



Universiteit
Leiden
The Netherlands

Strategies in preventive care for older people

Drewes, Y.M.

Citation

Drewes, Y. M. (2013, December 12). *Strategies in preventive care for older people*. Retrieved from <https://hdl.handle.net/1887/22867>

Version: Corrected Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/22867>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/22867> holds various files of this Leiden University dissertation

Author: Drewes, Yvonne

Title: Strategies in preventive care for older people

Issue Date: 2013-12-12

Chapter 1

General introduction

GENERAL INTRODUCTION

It is universally acknowledged that older people differ greatly from each other. For example, there is the healthy (sometimes wealthy) person, aged 75 years and over, who plays tennis or golf, still volunteers for activities with a social interest, frequently goes on holiday, and is still working on lifestyle improvements. On the other hand, there is the fragile widowed patient with decreased cognitive function, with only moderate self-care and health illiteracy. Is it justified to categorise these two types of older individuals into the same group for preventive strategies, even though their life expectancy, and levels of wellbeing and functioning are very different?

In current national prevention programs no difference is made between these types of individuals. For example, for breast cancer screening the woman's age is the stratifying criterion (i.e. 50-75 years). In a civil court case challenging the age criteria laid down in the permit for performing preventive breast cancer screening, the applicants argued that selection on the basis of age constituted a forbidden form of age discrimination by excluding women older than 75 years. The court of appeal concluded, however, that the medical reasons underlying this form of different treatment objectively justified using age as a selection criterion. The court concurred with the State that issued the permit, that for some women aged over 75 years preventive breast cancer screening might be beneficial, but that a collective approach for women older than 75 years would not be effective.¹ Therefore, when more health-specific criteria have been developed, it is possible that age will no longer be the most suitable selection criteria. This reasoning might also be applicable to other types of preventive care for older people. The work in this thesis investigates the possibilities to develop subgroup-specific preventive strategies for older people.

Demography of older people

Worldwide, the proportion of aged persons is growing faster than any other age group.² It is estimated that in the Netherlands by 2040, 26% of the population will be aged 65 years and older; of these, about one third will be aged over 80 years. Moreover, by 2060 it is expected that the proportion aged over 65 years will increase to 39%.³

The relative growth of the aged population is partly due to the 'baby boom' after World War II and to the increasing life expectancy. In the period 1950-2010 in the Netherlands, the life expectancy of men increased from 70.4 to 78.8 years and for women from 72.7 to 82.7 years.⁴ However, the growing life expectancy does not necessarily imply an increasing number of years without chronic disease. On the contrary, life expectancy without chronic diseases has decreased in the Netherlands:⁵ e.g. diseases like coronary heart

disease, depression, anxiety disorders, diabetes, stroke and arthritis are responsible for the greatest number of years lived with disability.⁶

In the context of these demographic developments healthy aging is a prominent theme in current international health policy.⁷⁻¹⁰ The goal of healthy aging is not only a matter of maintaining good physical and mental health, but also of older people remaining independent and participating in social activities. It is of considerable importance for the coming years to develop strategies in health care for older people, which not only contribute to life expectancy but also to functioning in daily life and wellbeing. Nowadays, the number of people available to work is about four times the population of older persons. Due to changes in demography in the future, this ratio will change: it is estimated that in 2039 the number of people available to work will be only about two times the size of the older population.¹¹ Therefore, a shortage of personnel in health care can be foreseen. This shortage might be compensated by increasing the independence level of older people, thereby reducing the need for professionals in health and home care.

Preventive strategies in older people

Aims

Preventive care traditionally refers to measures taken to prevent disease, injury and death. In older persons, however, no breakthroughs in the prevention and treatment of diseases are expected in the short term. Therefore, according to the Health Council of the Netherlands, prevention in older people might also be used to contribute to the goal of healthy aging, i.e. the maintenance of independence and wellbeing by preventing or postponing disability and social isolation. This functional approach seems to be more promising and may also limit the need for care.¹² However, research on the effectiveness of preventive strategies to contribute to independence is lacking.

Strategies

Preventive strategies can be classified into four types of approach: universal, selective, indicated, and care-related prevention. Universal and selective prevention are based on a collective approach, whereas indicated and care-related prevention need an individualized approach (Figure 1).¹³⁻¹⁵

Universal prevention is desirable for the population (or subgroups) in general and should be applied to persons not motivated by current complaints or symptoms. This category comprises all those measures which can be advocated for the general public, aiming at health improvement and a decrease in risk of disease. *Selective prevention* is recommended for specific groups in the population with increased risk, and aims at improve-

ment of health of these specific risk groups. The third class of preventive measures, called *indicated prevention*, encompasses individuals who do not yet have a diagnosed disease but who do have complaints or mild symptoms. The aim of indicated prevention is to prevent the onset of disease or health damage. The fourth category of preventive care is *care-related prevention*, which aims at individuals with an established disease to reduce the burden of disease and to prevent complications, comorbidity and disability.

According to this classification, preventive programs can be organized collectively or individually. However, it is still unclear which approach is appropriate in preventive care for older people. Since 2008, the Dutch Public Health Act (*Wet publieke gezondheid: WPG*) stipulates that the local authorities (more precisely city councils) are responsible for the provision of health care to the elderly, including systematic monitoring of the health status of older people and the early detection and prevention of specific disorders like comorbidity.¹⁶ According to the Act's explanation memorandum, the central government aims at prevention of comorbidity and prevention of health problems like decubitus, undernutrition, dehydration and intertrigo.¹⁷ This section of the Act is placed directly after the provisions on youth health care and suggests that elderly health care can follow the same standardized, programmatic approach as youth health care.

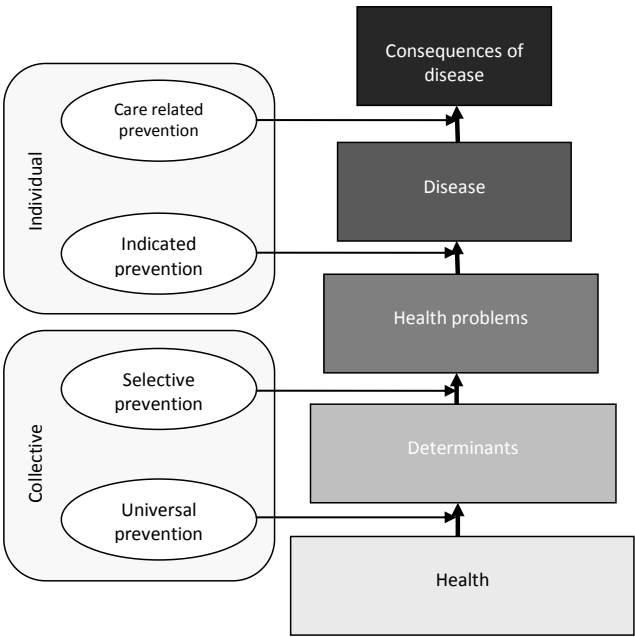


Figure 1. Classification of preventive strategies.¹⁵

However, it has been shown that a collective approach by screening community-dwelling older people for specific highly-prevalent disorders (such as hearing loss and impaired vision) is not effective.¹⁸⁻²³ Furthermore, screening older people for depressive symptoms by the general practitioner (GP) in order to offer them an intervention, was also not effective.²⁴ These screening programs did not fulfil the criteria for screening formulated in 1968 by Wilson and Jungner, in particular the criterion which demands that there should be an accepted treatment for patients with recognized disease and the criterion that the costs should be economically balanced in relation to possible expenditure on medical care as a whole.²⁵

A possible explanation for the finding in these studies that a collective screening approach is not effective, is that in older persons health is a product of lifetime influences of diseases, lifestyle, environment and personal preferences in self-determination, accumulating in a variety of health status, functional status and expectations in older persons. Therefore, the perspectives on aged-related medical problems will differ considerably between older people. For example, is hearing impairment in older people a medical disorder or a normal, age-related decrease in functioning? A targeted approach to specific subgroups will probably be beneficial to prevent specific diseases or disorders, while a collective approach to the general older population is not effective.

Integration of subgroup-specific aims and strategies

Thus, for the development of effective preventive care for older people it is necessary to consider both the aim and the strategy. First, which aim of prevention should be pursued for older people: prevention of diseases and injury to contribute to life expectancy, or the maintenance of independence in daily life and wellbeing? Second, which strategy might be appropriate: a collective strategy targeting at (subgroups of) community-dwelling older people, or an individualized approach, targeting persons with complaints, symptoms or diseases for whom the preventive strategy can be customized to personal circumstances?

Figure 2 depicts these two dimensions of preventive care for older persons. This figure divides the preventive strategies into four quadrants, depending on the aim of prevention and the approach. In relation to this figure, the main question is: which preventive interventions for which subgroup of older persons might be applicable in each quadrant. To select these subgroups for interventions it is necessary to find predictors to stratify.

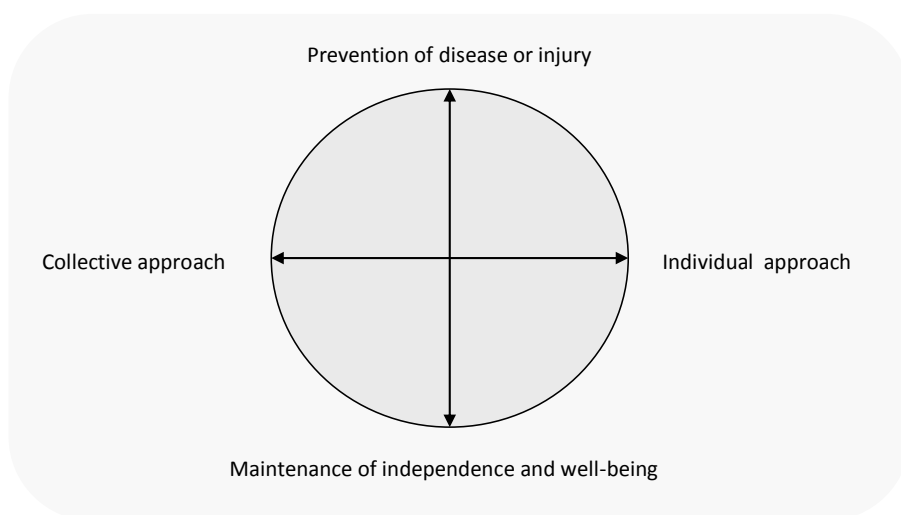


Figure 2. Aims and approaches in preventive strategies.

Current practice in the Netherlands

Activities to prevent disease

In current practice, the most prominent preventive activities for older people take place in order to prevent disease and therefore belong to the upper half of the circle. Below, two examples are described: the national programs for screening and for prevention, and cardiovascular risk management.

National programs for screening and vaccination

Breast cancer screening, colon cancer screening and influenza vaccination are collective preventive care strategies aiming to prevent disease, and fit in the left upper quadrant. These programs target subgroups of community-dwelling older people, defined by sex, age and specific indications, such as diabetes mellitus.

Cardiovascular risk management

Cardiovascular risk management, another prominent preventive activity in the Netherlands, also fits in the upper half of the circle. The aim of cardiovascular risk management is to reduce the incidence of cardiovascular events in a high-risk population. For prevention of cardiovascular disease both the collective and the individual approach is used. Prevention of cardiovascular disease in persons with a history of cardiovascular disease obviously follows an individual approach, because prevention of recurrent disease belongs to the care-related individual approach.

Providing lifestyle information to the general public by public health agencies and other organizations follows a collective approach. Another collective activity is the recently introduced 'prevention consultation' by GPs, which uses an open internet-based invitation to the general public to screen for risk factors for cardiovascular disease.²⁶ However, this consultation explicitly excludes older people because of their predetermined age-related higher risk.

Apart from these collective strategies, cardiovascular risk management for people without cardiovascular disease is mainly based on case finding carried out by GPs. Case finding comprises both selective prevention and indicated prevention. To identify individuals with a high cardiovascular risk, GPs often use clinical cardiovascular risk scores, such as the Framingham Risk Score²⁷ and the Systematic Coronary Risk Evaluation (SCORE).²⁸ However, their accuracy to predict risk on cardiovascular outcomes is clearly reduced in older persons.²⁹⁻³² Recently, the Leiden 85-plus Study and others have shown that homocysteine is predictive for cardiovascular events in old age.³³⁻³⁸ However, it is not clear whether preventive cardiovascular treatment is more effective in a group of older people with high risk compared to older people with low risk.

Activities to maintain independence and wellbeing

In current practice, the market for general health checks is growing in the Netherlands. Especially so-called preventive health centers for seniors, to which older people are invited for a preventive check up, is an upcoming phenomenon. According to the policy document on this type of center, the aim of these centers is to improve social participation and social wellbeing, to enhance self-determination and to improve health literacy.³⁹ These centers use a collective approach, aiming at older people without using various selection criteria as are used for care-related or indicated prevention. Therefore, preventive health checks can be placed in the lower left quadrant. According to the preventive health center guidebook,⁴⁰ these centers try to reach this aim by screening older people for various conditions. However, evidence for the benefit of this type of screening is still lacking.¹⁸⁻²⁴

Apart from these preventive health centers, a systematic approach to realize maintenance of independence and wellbeing (the lower half of the figure), is scarce. This does not mean that GPs and other caregivers do not work on the maintenance of independence and wellbeing in individual cases. However, apart from care-related prevention in the management of specific diseases, guidelines for maintenance of independence and wellbeing are lacking. To identify patients for whom preventive strategies aiming at maintenance of independence would be beneficial, instruments are needed to identify older people at high risk to develop disability in the near future. It is known that chronic

diseases⁴¹⁻⁴⁷ and multimorbidity⁴⁶⁻⁴⁸ are strongly related with disability, but the predictive value of these factors for disability differs according to the health status of the older individual. When such instruments become available, older people can pro-actively be approached (collectively or individually) to prevent increase in disability, thereby resulting in the maintenance of independence and wellbeing.

Conclusion

In conclusion, in current practice, the most prominent preventive activities for older persons are related to the prevention of disease. However, there is room for improvement in the current cardiovascular risk management strategy, which is widely used for the prevention of cardiovascular disease in older persons. Moreover, it is still unknown which preventive activities can contribute to maintaining an acceptable level of functioning in daily life and wellbeing. In addition, instruments to identify eligible risk groups for this approach are lacking.

Therefore, it is important to explore the ideas of caregivers about the possibility to develop strategies in preventive care for older people to prevent disease or to maintain independence. To develop aim-specific collective preventive care for older persons, not only are instruments needed to define and select subgroups of older people at risk for disease or at risk for loss of independence, but also adequate interventions need to be available to prevent disease or to maintain independence.

Aim of this thesis

The general aim of the work in this thesis is to study the strategies in preventive care (varying in their aim and approach) for older people to facilitate the development of subgroup-specific evidence-based guidelines for preventive care for older persons.

To achieve this aim, the following questions were explored:

1. Is there scientific support for the idea that the aim of prevention is not only to prevent disease and injury, but also to maintain independence and wellbeing?
2. In order to aim at maintenance of independence and wellbeing:
 - a. Is it possible to identify older people who will benefit from a preventive approach which contributes to the maintenance of independence and wellbeing?
 - b. Which preventive strategies are appropriate to contribute to the maintenance of independence and wellbeing?
3. In order to aim at prevention of disease, with a focus on cardiovascular disease:
 - a. Is it possible to identify subgroups by screening older people to prevent disease?
 - b. Is a high-risk approach an appropriate preventive strategy to contribute to prevention of cardiovascular disease in older persons?

Brief description of chapters

1. Exploration of aims in preventive care for older people

Chapter 2 describes the perspectives of general practitioners (GPs) on preventive care for older people: these were examined in six focus groups. Perceptions of GPs regarding preventive care for older people, and the individual motivations of GPs for variation in preventive care, are largely unknown. Moreover, it is unclear whether GPs deliver preventive care in the traditional way, i.e. mainly to prevent diseases or injuries, or to maintain independence and wellbeing. Therefore, this qualitative study explores GPs' perspectives on preventive care to elucidate their ideas about the aim, organisation and content of preventive care for older people. This investigation will reveal the direction in which preventive care for older people, according to GPs, needs to be developed in the future.

2. Maintenance of independence and wellbeing

a. Specifying subgroups of older people

The aim of prevention probably depends on the health status of older persons, because values such as functioning in daily life and wellbeing become more important than life expectancy when the general health of older individuals declines.¹² To develop aim-specific evidence-based guidelines for preventive care for older people, instruments are needed to define and select subgroups. Chapter 3 describes the predictive value of multimorbidity for the development of disability in the general population of very old people and the role of cognitive impairment in this association. Chapter 4 investigates the variation in vulnerability concepts between the GPs and determines whether GPs have common or distinctive concepts of vulnerability in mind. If the variability between GPs proves to be small, assessment by GPs could be an effective instrument to select older people for geriatric care.

b. Preventive strategies to maintain independence and wellbeing

After exploring the possibilities to define subgroups, we investigated which conditions are appropriate for a collective approach to maintain independence and wellbeing. In Chapter 5 a RAND/UCLA appropriateness method was carried out to identify appropriate screening conditions to prevent functional decline in older people, stratified for age and vulnerability.

3. Prevention of disease with a focus on cardiovascular disease

a. Specifying subgroups of older people

In current guidelines for cardiovascular risk management, which primarily aim at preventing disease, the cardiovascular risk determinants (as selection criteria for preventive cardiovascular treatment) are insufficient for older persons. To select subgroups of older

people who are expected to derive the most benefit from preventive cardiovascular treatment, appropriate risk stratification instruments are needed. Furthermore, the influence of cardiovascular disease on the maintenance of independence and wellbeing needs to be investigated, because prevention of non-fatal cardiovascular disease probably not only improves life expectancy but also functional status and wellbeing. Chapter 6 investigates whether there are differences in prognosis between very old people with various levels of prevalent cardiovascular disease, compared to those with no manifest cardiovascular disease. The prognosis was studied not only with regard to incident cardiovascular morbidity and mortality, but also with respect to functional status. If risk stratification proves predictive not only for morbidity and mortality but also for functional status, then cardiovascular risk stratification will contribute to both aims, i.e. the prevention of disease and the maintenance of a person's independence.

b. Preventive strategies in cardiovascular risk management

Chapter 7 describes the effect of preventive pravastatin treatment in older people stratified into three groups at risk for cardiovascular disease based on their plasma levels of homocysteine. Since, according to Wilson and Jungner, risk predictors are clinically meaningful only when effective preventive treatment is available,²⁵ we need to establish which treatment possibilities are appropriate for older persons with high homocysteine to lower their cardiovascular risk. Therefore, a post-hoc subanalysis was performed in PROSPER⁴⁹ (a large double-blinded randomized placebo-controlled trial) to assess the effect of pravastatin on the risk for coronary heart disease and mortality in older persons, stratified for plasma levels of homocysteine.

General discussion and summary

Chapter 8 presents a general discussion on the main findings of the work in this thesis, considers the clinical implications of the results, and makes some recommendations for further research. Chapters 9 and 10 present a summary of this thesis in English and in Dutch, respectively.

REFERENCES

1. Gerechtshof 's-Gravenhage, February 9, 2010; GJ 2010/51 m.nt. YM Drewes and RE van Hellemond, Gezondheidszorg Jurisprudentie. 2010.
2. World Health Organisation. Active Aging: A Policy Framework. Geneva: World Health Organization, 2002.
3. National Public Health Compass. [Population: What are the main expectations for the future?] (online) Available at: <http://www.nationaalkompas.nl/bevolking/toekomst>. Accessed January 11 2013.
4. National Public Health Compass. [Life expectancy summarized] (online) Available at: <http://www.nationaalkompas.nl/gezondheid-en-ziekte/sterfte-levensverwachting-en-daly-s/levensverwachting/levensverwachting-samengevat>. Accessed January 11 2013.
5. Polder J, Kooiker S, van der Lucht F. [The health epidemic. Why do we become healthier and sicker]. Amsterdam: Reed Business, 2012.
6. National Public Health Compass. [What diseases cause the greatest loss of healthy lifeyears?] (online) Available at: <http://www.nationaalkompas.nl/gezondheid-en-ziekte/ziekten-en-aandoeningen/welke-ziekten-tasten-de-kwaliteit-van-leven-het-meest-aan>. Accessed January 11 2013.
7. Swedish National Institute of Public Health. Healthy Ageing Project. Healthy ageing: A challenge for Europe. Stockholm: Swedish National Institute of Public Health, 2007.
8. Division of Aging and Seniors, Public Health Agency of Canada. Healthy Aging in Canada: a New Vision, a Vital Investment. From Evidence to Action. A background paper for the Federal, Provincial and Territorial Committee of Officials (Seniors). Ottawa: Division of Aging and Seniors, Public Health Agency of Canada, 2006.
9. National Center for Chronic Disease Prevention and Health Promotion. Healthy Aging, Improving and Extending Quality of Life Among Older Americans, at a Glance 2010. Atlanta, GA: National Center for Chronic Disease Prevention and Health Promotion, 2010.
10. Prime Minister's Science Engineering and Innovation Council. Promoting healthy ageing in Australia. Canberra: Prime Minister's Science Engineering and Innovation Council, 2003.
11. National Public Health Compass. [Ageing: What are the main expectations for the future?] (online) Available at: <http://www.nationaalkompas.nl/gezondheid-en-ziekte/ziekten-en-aandoeningen/welke-ziekten-tasten-de-kwaliteit-van-leven-het-meest-aan>. Accessed January 11 2013.
12. Health Council of the Netherlands. [Prevention in the Elderly: Focus on Functioning in Daily Life]. 2009/07 ed. The Hague: Health Council of the Netherlands, 2009.
13. Reddy MS. Primary prevention in psychiatry. *Indian J Psychol Med* 2009; 31(1):1-2.
14. Gordon RS, Jr. An operational classification of disease prevention. *Public Health Rep* 1983; 98(2):107-109.
15. Berg M van den, Schoemaker CG (red.). [Effects of Prevention. Partial Report of the Dutch 2010 Public Health Status and Forecasts Report: Towards better Health.] RIVM-rapport nr. 270061007. Bilthoven: RIVM, 2010.
16. art. 5a lid 2 sub c WPG.
17. Kamerstukken II 2007/08, 31 316, nr. 10, p. 2. 2013.
18. de Craen AJ, Gussekloo J, Blauw GJ, Willems CG, Westendorp RG. Randomised controlled trial of unsolicited occupational therapy in community-dwelling elderly people: the LOTIS trial. *PLoS Clin Trials* 2006; 1(1):e2.

19. Eekhof J, De Bock G, Schaapveld K, Springer M. Effects of screening for disorders among the elderly: an intervention study in general practice. *Fam Pract* 2000; 17(4):329-333.
20. Gussekloo J, de Bont LE, von Faber M, Eekhof JA, de Laat JA, Hulshof JH et al. Auditory rehabilitation of older people from the general population--the Leiden 85-plus study. *Br J Gen Pract* 2003; 53(492):536-540.
21. Shenson D, Adams M, Bolen J, Anderson L. Routine checkups don't ensure that seniors get preventive services. *J Fam Pract* 2011; 60(1):E1-E10.
22. Smeeth L, Iliffe S. Community screening for visual impairment in the elderly. *Cochrane Database Syst Rev* 2006; 3:CD001054.
23. Yueh B, Shapiro N, MacLean CH, Shekelle PG. Screening and management of adult hearing loss in primary care: scientific review. *JAMA* 2003; 289(15):1976-1985.
24. van der Weele GM, de Waal MW, van den Hout WB, de Craen AJ, Spinoven P, Stijnen T et al. Effects of a stepped-care intervention programme among older subjects who screened positive for depressive symptoms in general practice: the PROMODE randomised controlled trial. *Age Ageing* 2012; 41(4):482-488.
25. Wilson JMG, Jungner G. Principles and practice of screening for disease. Geneva: World Health Organization, 1968.
26. Assendelft WJ, Nielen MM, Hetinga DM, van der Meer, V, van Vliet M, Drenthen AJ et al. Bridging the gap between public health and primary care in prevention of cardiometabolic diseases; background of and experiences with the Prevention Consultation in The Netherlands. *Fam Pract* 2012; 29 Suppl 1:i126-i131.
27. Anderson KM, Odell PM, Wilson PW, Kannel WB. Cardiovascular disease risk profiles. *Am Heart J* 1991; 121(1 Pt 2):293-298.
28. Conroy RM, Pyorala K, Fitzgerald AP, Sans S, Menotti A, De Backer G et al. Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project. *Eur Heart J* 2003; 24(11):987-1003.
29. Lernfelt B, Svanborg A. Change in blood pressure in the age interval 70-90. Late blood pressure peak related to longer survival. *Blood Press* 2002; 11(4):206-212.
30. Schatz U, Masaki K, Yano K, Chen R, Rodriguez BL, Curb JD. Cholesterol and all-cause mortality in elderly people from the Honolulu Heart Program: a cohort study. *Lancet* 2001; 358(9279):351-355.
31. van Bommel T, Gussekloo J, Westendorp RG, Blauw GJ. In a population-based prospective study, no association between high blood pressure and mortality after age 85 years. *J Hypertens* 2006; 24(2):287-292.
32. Weverling-Rijnsburger AW, Blauw GJ, Lagaay AM, Knook DL, Meinders AE, Westendorp RG. Total cholesterol and risk of mortality in the oldest old. *Lancet* 1997; 350(9085):1119-1123.
33. de Ruijter W, Westendorp RG, Assendelft WJ, den Elzen WP, de Craen AJ, le Cessie S et al. Use of Framingham risk score and new biomarkers to predict cardiovascular mortality in older people: population based observational cohort study. *BMJ* 2009; 338:a3083.
34. Splaver A, Lamas GA, Hennekens CH. Homocysteine and cardiovascular disease: biological mechanisms, observational epidemiology, and the need for randomized trials. *Am Heart J* 2004; 148(1):34-40.
35. Humphrey LL, Fu R, Rogers K, Freeman M, Helfand M. Homocysteine level and coronary heart disease incidence: a systematic review and meta-analysis. *Mayo Clin Proc* 2008; 83(11):1203-1212.
36. Wierzbicki AS. Homocysteine and cardiovascular disease: a review of the evidence. *Diab Vasc Dis Res* 2007; 4(2):143-150.

37. Mangoni AA, Woodman RJ. Homocysteine and cardiovascular risk an old foe creeps back. *J Am Coll Cardiol* 2011; 58(10):1034-1035.
38. Veeranna V, Zalawadiya SK, Niraj A, Pradhan J, Ference B, Burack RC et al. Homocysteine and reclassification of cardiovascular disease risk. *J Am Coll Cardiol* 2011; 58(10):1025-1033.
39. Bakker E, Jaspers N, Kraakman M, Visser G. [Preventive Health Care Centres for Older People, Policy Document]. Vilans, the Knowledge Centre on Ageing, 2008.
40. Bakker E, Jaspers N, Kraakman M, Visser G. [Preventive Health Care Centres for Older People, Guidebook]. Utrecht: Vilans, the Knowledge Centre on Ageing, 2008.
41. Wang L, van Belle G, Kukull WB, Larson EB. Predictors of functional change: a longitudinal study of nondemented people aged 65 and older. *J Am Geriatr Soc* 2002; 50(9):1525-1534.
42. Tas U, Verhagen AP, Bierma-Zeinstra SM, Hofman A, Odding E, Pols HA et al. Incidence and risk factors of disability in the elderly: the Rotterdam Study. *Prev Med* 2007; 44(3):272-278.
43. Spiers NA, Matthews RJ, Jagger C, Matthews FE, Boulton C, Robinson TG et al. Diseases and impairments as risk factors for onset of disability in the older population in England and Wales: findings from the Medical Research Council Cognitive Function and Ageing Study. *J Gerontol A Biol Sci Med Sci* 2005; 60(2):248-254.
44. Reynolds SL, Silverstein M. Observing the onset of disability in older adults. *Soc Sci Med* 2003; 57(10):1875-1889.
45. Puts MT, Deeg DJ, Hoeymans N, Nusselder WJ, Schellevis FG. Changes in the prevalence of chronic disease and the association with disability in the older Dutch population between 1987 and 2001. *Age Ageing* 2008; 37(2):187-193.
46. Kriegsman DM, Deeg DJ, Stalman WA. Comorbidity of somatic chronic diseases and decline in physical functioning; the Longitudinal Aging Study Amsterdam. *J Clin Epidemiol* 2004; 57(1):55-65.
47. Cigolle CT, Langa KM, Kabeto MU, Tian Z, Blaum CS. Geriatric conditions and disability: the Health and Retirement Study. *Ann Intern Med* 2007; 147(3):156-164.
48. Stuck AE, Walthert JM, Nikolaus T, Bula CJ, Hohmann C, Beck JC. Risk factors for functional status decline in community-living elderly people: a systematic literature review. *Soc Sci Med* 1999; 48(4):445-469.
49. Shepherd J, Blauw GJ, Murphy MB, Bollen EL, Buckley BM, Cobbe SM et al. Pravastatin in elderly individuals at risk of vascular disease (PROSPER): a randomised controlled trial. *Lancet* 2002; 360(9346):1623-1630.

