Needs of chronic disease prevention in Germany

Prof. Ulrich John, Dr. Sabina Ulbricht, PD Dr. Jennis Freyer-Adam, PD Dr. Christian Meyer
University Medicine Greifswald, Institute of Epidemiology and Social Medicine

This paper provides an outline of needs of chronic disease prevention with the focus on effectiveness at the population level. First, background information is given including epidemiological evidence and limitations of preventive efforts so far. The limitations include a lack of comprehensive preventive action. Second, necessary parts of a preventive program are explained from the viewpoint of scientific evidence. The program includes populations to be addressed, interventions, outcomes, and an evaluation. Third, an outlook is given for action priorities.

1. Background

In developed countries non-communicable chronic disease, particularly cardiovascular disease and cancer, has superseded communicable disease as the main cause of death. According to World Health Organization (WHO) death cases from non-communicable diseases (NCDs) will further increase by 15 % from the year 2010 to 2020 (WHO, 2011). In Germany, 66.6 % of the causes of death in the year 2010 were due to cardiovascular disease or cancer (http://www.gbe-bund.de). This corresponds to 66 % in Europe in 2008 (OECD, 2010).

There is international agreement that chronic disease is largely dependent on behavior (WHO, 2013; Perk et al., 2012; OECD, 2010). Behavior has been shown to be the single most influential among five domains that determine our health. The other four

are genetic endowments, social circumstances, environmental conditions, and medical care (McGinnis et al., 2002). Consequently, WHO stated "Evidence shows that NCDs are to a great extent preventable." (WHO, 2011). Worldwide, among death cases 10.5 % have been attributed to tobacco smoking, 5.6 % to lack of physical activity, 4.9 % to overweight or obesity due to high caloric intake, and another 4.0 % to unhealthy alcohol consumption (WHO, 2011). These four health risk behaviors (HRBs) compared to other risk factors are connected with the highest risk of the global burden of disease (Lim et al., 2012). The four HRBs have been referred to as the leading causes of death in the USA (Mokdad et al., 2004). Among risk factors, overweight, physical inactivity, and smoking have been shown to be related with the highest proportion of cardiovascular, and smoking to be related with the highest proportion of cancer death cases in the US (Danaei et al., 2009). Estimates for Germany revealed that 10.9 % of death cases were attributable to tobacco smoking alone, 6.3 % to smoking or alcohol risk drinking, and another 2.3 % to alcohol risk drinking alone in 1997 (John & Hanke, 2002). Among inpatient hospital treatments of patients aged 25 or older or less than one year, 9.9 % may have been due to smoking or alcohol risk drinking (Hanke & John, 2003). While tobacco smoking remained to be the single most preventable disease risk there is an increasing overweight epidemic (Schmechtig & Hahne, 2012; Finucane et al., 2011).

Reasons for needs of chronic disease prevention are simple. Perhaps the most serious reason is the necessity to keep people safe from health disturbance. Data are delivered by epidemiology. Overwhelming evidence exists about the largely causal role of tobacco smoking in many diseases. Just nine common well-known risk factors may explain 90 % of the global risk on myocardial infarction (Yusuf et al., 2004), and these risk factors are clearly dominated by the HRBs (McGorrian et al., 2011). Dose response relations with coronary heart disease and cancer have been revealed for the four HRBs both together and within a single behavior (Ford et al., 2009; Chiuve et al., 2006). This is important for needs of prevention since the majority of the adult general population in Germany exerts multiple risk behaviors. According to data of the German health survey 1998, among the adult general population 69.6 % had two or more, 26.1 % one, and only 4.3 % none of the four HRBs (own data analysis).

Two main long-term goals of preventive action are of first priority for decisions on chronic disease prevention: add to the decrease of chronic disease mortality and compress morbidity. Mean lifetime of people in Germany has steadily increased, among females from 68.5 years in 1950 to 82.7 years in 2010, among males from 64.6 in 1950 to 77.7 in 2010 (DeStatis, 2013). Disparities exist by socioeconomic status. The higher the income the longer the life expectancy is (Lampert et al., 2007). The role of prevention in the decrease of mortality has been delivered by data in favor of the IMPACT model. It provides calculations of rates of individuals with specific risk factors and rates of treatments for cardiovascular health over time. These rates are related to decreasing cardiovascular mortality rates. According to IMPACT model data of several studies, among the decrease of death cases in coronary heart disease at least 50 % have been attributed to the decrease of risk factors and less than half to progress in treatment (Di Chiara & Vanuzzo, 2009).

Compression of morbidity, i. e. the shortening of time with disease and other disability before death, may be realized. This has been revealed by cohort study data (Fries et al., 2011). Evidence suggests that age at disability may be more postponed than death (Fries et al., 2011). Compression of morbidity has been seen as one of several types of aging (Robine & Michel, 2004). One main goal of prevention is to increase healthy aging of populations by compression of morbidity.

Mortality and compression of morbidity data may be combined. One approach is provided by disability adjusted life years (DALYs). This metric includes both mortality and ill-health data (Murray et al., 2012). DALYs may be calculated “as the sum of years of life lost due to premature mortality (YLLs) and years lived with disability (YLDs).” (Murray et al., 2012, p. 2198). Disability may be understood as any health disturbance or functional loss other than death (Murray et al., 2012). DALYs have been used to express global burden of disease.

In contrast to the burden of disease that may be attributed to HRBs there have been only little efforts to develop and practice prevention which is effective at the population level. Some countries in different areas of the world have been particularly active in the prevention of tobacco- or alcohol-attributable disease. They may provide an action paradigm. In California the decline of smoker rates coincided with the increase

of investments in tobacco control (Farrelly et al., 2008). Decrease of morbidity was shown. Based on this evidence and the WHO Framework Convention on Tobacco Control (http://www.who.int/fctc/en/) it is known what has to be done in the tobacco field. Germany has been estimated on the fifth lowest rank, rank 26, among 30 European countries according to the prevention of tobacco-attributable disease. Criteria were legislation in favor of prevention, price of tobacco products, and the budget for preventive action in the tobacco field (Joossens & Raw, 2011). Well-known but less practiced in the majority of European countries is the prevention of alcohol-attributable disease. Scandinavian countries have demonstrated strong evidence since the beginning of the 20th century (Österberg & Karlsson, 2002; Room, 2002). Germany according to legislation activities in the areas of availability, price, traffic, and public awareness of risks related to alcohol consumption has been ranked the third lowest position among 30 countries of the Organization for Economic Cooperation and Development (OECD; Brand et al., 2007). It may be concluded, first, that there are examples of reasonable preventive action at a national level. Second, Germany in international comparison has strongly neglected to develop and practice a prevention program.

A lag between evidence and action in chronic disease prevention exists. The success of preventive efforts from single states has not been sufficiently followed by broader preventive action in many countries. Preventive action includes all interventions that are intended to add to the decrease of chronic disease mortality and to the compression of morbidity. Even if no political decision to invest larger resources may be achieved simple and inexpensive measures are available. Ten such inexpensive preventive measures to reduce HRBs have been proposed by WHO: protect against tobacco smoke, warn about the dangers of tobacco smoke, ban tobacco advertising, increase taxes on tobacco, regulate availability of alcohol, ban alcohol advertising, increase taxes on alcohol, reduce salt intake, substitute trans-fat by polyunsaturated fat, campaign according to diet and physical activity (WHO, 2011). Data suggest that the problem of a lag between knowledge and its transfer into practice is particularly severe in Germany (e. g. Joossens & Raw, 2011).

In addition to the successes of preventive efforts so far there are also limitations. Limitations of prevention so far may be found according to populations, HRBs, and

preventive measures. The variety of populations has not sufficiently been taken into focus. Populations may be defined as people that have demographic and conceivably further characteristics in common. Specific barriers against behavior change at the population level have not been elucidated sufficiently (Warner & Burns, 2003). “Hard-core” populations may exist that include people who are reluctant to preventive endeavors for different reasons, low socioeconomic status and psychiatric disorders being two of them. Too little is known about potentially acting factors in low socioeconomic status such as health literacy (Paasche-Orlow & Wolf, 2010). Psychiatric comorbidity has not been considered sufficiently although it may be particularly prevalent among populations with HRBs (Lasser et al., 2000). Depressive disorders are among the 30 most common causes of years lived with disability (Vos et al., 2012). Depressive disorders might add to the maintenance of adverse health behaviors, and populations with depressive disorders seem to have special needs for intervention that is tailored to these.

According to HRBs, two limitations seem to be predominant: variety of simultaneously existing HRBs and life span. Simultaneously existing HRBs have not been met so far by particular preventive approaches. Different preventive action might be needed dependent on specific constellations of HRBs, e. g. overweight and smoking. According to life span, there seems to be consensus that interventions should be tailored to different phases of life. So far, populations at different ages and relations between them have not been considered sufficiently.

According to preventive measures, promising evidence exists from single states such as California (Warner et al., 2008) or Scandinavian countries (Österberg & Karlsson, 2002). However, limitations also exist. Two specific limitations are that comprehensiveness seemingly has not been practiced in a sufficiently broad sense and that forces of prevention are too weak to date. Comprehensiveness means that as many interventions as possible should be provided to succeed in prevention effectiveness. One main reason for comprehensiveness of prevention programs is that preventive action occurs in a field of conflicting interests. Evidence revealed that the increase of resources for interventions coincided with or was followed by increases of resources of the tobacco industry (Begay et al., 1993). Compared with financial resources of such industries the public health sector is “poor”. Comprehensiveness did not seem

to sufficiently include a tailoring of measures to the needs of the target populations. This means the most suitable contacting of and intervention in different populations, and addressing all existing HRBs. According to the contacting of target populations, proactive approaches have not been practiced sufficiently. In a proactive approach every individual is contacted in contrast to a reactive approach in which only those individuals who are interested and ask for help will receive support. Forces of prevention come from the general population, are mainly determined by health-related goals of strong majorities among populations, and include a large variety of actors. A large variety of actors have not been involved in a concerted preventive action and systematic way. Institutions that add to socialization in childhood, youth, and adulthood should add to preventive efforts. It may be concluded that a comprehensive program of prevention is needed.

2. Prevention program

A prevention program may be formulated that includes provisions of prevention and their outcomes. The program has the long-term aim to add to the increase of life expectancy and to compress time with disability and disease before death. The provisions and the outcomes should be comprehensive. Evaluation should reveal whether this aim has been realized by the interventions.

Provisions of prevention

Two main aspects of the provisions are: populations and interventions. Interventions should be suited to different target populations. This is included in comprehensive provisions. Comprehensiveness is to be understood across populations and within a single population that is targeted by preventive action. Interventions should work in populations that differ according to several criteria. One main criterion is social disparity. There is need of evidence about whether interventions should be tailored to different socioeconomic status, if so, to what degree. One intervention may be more effective in one population than in another. E.g. tax increases on risky products such as alcohol or tobacco may be particularly effective among those who are at particularly high risk such as unemployed or young people who do not belong to the workforce yet. There may be additional criteria such as hedonistic lifestyle or psychiatric disorders, particularly depressive states or depressive disorders, which may act as a barrier against healthy living. The whole life span should be included. Parts of life

span may act as barriers to preventive efforts. Dependent on the fact that some target populations may need strong support, dependent on their load of HRBs and their ability to get rid of these, others may need only a minimum of motivational efforts.

When a target population has been defined, three steps have to be taken. The target population is to be addressed, contacted and motivated to participate until people participate in the intervention. This process needs specific action. The three steps are needed for all interventions.

Intervention will be delivered after a target population has been motivated to participate. Interventions are to make HRBs unattractive and are to motivate populations to divert from HRBs to health behavior. Health behavior is the opposite of HRBs: living smoke-free, with alcohol consumption below recommended levels or drinking no alcohol at all, with practicing a balanced diet and a recommended minimum of physical activity. Living smoke-free includes smoke-free environments. A balanced diet means the practice of meals according to recommendations and a caloric intake that is balanced to energy expenditure. Physical activity should be integrated in everyday life according to recommendations. Health behavior should be possible in an atmosphere of self-determination of the individual and the taking of responsibility for the public. Health as a public good needs the contribution of everybody or at least the majorities of populations.

Interventions include two main provisions (Figure 1): first, change risky products or environments and, second, change HRBs directly. Both approaches are to reduce HRBs at the population level. Both approaches need a theoretical base. Theories guide us in conceptualizing single actions and their interplay and synergies. The utilization of theory makes efficacy and effectiveness of a preventive program more probable than action without theoretical guidance. Both approaches are to make HRBs unattractive. Both approaches are to add to each other in order to secure a minimum effectiveness on outcomes. In addition, resources for prevention are needed.

The change of risky products and environments is preferably realized by legislative action. A main theory base of this approach is changing social norms. According to

evidence, this may be achieved by regulations of consumption with respect to price, locations of consumption, availability (time, location), protection of youth, protection of others who are at risk without being able to control the risk (protection of the unborn, protection of exposure to environmental tobacco smoke), and regulations of product promotion (advertising, promotion, sponsoring). Environments are to be made attractive to support the intention to live a physically active life. Neighborhoods and traffic infrastructure should be conceptualized according to that.

The direct change of HRBs includes addressing HRBs among target populations of individuals who are at risk to practice HRB or who practice it. Behavior change theories and techniques are provided at a high level of knowledge (Spahn et al., 2010; Webb et al., 2010). Theories of behavior change are an intervention prerequisite which helps to provide a high probability of intervention success. In the majority of a target population this probably means to motivate people to change HRBs. One reason for the need to include action to motivate individuals to change is provided by evidence. The majority of general populations of those who exert risk behaviors do not intend to change it in the foreseeable future (John et al., 2003). The absence of motivation to reduce HRBs at one point of time does not preclude preventive action.

Main provisions of direct HRB change are brief interventions including advice and counseling. This is now possible after computer devices have been developed that enable the provision of individualized counseling to entire populations. Setting or supporting the motivation to reduce HRBs in the individual is dominant in such approaches. One assumed factor of its effectiveness is individualization. This means that the interventions, although suited to entire populations, use individual information and provide individualized feedback to each single participant. There may be additional strategies to be provided such as motivational interviewing if personal contact is needed. Furthermore, educational and training programs may be helpful. Treatment may be suitable among minorities who do not respond to counseling or who have special problems to behave in a healthy way.

Another important intervention approach is to reduce social disparity by increasing socioeconomic status among those who are at the lowest end of it (Wilkinson &

Pickett, 2009). If education and income are secured at a reasonable minimum it may be assumed that less effort will be needed for reducing HRBs.

Resources for preventive action are needed. They include paid staff and non-governmental pressure groups that are not paid by the state. Resources should be established on a long-term base and dependent on two conditions. First, preventive action occurs in an arena of different interests, international and national. Preventive action particularly occurs in opposition to interests of industries as has already been explained. Second, provisions of prevention must be seen in size similar to provisions of medical care. IMPACT model data as explained above (Perk et al., 2012; Di Chiara & Vanuzzo, 2009) suggest that more than half of state resources for health may be invested in chronic disease prevention. Preventive efforts may distract parts of populations from treatment. Sufficient power must be provided by prevention. Otherwise, effects may not be expected.

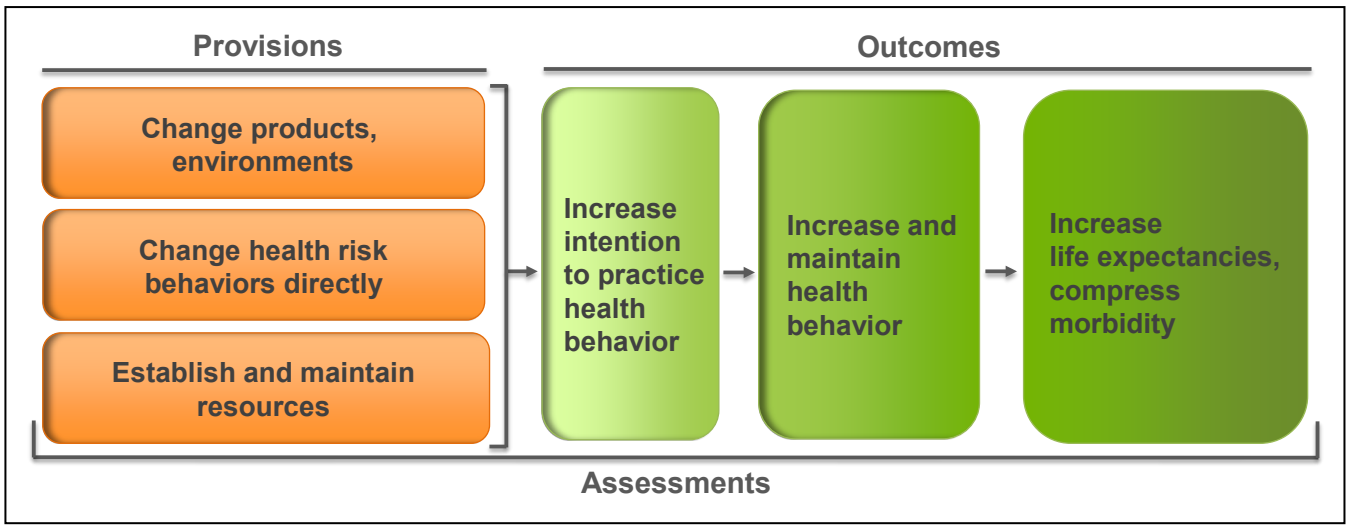
Intervention should be comprehensive. As many of the above mentioned measures as possible should be included in concerted intervention action. Comprehensiveness of intervention includes that the single measures reach the diversity of populations, life span and social disparity, and all four HRBs. All four HRBs should be addressed simultaneously or in sequence in a variety of populations, including those at highest risk and including the whole life span. A large variety of actors in prevention who have access to target populations should add to preventive action. This includes legislative forces and actors in working life, education, medical care, and social welfare. Actors should organize themselves in networks and agree on principles of prevention. Some promising work has been started in this field in Germany (BVPG, 2013).

Outcomes of prevention

Three steps of outcomes should be considered for target populations: increase intention to practice health behavior and to live healthy, increase and maintain health behavior, increase life expectancies and compress time with disease and other disability before death. The motivation to reduce HRBs has to be generated or supported among entire populations. This is important since it has been revealed by data that majorities of smoker populations did not intend to quit within their foreseeable future. HRB change at the population level includes all of the following: reduce tobacco

smoking, alcohol risk drinking, inadequate nutrition, and insufficient physical activity. According to the available evidence, compression of morbidity in the last months or years immediately before death may be assumed to be the stronger the smaller the lifetime dose of HRBs is (Fries et al., 2011).

Figure 1: Prevention: Provisions and Outcomes



Assessments are needed to analyze the effectiveness of the provisions. Effects should be understood in the sense of population impact. This includes five elements: reach, efficacy, adoption, implementation, and maintenance (RE-AIM, Glasgow et al., 1999). Reach may be understood as the proportion among the target population who have been contacted and take part in the intervention. Evidence of participation may be the stopping or maintenance of purchasing cigarettes after a price increase or the taking part in an individualized brief intervention to directly change HRBs. Efficacy refers to the causes of effects of an intervention or the entire intervention program. Efficacy is assessed using intended and non-intended outcomes. Adoption means the acceptance of the intervention by those institutions or communities who are involved in the intervention, e. g. physicians in primary medical care who are willing to provide a brief intervention to every overweight patient. Implementation is conceptualized as the degree to which an intervention or the entire program is provided as intended. (Glasgow et al., 1999). This includes the delivery of the intervention to individual participants and their adherence to the intervention. Maintenance is the sustaining of the intervention over time under routine care conditions. This includes e.g. the continuous enforcement of laws such as youth protection laws but also the

maintenance of a new behavior such as staying physically active in everyday routine (Glasgow et al., 1999). There is a need to assess population impact, and RE-AIM is suited to provide the information that is needed. Particularly adoption, implementation, and maintenance data are lacking. Health monitoring, mortality monitoring, and quality assessment of the provisions of prevention are needed. Assessment includes the measurement of the interventions and their relations to outcomes.

3. Outlook

First, we know about the successes of several preventive measures practiced in single countries. Descriptive longitudinal data revealed clear relations between the introduction of preventive measures and outcomes. Randomized controlled trials revealed intervention efficacy. This refers to tobacco smoking and to alcohol risk drinking. The next step in prevention development is to put into practice what has been revealed by evidence and to care for its maintenance over long time. For that purpose, a theory-based comprehensive program should guide the agenda of prevention. Second, we have only little knowledge in the fields of changing diet and increasing physical activities among populations. According to overweight, obesity and sedentary lifestyle, we know the hazards but there have been hardly any efforts of prevention at the population level including research. We have almost no knowledge about intervention in two or more HRBs at the same time or in sequence and about interactions between the single HRBs and how health behaviors may support each other. These fields with the greatest lack of knowledge should be particularly promoted. They are a main challenge.

References

Begay, M. E., Traynor, M., & Glantz, S. A. (1993). The tobacco industry, state politics, and tobacco education in California. *Am J Public Health, 83*(9), 1214-1221.

Brand, D. A., Saisana, M., Rynn, L. A., Pennoni, F., & Lowenfels, A. B. (2007). Comparative analysis of alcohol control policies in 30 countries. *PLoS Med, 4*(4), e151.

BVPG (2013). *„Potenzial Gesundheit“ Strategien zur Weiterentwicklung von Gesundheitsförderung und Prävention in der 18. Legislaturperiode aus Sicht der Bundesvereinigung Prävention und Gesundheitsförderung e.V. (BVPG) Langfassung ("Potential of prevention" Strategies of the development of health education and prevention in the 18th legislative period in the view of the German Association for prevention and health education, long version)*. Bonn: Bundesvereinigung für Prävention und Gesundheitsförderung.

Chiuve, S. E., McCullough, M. L., Sacks, F. M., & Rimm, E. B. (2006). Healthy lifestyle factors in the primary prevention of coronary heart disease among men: benefits among users and nonusers of lipid-lowering and antihypertensive medications. *Circulation, 114*(2), 160-167.

Danaei, G., Ding, E. L., Mozaffarian, D., Taylor, B., Rehm, J., Murray, C. J., et al. (2009). The preventable causes of death in the United States: comparative risk assessment of dietary, lifestyle, and metabolic risk factors. *PLoS Med, 6*(4), e1000058.

DeStatis. (2013). Sterbefälle. Durchschnittliche weitere Lebenserwartung nach Altersstufen. Retrieved from http://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/Bevoelkerung/Sterbefaelle/Tabellen/Lebenserwartung.pdf;jsessionid=4A38FFBA433CE91D4A9D9D3915363BB2.cae3?__blob=publicationFile

Di Chiara, A., & Vanuzzo, D. (2009). Does surveillance impact on cardiovascular prevention? *Eur Heart J, 30*(9), 1027-1029.

Farrelly, M. C., Pechacek, T. F., Thomas, K. Y., & Nelson, D. (2008). The impact of tobacco control programs on adult smoking. *Am J Public Health, 98*(2), 304-309.

Finucane, M. M., Stevens, G. A., Cowan, M. J., Danaei, G., Lin, J. K., Paciorek, C. J., et al. (2011). 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, 377*(9765), 557-567.

Ford, E. S., Bergmann, M. M., Kroger, J., Schienkiewitz, A., Weikert, C., & Boeing, H. (2009). Healthy living is the best revenge: findings from the European Prospective Investigation Into Cancer and Nutrition-Potsdam study. *Arch Intern Med, 169*(15), 1355-1362.

Fries, J. F., Bruce, B., & Chakravarty, E. (2011). Compression of morbidity 1980-2011: a focused review of paradigms and progress. *J Aging Res, 2011*, 261702.

Glasgow, R. E., Vogt, T. M., & Boles, S. M. (1999). Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *Am J Public Health, 89*(9), 1322-1327.

Hanke, M., & John, U. (2003). Tabak- oder alkoholattributable stationäre Behandlungen. *Deutsche Medizinische Wochenschrift, 128*(25-26), 1387-1390.

John, U., & Hanke, M. (2002). Tobacco smoking- and alcohol drinking-attributable cancer mortality in Germany. *Eur J Cancer Prev, 11*(1), 11-17.

John, U., Meyer, C., Rumpf, H.-J., & Hapke, U. (2003). Relation among stage of change, demographic characteristics, smoking history, and nicotine dependence in an adult German population. *Preventive Medicine, 37*(4), 368-374.

Joossens, L., & Raw, M. (2011). The Tobacco Control Scale 2010 in Europe. Brussels: Association of European Cancer leagues.

Lampert, T., Kroll, L. E., & Dunkelberg, A. (2007). Soziale Ungleichheit in der Lebenserwartung. *Aus Politik und Zeitgeschichte, , 42*, 11-17.

Lasser, K., Boyd, J. W., Woolhandler, S., Himmelstein, D. U., McCormick, D., & Bor, D. H. (2000). Smoking and mental illness: A population-based prevalence study. *JAMA, 284*(20), 2606-2610.

Lim, S. S., Vos, T., Flaxman, A. D., Danaei, G., Shibuya, K., Adair-Rohani, H., et al. (2012). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet, 380*(9859), 2224-2260.

McGinnis, J. M., Williams-Russo, P., & Knickman, J. R. (2002). The case for more active policy attention to health promotion. *Health Aff (Millwood), 21*(2), 78-93.

McGorrian, C., Yusuf, S., Islam, S., Jung, H., Rangarajan, S., Avezum, A., et al. (2011). Estimating modifiable coronary heart disease risk in multiple regions of the world: the INTERHEART Modifiable Risk Score. *Eur Heart J, 32*(5), 581-589.

Mokdad, A. H., Marks, J. S., Stroup, D. F., & Gerberding, J. L. (2004). Actual causes of death in the United States, 2000. *JAMA, 291*(10), 1238-1245.

Murray, C. J., Vos, T., Lozano, R., Naghavi, M., Flaxman, A. D., Michaud, C., et al. (2012). Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet, 380*(9859), 2197-2223.

OECD (2010). *Health at a glance. Europe 2010*: OECD Publishing.

Österberg, E., & Karlsson, T. (Eds.). (2002). *Alcohol policies in the EU member states and Norway. A collection of country reports*. Helsinki: STAKES.

Paasche-Orlow, M. K., & Wolf, M. S. (2010). Promoting health literacy research to reduce health disparities. *J Health Commun, 15 Suppl 2*, 34-41.

Perk, J., De Backer, G., Gohlke, H., Graham, I., Reiner, Z., Verschuren, M., et al. (2012). European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts). Developed with the special contribution of the European

Association for Cardiovascular Prevention & Rehabilitation (EACPR). *Eur Heart J, 33*(13), 1635-1701.

Robine, J. M., & Michel, J. P. (2004). Looking forward to a general theory on population aging. *J Gerontol A Biol Sci Med Sci, 59*(6), M590-597.

Room, R. (Ed.). (2002). *What happens to drinking and harm when alcohol controls change? NAD Publication no. 42*. Helsinki, Finland: Nordic Council for Alcohol and Drug Research (NAD).

Schmechtig, N., & Hahne, C. (2012). Veränderungen des Körpergewichts und Körperbildes von Kindern und Jugendlichen--Entwicklungstrends 2002-2006-2010 in Deutschland. *Gesundheitswesen, 74 Suppl*, S25-32.

Spahn, J. M., Reeves, R. S., Keim, K. S., Laquatra, I., Kellogg, M., Jortberg, B., et al. (2010). State of the evidence regarding behavior change theories and strategies in nutrition counseling to facilitate health and food behavior change. *J Am Diet Assoc, 110*(6), 879-891.

Vos, T., Flaxman, A. D., Naghavi, M., Lozano, R., Michaud, C., Ezzati, M., et al. (2012). Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet, 380*(9859), 2163-2196.

Warner, K. E., & Burns, D. M. (2003). Hardening and the hard-core smoker: concepts, evidence, and implications. *Nicotine Tob Res, 5*(1), 37-48.

Warner, K. E., Mendez, D., & Alshanqeety, O. (2008). Tobacco control success versus demographic destiny: examining the causes of the low smoking prevalence in California. *Am J Public Health, 98*(2), 268-269.

Webb, T. L., Sniehotta, F. F., & Michie, S. (2010). Using theories of behaviour change to inform interventions for addictive behaviours. *Addiction, 105*(11), 1879-1892.

WHO (2011). *Global status report on non communicable diseases 2010*. Geneva: WHO, .

WHO (2013). *The European health report 2012: charting the way to well-being*. Copenhagen: WHO Regional Office for Europe.

Wilkinson, R., & Pickett, K. (2009). *The Spirit level: Why more equal societies almost always do better*. London: Penguin.

Yusuf, S., Hawken, S., Ounpuu, S., Dans, T., Avezum, A., Lanas, F., et al. (2004). Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet, 364*(9438), 937-952.