.
8. Schipf S, Werner A, Tamayo T, et al.: Regional differences in the prevalence of known type 2 diabetes mellitus in 45–74 years old individuals: results from six population-based studies in Germany (DIAB-CORE Consortium). Diabet Med 2012; 29: e88–95.
9. Baumeister SE, Alte D, Meyer C, John U: [Health risk drinking and problematic consumption of alcohol in Pomerania: comparative analysis of the Study of Health in Pomerania (SHIP) compared with the Federal German Health and Examination Survey in 1998]. Gesundheitswesen 2005; 67: 39–47.
10. Stang A, Stang M: An inter-state comparison of cardiovascular risk factors in Germany: towards an explanation of high ischemic heart disease mortality in Saxony-Anhalt. Dtsch Arztebl Int 2014; 111: 530–6.
11. Goebel J, Habich R, Krause P: Zur Angleichung von Einkommen und Lebensqualität im vereinigten Deutschland. Vierteljahrshefte zur Wirtschaftsforschung 2009; 78: 122–45.

KEY MESSAGES

- Consumption of both alcohol and tobacco is decreasing in the population of northeastern Germany.
- Physical inactivity is decreasing in older adults, but increasing in younger women.
- The prevalence of both obesity and diabetes mellitus is rising sharply.
- Preventive measures should more specifically target obesity.

12. Sargent JD, Demidenko E, Malenka DJ, Li Z, Gohlke H, Hanewinkel R: Smoking restrictions and hospitalization for acute coronary events in Germany. Clin Res Cardiol 2012; 101: 227–35.
13. John U, Greiner B, Hensel E, et al.: Study of Health In Pomerania (SHIP): a health examination survey in an east German region: objectives and design. Soz Präventivmed 2001; 46: 186–94.
14. Schmidt CO, Alte D, Volzke H, Sauer S, Friedrich N, Valliant R: Partial misspecification of survey design features sufficed to severely bias estimates of health-related outcomes. J Clin Epidemiol 2011; 64: 416–23.
15. Haring R, Alte D, Volzke H, et al.: Extended recruitment efforts minimize attrition but not necessarily bias. J Clin Epidemiol 2009; 62: 252–60.
16. Conroy RM, Pyorala K, Fitzgerald AP, et al.: Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project. Eur Heart J 2003; 24: 987–1003.
17. Smith TM: Post-stratification. Statistician 1991; 40: 315–23.
18. Li L, Shen C, Li X, Robins JM: On weighting approaches for missing data. Stat Methods Med Res 2013; 22: 14–30.
19. Jonsson B, CODE-2 Advisory Board: Revealing the cost of type II diabetes in Europe. Diabetologia 2002; 45: 5–12.
20. Lampert T, Kroll LE, Muters S, Stolzenberg H: [Measurement of the socioeconomic status within the German Health Update 2009 (GEDA)]. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz 2013; 56: 131–43.
21. Hanewinkel R, Radden C, Rosenkranz T: Price increase causes fewer sales of factory-made cigarettes and higher sales of cheaper loose tobacco in Germany. Health Econ 2008; 17: 683–93.
22. Gaertner B, Meyer C, John U, Freyer-Adam J: Alkohol – Zahlen und Fakten zum Konsum. Lengerich: Pabst Science Publishers 2013; 36–66.
23. Finucane MM, Stevens GA, Cowan MJ, et al.: National, regional, and global trends in body-mass index since 1980: systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. Lancet 2011; 377: 557–67.
24. Danaei G, Finucane MM, Lu Y, et al.: National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2.7 million participants. Lancet 2011; 378: 31–40.
25. Mensink GB: [Physical activity]. Gesundheitswesen 1999; 61: 126–31.
26. Richter M, Pfortner TK, Lampert T, HBSC-Team Deutschland: [Changes in tobacco, alcohol and cannabis use by adolescents from 2002 to 2010 in Germany]. Gesundheitswesen 2012; 74: 42–8.

27. WHO: The European tobacco control report 2007. www.euro.who.int/__data/assets/pdf_file/0005/68117/E89842.pdf (last accessed on 3 February 2015).
28. WHO: Global status report on alcohol and health 2014. www.who.int/substance_abuse/publications/global_alcohol_report/en/ (last accessed on 3 February 2015).
29. Bloomfield K, Kraus L, Soyka M: Alkoholkonsum und alkoholbezogene Störungen. Gesundheitsberichterstattung des Bundes. Heft 40. Berlin: Robert Koch-Institut 2008.
30. Myrskylä M, Scholz R: Reversing East-West mortality difference among German women, and the role of smoking. *Int J Epidemiol* 2013; 42: 549–58.
31. Schmidt CO, Raspe H, Pfingsten M, et al.: Does attrition bias longitudinal population-based studies on back pain? *Eur J Pain* 2011; 15: 84–91.
32. Torvik FA, Rognmo K, Tambs K: Alcohol use and mental distress as predictors of non-response in a general population health survey: the HUNT study. *Soc Psychiatry Psychiatr Epidemiol* 2012; 47: 805–16.
33. Lahaut VM, Jansen HA, van de Mheen D, Garretsen HF, Verdurmen JE, van Dijk A: Estimating non-response bias in a survey on alcohol consumption: comparison of response waves. *Alcohol Alcohol* 2003; 38: 128–34.
34. Kraus L, Augustin R: Measuring alcohol consumption and alcohol-related problems: comparison of responses from self-administered questionnaires and telephone interviews. *Addiction* 2001; 96: 459–71.
35. Graham A, Goss C, Xu S, Magid DJ, Diguiseppi C: Effect of using different modes to administer the AUDIT-C on identification of hazardous drinking and acquiescence to trial participation among injured patients. *Alcohol Alcohol* 2007; 42: 423–9.

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