Int J Public Health (2012) 57:185–191
DOI 10.1007/s00038-011-0274-4

ORIGINAL ARTICLE

Treatment of hypertension in Germany: is there a social gradient?

Ulrich Laaser · Jürgen Breckenkamp · Vesna Bjegovic

Received: 3 January 2011 / Revised: 24 May 2011 / Accepted: 16 June 2011 / Published online: 7 July 2011

Abstract
Objectives Effective hypertension control remains low without much improvement since the 1990s. However, information is limited whether and how social status impacts on hypertension control.
Methods Data from the German Health Survey 1998 are used to explore the role of social status according to educational achievement in treating hypertension, adjusted for key determinants in a logistic regression.
Results Actual as well as population prevalence (≥140 mmHg/≥90 mmHg) is highest in the lowest of the three social classes with 59.4 and 51.9% as compared to 44.5 and 40.5% in the highest. Physician contacts during the previous year were also highest in the lower class with 76.0% as compared to 59.0% in the highest. The logistic regression revealed insignificant odds ratios (OR) of 1.46 for the highest and 1.12 for the middle class for treatment of known hypertension after adjusting for gender (OR for females, 1.38), age (OR for 60–69 years, 13.13), GP visits (OR, 1.43) and living in East Germany (OR, 1.56).
Conclusions German survey data for antihypertensive treatment do not show any significant disadvantage for the lowest social class.

Keywords Hypertension · Treatment · Social gradient · Germany

U. Laaser · J. Breckenkamp (✉)
Faculty of Health Sciences, University of Bielefeld,
POB 100131, 33501 Bielefeld, Germany
e-mail: juergen.breckenkamp@uni-bielefeld.de

V. Bjegovic
Centre School of Public Health, Faculty of Medicine,
University of Belgrade, Belgrade, Serbia

Introduction

As earlier analyses have shown (Laaser and Breckenkamp 2006), the actual prevalence of hypertension (≥160 mmHg systolic and/or ≥95 mmHg diastolic) in Germans aged 30–69 years, including successfully treated hypertensives, has remained almost unchanged between 32.5% in 1984 and 34.4% in 1998 on the basis of the National Health Surveys of 1984, 1988, 1991 (in the Western German population) and 1998 (in the unified Germany). Correspondingly also the population prevalence of elevated blood pressure values has remained between 19.6 and 24.0%, i.e. the effect of treatment and lifestyle change was limited and certainly did not improve over time. In comparison between European countries and North America, Wolf-Maier et al. (2003) found Germany to have the highest prevalence for blood pressure, ≥140/90 mmHg, and one of the lowest treatment rates (26.0%).

The low level of high blood pressure control is well documented for many populations all over the world. We found 10.8% of all adult hypertensives successfully treated, i.e. with normalized blood pressures (see Table 1). In literature, there is a wide range, e.g. up to 65.7% of the actual prevalence, controlled in different studies with larger populations between $N = 2{,}992$ and $N = 26{,}913$ (Haijar and Kotchen 2003; Jo et al. 2001; Laaser et al. 1993; Leenen et al. 2008; Macedo et al. 2005; Meisinger et al. 2006; Psaltopoulou et al. 2004; Wang et al. 2004). In the majority of these studies, control rates between 10 and 20% were found. A recent study from India (Jonas et al. 2010) found a treatment rate of 8%, i.e. an even lower control rate. A Czech study reported an exceptional rise of the control rate from 3.9 to 17.0% (Cifkova et al. 2004).

Social status since long has been well known to be a good predictor of healthy life expectancy (Mathers et al.

Table 1 Parameters of hypertension (adapted from Laaser and Breckenkamp 2006)

Parameter	Numerator	Denominator	Ratio formed
Actual prevalence	Participants with increased values of blood pressure, or values normalized after successful treatment	All participants	$(a + d + k) \times 100/l$ $2{,}661 \times 100/5{,}081 = 52.4\%$
Awareness	Participants who are aware of risk factor values that are now or have been previously elevated	Participants with increased values of blood pressure, or values normalized after successful treatment	$(c + f) \times 100/(a + d + k)$ $1{,}269 \times 100/2{,}661 = 47.7\%$
Treatment coverage	Participants under medical treatment	Participants who are aware of risk factor values that are now or have been previously elevated	$c \times 100/(c + f)$ $845 \times 100/1{,}269 = 66.6\%$
Treatment effective	Participants under drug treatment with normalized values of the risk factor	Participants who are aware of risk factor values	$a \times 100/c$ $165 \times 100/845 = 19.5\%$
Controlled prevalence	Participants under drug treatment with normalized values of the risk factor	Participants with increased values of blood pressure, or values normalized after successful treatment	$a \times 100/(a + d + k)$ $165 \times 100/(1{,}522) = 10.8\%$
Population prevalence	Participants with increased values of blood pressure	All participants	$k \times 100/l$ $2{,}375 \times 100/5{,}081 = 46.7\%$

Hypertension ≥140 mmHg systolic and/or ≥90 mmHg diastolic	Normal	Elevated	All
Aware			
Hypertension treated			
Yes	165 (*a*)	680 (*b*)	845 (*c*)
No	121 (*d*)	303 (*e*)	424 (*f*)
Not aware	2,420 (*g*)	1,392 (*h*)	3,812 (*i*)
All	2,706 (*j*)	2,375 (*k*)	5,081 (*l*)

2001), burden of disease (Murray and Lopez 1996a) and cardiovascular diseases (Murray and Lopez 1996b). Recently, the WHO reports on social determinants (World Health Organization 2008; World Health Organization 2009) have let to a revival of the concept of social determinants of health. In searching for explanations for the low degree of blood pressure control, we therefore investigated the role of social class in Germany, adjusting for gender, age, access to health care and living in the eastern parts of Germany.

Methods

Data from the last nationally representative Federal Health Survey (FHS) in 1998 were available for analysis. The objective of this first all-German survey was to establish a routine instrument for health monitoring at the federal level (Bellach et al. 1998). Apart from the 18- to 79-year-old German population, the FHS also covered foreign citizens with a main domicile in Germany, who spoke adequate German. The net sample size of this cross-sectional study was 7,124 according to a response rate of 61.4%. A subset of the survey participants aged 30–69 years is presented ($N = 5{,}081$), representing the age band most critical with regard to hypertension control.

Data collection and medical examinations took place at 130 sample points in 113 cities and communities all over Germany from October 1997 until March 1999. Medical examinations (including blood pressure readings) were done by four examination teams with six staff members in each case at the locations (Potthoff et al. 1999).

Assessment of social status

To determine the social status, we used educational achievement as the most stable indicator. The variable "Education" was defined by the highest academic/professional qualification, measured by a range of 1–7 points, in which 1 represented the lowest and 7 the highest status (Hoffmeister et al. 1992). Based on this range, three social classes were defined: the lower class ranged from 1 to 3 points (no graduation/no vocational training, certificate of secondary education [Hauptschule, Realschule]/no vocational training), the middle class comprised 4 and 5 points (no graduation or certificate of secondary education [Hauptschule, Realschule]/and vocational training) and the upper class 6 and 7 points (university entrance diploma

[West Germany], extended secondary school [East Germany] with or without vocational training in each case) (Stolzenberg 2000). The different qualifications in the former eastern states of Germany, due to a different school system, were adapted to the qualifications in the former western states.

To analyse any major deviations if occupation and household income were used in addition, we employed a three-dimensional, additive, non-weighted social class index, the so-called "Winkler-Index" (Winkler and Stolzenberg 1999). The index has been derived from the validated short version of the "Scheuch-Index" (Scheuch 1974) and has been employed to describe social gradients in the German Cardiovascular Prevention Study (DHP) (Forschungsverbund 1998), which represented a study population of more than 1 million. Each of the three indicators is measured by a range of 1–7 points, and the Winkler-Index therefore can score from 3 to 21 (Hoffmeister et al. 1992). The results of the two instruments for determining social status do not differ to a significant extent; therefore, the following analyses were performed exclusively based on educational achievement.

Risk factor hypertension and parameters of treatment

During the survey, three blood pressure readings were taken with a standard device by trained observers (Forschungsverbund 1998) at intervals of 3 min. For analysis, the second and third readings—systolic and 5th phase diastolic blood pressure—in sitting position on the right arm were averaged (mean value). Elevated blood pressure was defined as a blood pressure of $\geq$140 mmHg systolic and/or $\geq$90 mmHg diastolic (5th phase) (World Health Organisation and International Society of Hypertension Writing Group 2003).

Regarding self-reported hypertension (awareness), the question was: "Which of the following diseases have you ever had?"

As regards the definition of treatment, only pharmacological prescriptions were considered. With reference to antihypertensive medications, a dosage of "several times a week" or more was considered as relevant drug intake and rated as positive. For participants with positive answers regarding medical treatment, a known hypertension was assumed in those cases where appropriate data in the questionnaire were missing.

For the definition and computation of parameters, see Table 1. It is of particular importance for intervention strategies to differentiate between the epidemiologically relevant "actual prevalence" and the "population prevalence". The actual prevalence is defined as the percentage of all persons with hypertension, including those with successfully treated and therefore normalized values. Compared with this, the population prevalence describes the occurrence of elevated blood pressures within a population, including those who are treated ineffectively. Whereas the population prevalence is of importance with regard to the medical supply (ineffective prescriptions, lack of compliance), the actual prevalence is a result of all factors causally effective in the pathogenesis of hypertension. This includes a genetic disposition as well as unhealthy ways of living.

Statistical analysis

Participants with missing measurements of blood pressure and with missing or incomplete information about social status were excluded from analysis. All analyses were performed on 2,595 female (51.1%) and 2,486 male (48.9%) participants, with the statistical software SAS 9.2.

Results

In the descriptive analysis, the answer "yes" (23.4%) for the item "high blood pressure, hypertension" was rated as positive answer. The answers "no" (69.5%) and "I don't know" (5.1%), as well as missing values (2.0%), with the exception of confirmed treatment, were rated as negative answers. Table 2 shows that the actual as well as the population prevalence is highest in the lower class and lowest in the upper class irrespective of the borderlines for elevated blood pressure.

In the first step, we analysed the frequency of physician contacts during the last 12 months. Whereas men and women indicated equally frequent visits to a general practitioner ("Praktischer Arzt/Arzt fuer Allgemeinmedizin") (67.0 and 71.0%, respectively), Table 3 shows that the lower class had closer physician contacts than the higher classes, i.e. 76.0% as compared to 70.6 and 59.0% in terms of any contact, and a higher average number of visits, e.g. 10.8 to any physician, as compared to 8.7 and 7.2.

In a second step, we ran a logistic regression analysis which after inclusion of all variables resulted in Table 4. Gender and age were associated with the degree of treatment. Although the odds ratios (OR) for social status pointed in the expected direction, favouring the upper class, they did not reach statistical significance. However, the visit to a general practitioner has a relatively small but just statistically significant impact on antihypertensive treatment, as well as being a citizen of one of the Eastern German states.

A further logistic regression targeting the degree of treatment effectiveness in terms of controlled blood pressures ($N = 845$) revealed again statistically insignificant

Table 2 Prevalence of hypertension (%) according to educational level (as a proxy for social class)

Prevalence	Lower class $N = 779$	Middle class $N = 3273$	Upper class $N = 1,029$	Average prevalences $N = 5,081$
Actual prevalence				
≥160/95	45.3***	35.9**	29.6	37.0
≥140/90	59.4***	53.3*	44.5	52.4
Population prevalence				
≥160/95	28.4***	25.1*	21.1	25.3
≥140/90	51.9***	47.6***	40.5	46.8

German National Health Survey, Germany, 1998

Chi square test to test hypothesis that distributions in lower class and middle class, respectively, differ from upper class: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 3 Physician contacts during the previous 12 months

Physician contacts in the general population, aged 30–69 years	Lower class ($N = 779$)	Middle class ($N = 3,273$)	Upper class ($N = 1,029$)	Total ($N = 5,081$)
Any visit to a general practitioner	76.0%***[a] (592/779)	70.6%***[a] (2,309/3273)	59.0% (607/1,029)	69.0% (3,508/5,081)
Average number of visits[b] to a general practitioner	4.7***[c]	3.3***[c]	2.3	3.3
Average number of visits to any physician including specialists	10.8***[c]	8.7***[c]	7.2	8.7

German National Health Survey, Germany, 1998

[a] Chi square test: distribution of lower class and middle class, respectively, versus upper class: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

[b] Missing values set at "0"

[c] t test: values of lower class and middle class, respectively, versus upper class: *$p < 0.05$, **$p < 0.01$; ***$p < 0.001$

Table 4 Logistic regression of potential determinants of antihypertensive treatment

Variable	Point estimate	95% Confidence interval
Females	1.38	1.05–1.80
Males	1.00 (Reference)	
Age4 (60–69 years)	13.13	8.39–20.55
Age3 (50–59 years)	5.45	3.58–8.31
Age2 (40–49 years)	2.62	1.67–4.10
Age1 (30–39 years)	1.00 (Reference)	
Visit of a GP YES	1.43	1.06–1.93
Visit of a GP NO	1.00 (Reference)	
Former East Germany	1.56	1.19–2.04
Former West Germany	1.00 (Reference)	
Upper class	1.46	0.91–2.34
Middle class	1.12	0.79–1.59
Lower class	1.00 (Reference)	

Subgroup: antihypertensive treatment YES ($N = 842$) or NO ($N = 421$) of those being aware of presently or formerly elevated blood pressures ($N = 1,263/5,081$). German National Health Survey, Germany, 1998

GP general practitioner

OR for potential effects of social class with 0.88 (95% CI 0.56–1.40) for the middle class and 0.83 (95% CI 0.45–1.56) for the upper class. The same applies for the status as an East German (OR 1.17, 95% CI 0.82–1.66). Visiting a general practitioner has an effect in the sense that a visit during the previous 12 months is associated with a lower chance of having normalized blood pressure (OR 0.61, 95% CI 0.41–0.92) (Table 5).

Discussion

Our findings are as expected, in line with almost all of the international literature two decades ago (Tyroler 1989) as well as more recently (e.g. Colhoun et al. 1998; Daistra et al. 2005; Regidor et al. 2006; Vukovic et al. 2008), which confirms a higher prevalence of cardiovascular disease and the related risk factors for the lower social class irrespective of the way how social status is determined. Recently, Conen et al. (2009) found education, but not income, to be a strong predictor of blood pressure progression in women.

Table 5 Logistic regression of potential determinants of antihypertensive treatment

Variable	Point estimate	95% Confidence interval
Females	0.84	0.58–1.23
Males	1.00 (Reference)	
Age4 (60–69 years)	0.39	0.20–0.80
Age3 (50–59 years)	0.39	0.19–0.79
Age2 (40–49 years)	0.60	0.28–1.31
Age1 (30–39 years)	1.00 (Reference)	
Visit of GP Yes	0.61	0.41–0.92
Visit of GP No	1.00 (Reference)	
Former East Germany	1.17	0.82–1.66
Former West Germany	1.00 (Reference)	
Upper class	0.83	0.45–1.56
Middle class	0.88	0.56–1.40
Lower class	1.00 (Reference)	

Subgroup: treatment effective YES ($N = 164$), No ($N = 678$) of those with antihypertensive treatment ($N = 842$). German National Health Survey, Germany, 1998

GP general practitioner

As we find similar gradients for the actual as well as for the population prevalence (see Table 2) irrespective of the borderlines chosen for elevated blood pressure (≥140/90 or≥160/95 mmHg), we can quite safely assume that the measurement methodology chosen separates reasonably well hypertensive from non-hypertensive persons. Also, there is no indication that the low levels of awareness and treatment have been strikingly improving since (Loewel et al. 2006; Meisinger et al. 2006).

The same applies to the frequency of physician contacts, which were determined in various ways by the survey questionnaire (Table 3). The participants classified as lower social status indicated about twice as many visits to a general practitioner as members classified as upper class. This seems logical if in fact the lower class is in general more prone to disease than the upper one. The question remains of course whether this obviously unrestricted access to the German health-care system leads to a better control in case of elevated blood pressures. Looking at treatment effectiveness, this seems not to be the case, as visiting a general practitioner more often—being a member of the lower social class—did not increase the chance of having normalized blood pressures, rather to the contrary.

To disentangle these relationships, we ran a logistic regression (see Table 4), which did not come up with a statistically significant influence of educational achievement on pharmacological antihypertensive treatment after adjustment for gender, age, visiting a general practitioner and living in East Germany. The statistically significant OR of the latter disappeared when treatment effectiveness (i.e. blood pressures normalized under antihypertensives) was targeted as the dependent variable. A disadvantage for the lower social class in terms of medical care therefore seems to be rather small, especially in the East German states. Disturbing questions arise from the discrepancy between the higher frequency of medical visits in the lower class (see Table 3) and their lower treatment coverage, although not statistically significant (Table 4). An admittedly speculative explanation could be that the communication between physician and patients with lower educational background is to some degree ineffective in spite of more intense contacts. This would support the relevance of the relatively new concept of health literacy (Jovic-Vranes et al. 2009). Especially, the concept of health literacy in this context merits further research.

It is interesting to note that in spite of the abundance of studies on social disparities, on the one hand, and the prevalence and control of hypertension, on the other, we found only few studies linking expressively effective high blood pressure control to social gradients. For example, Chen et al. (2003) found that in Scotland poor control of hypertension was not related to social deprivation. On the other hand, De Gaudemaris et al. (2002) found in France that blood pressure control under treatment was lower among lower occupational categories. For China, Muntner et al. (2004) could show that among those aware of their hypertension, treatment was more common at higher income. Finally, Shah and Cook (2001) summarize for England what seems to be the case in most western countries: "We found little evidence for socio-economic or geographic differences in the management of hypertension".

Thus it seems that in developed health-care systems whether of the English Beveridge or the German Bismarck type, lower social status does not constitute a major disadvantage for getting access to and benefiting from medical care in terms of antihypertensive treatment and control. This could have been expected given the differential life expectancy (as discussed in the "Introduction") and blood pressure distribution (see e.g. Table 2) according to social status. However, it should also be noted that the low level of hypertension control is appalling given the fact that normalization of elevated blood pressure contributes considerably to prolongation of healthy life expectancy.

While the strength of our study is the availability of a complete nationally representative database, its limitation is that the survey had been executed in 1998, more than a decade ago. However, it seems that little has changed since as discussed above (Loewel et al. 2006; Meisinger et al. 2006). Another weakness potentially is the restriction only to the educational dimension of social status, although we did not find any added value making use also of occupation and household income (Winkler and Stolzenberg 1999).

The German survey shows a higher prevalence of hypertension in men compared to women (Thefeld 2000)

and higher blood pressure levels in the former East German states (Thamm 1999). As expected, the prevalence of hypertension (treated or untreated) is highest in the lower social class. Taking into account the variables available for our analysis, this can be best explained by gender and age as well as living in eastern Germany and relates to a higher frequency of physician contacts. A disadvantage for the lower social class, however, in terms of antihypertensive medical care seems to be rather small if any, especially for the eastern part of the German population. In Germany and likely also in some other European countries, interventions as well as research efforts to improve the health status of the lower social class should be directed predominantly to the living conditions and lifestyle, whereas the social gradients in medical care are rather uneven. The forthcoming new National Health Survey in Germany (Robert Koch Institut 2011) will provide a follow-up of the relationship between social status and high blood pressure and its treatment.

Conflict of interest None.

References

Bellach BM, Knopf H, Thefeld W (1998) Der Bundes-Gesundheitssurvey 1997/98. Das Gesundheitswesen 60(Sonderheft 2):59–68

Chen R, Tunstall-Pedoe H, Morrison C et al (2003) Trends and social factors in blood pressure control in Scottish MONICA surveys 1986–1995: the rule of halves revisited. J Hum Hypertens 17:751–759

Cifkova R, Skodova Z, Lanska V et al (2004) Trends in blood pressure levels, prevalence, awareness, treatment, and control of hypertension in the Czech population from 1985 to 2000/2001. J Hypertens 22(6):1479–1485

Colhoun HM, Hemingway H, Poulter NR (1998) Socio-economic status and blood pressure: an overview analysis. J Hum Hypertens 12(2):91–110

Conen D, Glynn RJ, Ridker PM et al (2009) Socioeconomic status, blood pressure progression, and incident hypertension in a prospective cohort of female health professionals. Eur Heart J 30(11):1378–1384

Daistra JA, Kunst AE, Borell C et al (2005) Socioeconomic differences in the prevalence of common chronic diseases: an overview of eight European countries. Int J Epidemiol 34(2): 316–326

De Gaudemaris R, Lang T, Chatellier G, Larabi L et al (2002) Socioeconomic inequalities in hypertension prevalence and care: the IHPAF Study. Hypertension 39:1119–1125

Forschungsverbund DHP (1998) Die Deutsche Herz-Kreislauf Praeventionsstudie. Hans Huber Publishing Company, Bern

Haijar I, Kotchen TA (2003) Trends in prevalence, awareness, treatment, and control of hypertension in the United States, 1988–2000. JAMA 290(2):199–206

Hoffmeister H, Hütter H, Stolzenberg H, Lopez H, Winkler J (1992) Sozialer Status and Gesundheit. Nationaler Gesundheits-Survey 1984–86. Unterschiede in der Verteilung von Herz-Kreislauf-Krankheiten und ihrer Risikofaktoren in der Bevölkerung der Bundesrepublik Deutschland nach Schichten und Gruppen. BGA-Schriften 2/92. MMV Medizin Verlag, München

Jo I, Ahn Y, Lee J et al (2001) Prevalence, awareness, treatment, control and risk factors of hypertension in Korea: the Ansan study. Hypertension 19(9):1523–1532

Jonas JB, Nangia V, Matin A et al (2010) Prevalence, awareness, control, and associations of arterial hypertension in a rural central India population: the Central India Eye and Medical Study. Am J Hypertens 23(4):347–350

Jovic-Vranes A, Bjegovic-Mikanovic V, Marinkovic J (2009) Functional health literacy among primary health-care patients: data from the Belgrade pilot study. J Public Health (Oxf) 31(4): 490–495

Laaser U, Breckenkamp J (2006) Trends in risk factor control in Germany 1984–1998: high blood pressure and total cholesterol. Eur J Public Health 16(2):217–222

Laaser U, Lemke-Goliasch P, Schumann V et al (1993) Behandlung und Kontrolle primärer kardiovaskulärer Risikofaktoren in den alten Bundesländern. Zeitschrift fuer Gesundheitswissenschaften 1(1):35–46

Leenen FH, Dumais J, McInnis NH et al (2008) Results of the Ontario survey on the prevalence and control of hypertension. CMAJ 178(11):1441–1449

Loewel H, Meisinger C, Heier M et al (2006) Epidemiology of hypertension in Germany. Selected results of population representative cross-sectional studies. Dtsch Med Wochenschr 131(46): 2586–2591

Macedo ME, Lima MJ, Silva AO et al (2005) Prevalence, awareness, treatment, and control of hypertension in Portugal: the PAP Study. Hypertension 23(9):1661–1666

Mathers CD, Sadana R, Salomon JA et al (2001) Healthy life expectancy in 191 countries, 1999. Lancet 357(9269):1685–1691

Meisinger C, Heier M, Voelzke H et al (2006) Regional disparities of hypertension prevalence and management within Germany. J Hypertens 24(2):293–299

Muntner P, Gu D, Wu X et al (2004) Factors associated with hypertension awareness, treatment, and control in a representative sample of the Chinese population. Hypertension 43:578–585

Murray CJL, Lopez AD (eds.) (1996a) The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020. Global burden of disease and injury series, vol. 1. Harvard University Press, Cambridge

Murray CJL, Lopez AD (eds.) (1996b) Global health statistics: a compendium of incidence, prevalence and mortality estimates for over 200 conditions. Global burden of disease and injury series, vol. 1. Harvard University Press, Cambridge

Potthoff P, Schroeder E, Reis U, Klamert A (1999) Ablauf und Ergebnisse der Feldarbeit beim Bundes-Gesundheitssurvey. Das Gesundheitswesen 61(Sonderband 2):62–67

Psaltopoulou T, Orfanos P, Naska A et al (2004) Prevalence, awareness, treatment, and control of hypertension in a general population sample of 26, 913 adults in the Greek EPIC study. Int J Epidemiol 33(6):1345–1352

Regidor E, Gutierrez-Fisac JL, Banegas JR et al (2006) Association of adult socioeconomic position with hypertension in older people. J Epidemiol Community Health 60(1):74–80

Robert Koch Institut (2011) Studie zur Gesundheit Erwachsener in Deutschland (DEGS). http://de.wikipedia.org/wiki/Bundes-Gesundheitssurvey (Accessed 05 April 2011)

Scheuch EK (1974) Sozialprestige und soziale Schichtung. in: Glass DR, König R (Hrsg) Soziale Schichtung und soziale Mobilität. Kölner Zeitschrift für Soziologie und Sozialpsychologie (Sonderheft 5)

Shah S, Cook DG (2001) Inequalities in the treatment and control of hypertension: age, social isolation and lifestyle are more important than economic circumstances. J Hypertens 19(7): 1333–1340

Stolzenberg H (2000) Bundes-Gesundheitssurvey 1998. Public Use File BGS98. Dokumentation des Datensatzes, Berlin

Thamm M (1999) Blutdruck in Deutschland – Zustandsbeschreibung und Trends. Das Gesundheitswesen 61(Sonderheft 2):90–93

Thefeld W (2000) Verbreitung der Herz-Kreislauf-Risikofaktoren Hypercholesterinämie, Übergewicht, Hypertonie und Rauchen in der Bevölkerung. Bundesgesundheitsbl—Gesundheitsforsch—Gesundheitsschutz 43: 415–423

Tyroler HA (1989) Socioeconomic status in the epidemiology and treatment of hypertension. Hypertension 13(5 Suppl):194–197

Vukovic D, Bjegovic V, Vukovic G (2008) Prevalence of chronic diseases according to socioeconomic status measured by wealth index: health survey in Serbia. Croat Med J 49(6):832–841

Wang ZW, Wu YF, Zhao LC et al (2004) Trends in prevalence, awareness, treatment, and control of hypertension in middle-aged Chinese population. Zhonghua Liu Xing Bing Xue Za Zhi 25(5):407–411

Winkler J, Stolzenberg H (1999) Der Sozialschichtindex im Bundes-Gesundheitssurvey. Das Gesundheitswesen 61(Sonderheft 2): 178–183

Wolf-Maier K, Cooper RS, Banegas JR et al (2003) Hypertension prevalence and blood pressure levels in six European countries, Canada, and the United States. JAMA 289(18):2363–2369

World Health Organisation, International Society of Hypertension Writing Group (2003) World Health Organization (WHO)/ International Society of Hypertension (ISH) statement on management of hypertension. J Hypertens 21:1983–1992

World Health Organization (2008) Commission on social determinants of health: closing the gap in a generation. WHO, Geneva. http://www.who.int/social_determinants/thecommission/finalreport/en/index.html, visited 13 July 2010

World Health Organization (2009) Global health risks: mortality and burden of disease attributable to selected major risks. WHO, Geneva (http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf visited 13 July 2010)