CHANCES

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Consortium on **H**ealth and **A**geing:
Network of **C**ohorts in **E**urope and the United **S**tates

Dissemination Workshop

HEALTHY AGEING: DEFINITION, RISK FACTORS AND IMPLICATIONS FOR PUBLIC HEALTH

Friday, 23rd January 2015
MEGARON - The Athens Concert Hall
Athens, GREECE

SEVENTH FRAMEWORK PROGRAMME

H.H.F.
HELLENIC HEALTH FOUNDATION

PRESS RELEASES

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement no. HEALTH – F3-2010-242244.

Η έρευνα έχει χρηματοδοτηθεί από το Έβδομο Πρόγραμμα-Πλαίσιο της Ευρωπαϊκής Ένωσης (FP7/2007-2013), με αριθμό συμβολαίου HEALTH – F3-2010-242244.

(Thursday 15/1/2015)

HEALTHY AGEING – Dissemination workshop of the European research project CHANCES

Friday January 23, 2015, Athens Concert Hall

A. Trichopoulou

When it comes to ageing and ageing-related matters, society is facing one of its greatest challenges. Life expectancy has experienced a steady increase over the past decades, especially in the economically developed countries, which, in turn, has led to a continuous growth of the elderly population. But what are the social and economic consequences of this development? Which diseases are mostly associated with ageing and how can they be effectively dealt with? Can they be prevented? How can society incorporate elderly persons, treating them as active members yet, at the same time, recognising their special needs and offering them a good quality of life?

The European research project **CHANCES (Consortium on Health and Ageing: Network of cohorts in Europe and the United States)**, funded by the European Union's Seventh Framework Programme (FP7), focused on these exact matters. On **Friday January 23, 2015, in Athens**, renowned researchers from Europe and the United States will present for the first time the results of innovative studies carried out during the five-year duration (2010 - 2015) of CHANCES. The event will take place at the **Athens Concert Hall (Megaron Moussikis)**, organised by CHANCES coordinator, the **Hellenic Health Foundation** (HHF).

"CHANCES is one of the biggest programmes of the European Commission regarding ageing", says HHF vice-president, Professor Antonia Trichopoulou. "The CHANCES team of researchers includes renowned scientists who represent some of the world's top research centres. Their aim was to produce a substantial approach to the most crucial health issues related to ageing and, hence, open the way for the design and implementation of appropriate health strategies and policies. Healthy ageing is not just about preventing disease. It goes well beyond that."

With the participation of 17 research centres and focusing on 14 cohorts in Europe and North America, the aim of CHANCES was to evaluate health problems that are evident among the elderly and to further explore the causes that contribute to the development of the respective diseases.

The project focused on four categories of medical conditions, all of which affect healthy ageing:

- **Cardiovascular diseases and type 2 diabetes mellitus**
- **Cancer**
- **Osteoporosis and fractures**
- **Cognitive disorders**

CHANCES further produced a new, short and user-friendly questionnaire, to evaluate the health of the elderly. The questionnaire has been designed in such a way that allows its implementation across Europe, seeking to facilitate the development of health strategies and policies for the elderly at a European level.

The Hellenic Health Foundation (HHF) is a non-profit organisation, actively contributing to scientific health research and to the dissemination of health-related information since 2006. It collaborates with Greek and international institutions, organisations and individuals, towards the promotion and advancement of health research and disease prevention among the Greek population.
For further information, please contact the Hellenic Health Foundation:
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(Monday 26/1/2015)

HEALTHY AGEING – Dissemination workshop of the European research project CHANCES

The results of the five-year European research programme **CHANCES (Consortium on Health and Ageing: Network of cohorts in Europe and the United States)** were presented in Athens, on Friday 23rd January. Scientists from Europe and the United States showcased their findings, following extensive research on different ageing-related health matters, during the "Healthy Ageing – Dissemination workshop of the European research project CHANCES" at the Athens Concert Hall.

CHANCES (2010-2015) was funded by the European Union's Seventh Framework Programme (FP7) and coordinated by the Hellenic Health Foundation (HHF). It was carried out with the participation of 17 research centres and focused on 14 cohorts in Europe and North America. Its aim was to evaluate health problems that are evident among the elderly and to further explore risk factors that contribute to the development of the respective diseases. The project focused on four categories of medical conditions, all of which affect healthy ageing, namely **cardiovascular diseases and type 2 diabetes mellitus, cancer, osteoporosis and fractures, cognitive disorders**.

CHANCES further produced a new, short and user-friendly questionnaire, to evaluate the health of the elderly. The questionnaire was designed in such a way so as to allow its implementation across Europe, seeking to facilitate the development of health strategies and policies for the elderly at a European level.

Life expectancy has experienced a steady increase over the past decades, especially in the economically developed countries. As the number of elderly rises, ageing and all ageing-related matters have become one of society's greatest challenges. What are the social and economic consequences of this development? Which diseases are mostly associated with ageing and how can they be effectively dealt with? Can they be prevented? How can society incorporate elderly persons, treating them as active members yet, at the same time, recognising their special needs and offering them a good quality of life? These are some of the issues CHANCES focused on.

As pointed out by the CHANCES Consortium, while Europeans live longer, the real challenge for them is to be able to live more years without disability. This cannot be accomplished by clinical care alone – a comprehensive prevention plan, supported by research targeting both individuals and society, is essential. Prevention needs to

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start from conception and then conclude at older age, as healthy ageing is affected by several factors, related to all ages.

"Society needs to treat elderly persons as equal, active partners yet, at the same time, recognise their special needs and offer them a good quality of life,» said HHF vice-president, Professor **Antonia Trichopoulou**. "With this in mind, the aim of the CHANCES dissemination activity is to combine the new evidence provided by this research project with existing information and then use the results of the project to improve European public health policy for the elderly."

«The CHANCES project produced novel and strong scientific evidence on the determinants of healthy ageing in Europe, including modifiable behaviors, nutritional factors, and environmental exposures,» said Italian epidemiologist **Paolo Boffetta**, CHANCES coordinator and HHF collaborator. «Using these results to shape the agenda of European public health policy is the objective of the aggressive dissemination program of CHANCES: the workshop convened in Athens on January 23rd represented the highlight for the translation activities of the consortium, by including researchers, clinicians, regulators, and the media.»

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AGENDA

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CHANCES Dissemination Workshop

HEALTHY AGEING: DEFINITION, RISK FACTORS AND IMPLICATIONS FOR PUBLIC HEALTH: THE CHANCES PROJECT EXPERIENCE

MEGARON – The Athens Concert Hall
MC3 Hall
Athens, Greece
January 23, 2015

Friday, 23rd January 2015		
Time	***Topic***	***Speaker / Panel Chair***
9:00 - 9:10	Opening of the Workshop	**A. Trichopoulou** *Hellenic Health Foundation (HHF)*
9:10 - 9: 40	European Innovation Partnership on Active and Healthy Ageing	**M. van den Berg** *European Commission*
9:40 - 10:00	Setting up CHANCES	**P. Boffetta** *Hellenic Health Foundation (HHF)*
10:00 - 10:30	CHANCES networking: Implications for future research	**K. Kuulasmaa** *National Institute for Health and Welfare (THL)*
10:30 - 11:10	**Coffee break and posters**	
11:10 – 13:20	**Results from the CHANCES projects**	
11:10 - 11:20	Vitamin D and all-cause mortality in older adults	**B. Schöttker** *German Cancer Research Center (DKFZ)*
11:20 - 11:30	Self-perceived health & mortality among the elders	**C. Bamia** *Hellenic Health Foundation (HHF)*

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11:30 - 11:40	Healthy ageing through a healthy diet-Never too old to eat healthy?!	**N. Jankovic** *Wageningen University (WU)* *Institut für Medizinische Informatik, Biometrie und Epidemiologie (IMIBE)*
11:40 – 11:50	Years of life lost due to premature mortality and disability because of cancer (DALYs)	**K. Tsilidis** *Hellenic Health Foundation (HHF)*
11:50 - 12:00	Biomarkers of ageing and disease	**E. Jansen** *National Institute for Public Health and the Environment (RIVM)*
12:00 - 12:20	▪ The role of common lipid-altering gene variants in the risk of dyslipidemia through old age *(recorded presentation)* ▪ Overview of the role of telomere length in the ageing process	**C. van Duijn** *Erasmus MC* **I. de Vivo** *Harvard School of Public Health*
12:20 - 12:30	The association of the Herpes simplex infection with the risk of Alzheimer's disease among the elderly	**I. Bergdahl** *Umeå University*
12:30 - 12:50	Development of a common Health Tool for the assessment of health and ageing-related outcomes in Europe	**M. Bobak** *University College London (UCL)*
12:50 - 13:20	**Further results of the CHANCES project (Round Table)** - Smoking and cardiovascular disease in older adults - Cognitive decline in older adults - The effects of education, marital status and other factors on the risk of hip fracture in older men and women	Chair: A. Trichopoulou *DKFZ* - **U. Mons** *HHF* - **M. Katsoulis** *UoA* - **Ph. Orfanos**
13:20 - 14:30	**Lunch break and posters**	
14:30 - 15:00	**Panel discussion for CHANCES results**	
15:00 - 15:15	Nutrition Policy for the elders - the experience of France	**M. Chauliac** *Direction générale de la santé*
15:15 - 15:30	Social networking among the elders - the experience of Finland	**T. Niiranen** *National Institute for Health and Welfare (THL)*

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15:30 - 15:45	Increasing physical activity among the elders - the experience of Slovenia	**M. Gabrijelcic** *National Institute of Public Health*
15:45 - 16:00	**Coffee break and posters**	
16:00 - 16:45	**Session: Bringing together researchers and policy makers**	Chair: D. Boumpas *University of Athens (UoA)*
16:00 - 16:10	*- What should research focus on, with respect to the elderly "phenomenon" from a Public Health perspective?*	**H. Brenner** *German Cancer Research Center (DKFZ)*
16:10 - 16:30	*- The impact of ongoing studies on healthy ageing*	**Miguel A. Martínez-Gonzalez** *University of Navarra*
16:30 - 16:45	*- The role of research funding bodies*	**D. Boumpas** *University of Athens (UoA)*
16:45 - 17:15	**Summing Up & Workshop Closure**	

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FACT SHEET

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Healthy ageing: Dissemination workshop of the CHANCES research project: Summary of results

The studies carried out within the framework of CHANCES focused on four categories of major medical conditions related to ageing, namely: **cardiovascular diseases and type 2 diabetes mellitus**, **cancer**, **osteoporosis and fractures**, and **cognitive disorders**. Indicative results on these and other health outcomes as stated below, provide valuable information necessary for the development of health strategies that can contribute to the prevention and better treatment of major diseases affecting the elderly, hence also improving their quality of life. CHANCES further produced a new, short and user-friendly questionnaire, to evaluate the health of the elderly across Europe, seeking to facilitate the development of health strategies and policies for the elderly at a European level.

Indicative results:

- **Cardiovascular diseases and type 2 diabetes**

- Effects of major lifestyle risk factors, independent and jointly, on life expectancy with and without cardiovascular disease. Adopting a beneficial lifestyle, that includes not smoking, drinking lightly or moderately, taking regular exercise and maintaining a modest excess body mass index, benefits both, life expectancy without cardiovascular disease, and survival after the onset of cardiovascular disease. (Queen's University Belfast, Mark O'Doherty)

- Diagnosis, duration and treatment of type 2 diabetes and cancer incidence. There is little evidence to indicate an association between diabetes and the risk of cancer overall, but there is some evidence suggesting such an association for specific types of cancer. (International Agency for Research on Cancer, Amina Amadou)

- Plasma concentrations of B vitamins and the risk of cardiovascular disease at older age. Folate, but not vitamin B12, may help preventing cardiovascular diseases in older adults, but randomised trials in healthy subjects are necessary to confirm that such intervention is effective. (University College London, Martin Bobak)

- Smoking and cardiovascular disease in older adults. Smoking is a powerful independent risk factor concerning cardiovascular events and mortality among the elderly - quitting smoking can help reduce the cardiovascular excess risk caused by smoking, even among older adults. (German Cancer Research Center, Ute Mons)

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- Obesity and the risk of cardiovascular disease (CVD). Waist circumference, an indicator of abdominal obesity, may be a better measure of overall obesity than body mass index in predicting the risk of cardiovascular disease in elderly men and women aged 60-69 but its impact is diminished compared to BMI in older ages (70-79 years old). (Queen's University Belfast, Maria Hughes)

- The role of socio-economic position in the development of type 2 diabetes in older adults. Lower socio-economic position is associated with an increased risk of type 2 diabetes in older adults. Obesity plays a vital role in the development of type 2 diabetes even amongst well-educated individuals, as 20% of the relationship between socio-economic position and type 2 diabetes appears to be explained by body mass index. (Queen's University Belfast, Christopher Steele)

- Fruit and vegetable intake and risk of incident type 2 diabetes. Fruit and vegetable intakes, overall, or in terms of single vegetables such as green leafy vegetable or cabbage intakes do not appear to be related to incident type 2 diabetes. (Queen's University Belfast, Loubaba Mamluk)

- **Cancer**

- Cancer, mortality, morbidity and disability levels of middle-aged and elderly populations. Cancer is a serious cause of mortality, morbidity and disability. Even if the disease burden attributed to cancer is predominantly caused by mortality, some cancers are accompanied by a significant percentage of disability. (Hellenic Health Foundation, Kostas Tsilidis)

- Cumulative overweight in the elderly and cancer risk. A longer duration of being overweight increases the risk of obesity-related cancers, post-menopausal breast and colorectal cancer, among the elderly. (International Agency for Research on Cancer, Melina Arnold)

- Obesity and central obesity in relation to cancer risk among the elderly**.** Body mass index as a measure of obesity, compared to waist circumference, hip circumference or waist-to-hip ratio, appears to be the most appropriate indicator of body fatness with respect to its predictive ability of cancer risk in older adults (International Agency for Research on Cancer, Heinz Freisling)

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- Pre-diagnostic vitamin D concentrations and cancer risk in older individuals. There is little evidence to support that vitamin D concentrations in the blood can have a major effect on the development of cancer and cancer prevention among the elderly in Europe. (German Cancer Research Center, José Manuel Ordóñez-Mena)

- Quantification of the smoking-associated risk of total and site-specific cancer incidence and mortality. Even in older adults, being a smoker or having been one, considerably increases the risk of developing and dying from cancer, compared to individuals who have never smoked. Nonetheless, even among the elderly, quitting smoking can still have an impact on reducing the risk of cancer. (German Cancer Research Center, José Manuel Ordóñez-Mena)

- Alcohol and the risk of cancer. Alcohol use contributes to the development of cancer in the upper aero-digestive tract as well as breast, liver and colorectal cancer. Absolute risks of specific cancer types for different levels of exposure at given ages over time can account for the competing force of overall mortality. (International Agency for Research on Cancer, Pietro Ferrari)

- **Osteoporosis and fractures**

- Hip fractures affect mortality, morbidity and disability levels of middle-aged and elderly populations. Hip fracture is a serious cause of primary disability and mortality among the elderly. Future interventions should focus not only on shortening recovery and reducing long-term disability after a fracture incident, but also on a better primary prevention of falls. (Hellenic Health Foundation, Nikolaos Papadimitriou)

- The effects of education and marital status on the risk of hip fracture in older men and women. Higher education level appears to reduce the risk of hip fractures, whereas elders living alone, compared to being married/cohabiting, are more likely to have a hip fracture later in their life. (University of Athens, Philippos Orfanos and Vassiliki Benetou)

- **Cognitive disorders**

- Cognitive decline and cognitive disorders. Alzheimer's disease may be related to virus infection; there are clear indications that the Herpes virus is linked to the

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development of Alzheimer's disease. Further studies exploring the effects of sedentary lifestyle, dietary patterns, cerebrovascular diseases and socio-economic status on cognitive decline in the elderly are pending. (Umeå University, Sture Eriksson)

- Cognitive performance and decline. Cognitive impairment appears to be an independent risk factor for earlier death. Saturated fats (SFA) and monounsaturated fats (MUFA) do not appear to be associated with cognitive performance, but higher consumption of polyunsaturated fats (PUFA) seems to slightly improve cognitive performance. Close adherence to the Mediterranean diet appears to protect against cognitive decline. (Hellenic Health Foundation; University of Athens, Andreas Kyrozis; Michail Katsoulis)

- **Overall mortality and other outcomes**

- Education inequalities in health among the elderly. There is a consistent disadvantage of low versus higher education among the elderly in Europe, with respect to a number of health indicators. Nonetheless, the degree of education-related inequality in health differs consistently across European countries. (Bergische Universität Wuppertal, Marianna Schaubert)

- Self-perceived health and mortality of the elderly. Elderly people who perceive their health as good/excellent appear to have increased survival rates compared to the elders who feel not healthy, independently of lifestyle and socio-demographic characteristics as well as of diagnosed medical conditions. (Hellenic Health Foundation; University of Athens, Christina Bamia)

- Educational gradients in the effects of health shocks on early retirement. Health shocks can lead to early retirement, but education has a moderating effect on people's decision to retire early, which differs across sexes. Less educated men are more likely to stop working after experiencing a severe illness compared with higher educated men. The opposite was shown in the case of women. (Bergische Universität Wuppertal, Lars Thiel)

- Adaptation to adverse health events: The role of education and experience. Individuals' health self-ratings are affected by the onset of a severe disease, such as cancer or stroke, but people are also able to adapt to adverse health shocks over time. Better-educated individuals react more favorably to adverse health events. On

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the contrary, being diagnosed with a severe illness impairs subjective well-being to a greater extent for individuals that have previous experience of an adverse health event. (Bergische Universität Wuppertal, Sophie-Charlotte Meyer)

- Age at menopause between 40 and 50 lowers a woman's survival. Earlier menopause is associated with increased mortality, Women who went through menopause between 40 and 44 years of age appear to have a 16% higher chance of dying than women experiencing menopause between 50 and 54 years. The chance of dying was 9% higher in women going through menopause between the ages of 45 and 49. (University College London, Bernardine Stegeman)

- Healthy ageing through a healthy diet - Never too old to eat healthy. The adoption of a healthy diet based on the recommendations of the World Health Organisation increases life expectancy by about 2 years and prevents cardiovascular mortality among the elderly populations in Europe and the United States. Following the dietary recommendations of the World Cancer Research Fund/American Institute of Cancer Research prevents the occurrence of diet-related cancers, therefore contributes to a lower burden of cancer later in life. (Wageningen University (WU); Institut für Medizinische Informatik, Biometrie und Epidemiologie (IMIBE), Nicole Jankovic)

- Vitamin D and mortality: Europeans with vitamin D deficiency die much earlier than Europeans with a sufficient vitamin D concentration in their blood. (German Cancer Research Center, Ben Schöttker)

- Biomarkers and the ageing process. The measurement of suitable biomarkers in the blood that represent nutrition deficiencies and a disturbed oxidation balance in the human body can provide valuable information about the procedures that lead to chronic diseases and the ageing process. (National Institute for Public Health and the Environment, Eugene Jansen)

- Genetic factors are often associated with diseases early in life. Genetic factors are often associated with diseases early in life but there is increasing evidence that common genes may also be involved in the disability and mortality among the elderly. In particular there appears to exist a joint effect of common genes on the risk of high cholesterol levels similar to the effect of obesity on blood lipid levels. Similar findings seem to hold for low-risk genes in relation to risk factors of stroke. (Erasmus Universitair Medisch Centrum Rotterdam, Sarah Willems)

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- **Health Module**

- Health Module: a brief instrument to assess the health of older persons. The developed Health Module is a brief, reliable and comparable questionnaire for assessing the health of the elderly residing in Europe. It combines the most important subjective and objective measurements commonly used in the research on health ageing and provides researchers with a comprehensive yet versatile instrument that can be easily added to existing or newly designed studies of older adults. (University College London, Martin Bobak)

- The added value of CHANCES: An EU-funded project created valuable resources for studying the determinants as well as the improvement of the ageing population's health. (National Institute for Health and Welfare, Kari Kuulasmaa)

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ABSTRACTS

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Η έρευνα έχει χρηματοδοτηθεί από το Έβδομο Πρόγραμμα-Πλαίσιο της Ευρωπαϊκής Ένωσης (FP7/2007-2013), με αριθμό συμβολαίου HEALTH – F3-2010-242244.

Effects of major lifestyle risk factors, independent and jointly, on life expectancy with and without cardiovascular disease: results from CHANCES

There are significant variations in life expectancy (LE) and the percentages of LE lived without disease or disability in Europe that include differences in the rates of lifestyle-related deaths. These differences depend on many factors, one of which is socio-economic status. Over 21% of the global burden of disease and injury can be attributed to smoking, abnormally high body mass index and insufficient physical activity. Therefore, as our LE increases, the question of whether the number of years lived with disease in old age will be shortened or not is a subject of some debate. Although there has been some decline in the prevalence of smoking, current trends in physical activity, obesity and alcohol consumption are adverse. As the population ages, policies need to adapt accordingly, depending on how risk factor trends drive both the incidence and mortality from the major causes like cardiovascular disease (CVD).

Using data from CHANCES, we analysed how LE with and without CVD was related to the effects of smoking, obesity, alcohol consumption and physical activity – independently and jointly – in populations aged over 50 years at baseline. A multi-state Markov model was adopted: it is a way of describing the process in which an individual moves between states (no CVD – nonfatal CVD – all-cause mortality) in continuous time. The calculated transition rates between each state were then used to calculate LE with and without CVD at age 50, by risk factor level.

Remaining a non-smoker yielded the greatest gains in LE overall, compared to the effects of being physical active, not being obese, and drinking in moderation. The greatest percentage of LE is attributed to disease-free years, emphasising the much greater population dividend from adopting a 'healthier' lifestyle (e.g. quitting smoking or taking up exercise) before an event has occurred. Another advantage was observed among those physically active after a first event, something that reflects benefits reported from cardiac rehabilitation programmes that emphasise graded physical activity. Each cohort further showed a survival advantage among the overweight category (not obese), a category that enjoyed more than one year lived free of CVD compared to those with normal BMI.

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Diagnosis, duration and treatment of diabetes and risk of cancer incidence

Diabetes and cancer are both severe health problems that continue to develop worldwide. Epidemiologic evidence suggests that people with diabetes are at higher risk of developing many different forms of cancer. The association between diabetes and cancer may be partly attributed to shared risk factors, including physical inactivity and obesity. However, it remains unclear whether the association between diabetes and cancer is direct (due to the diabetes itself and the specific metabolic derangements), whether it is indirect and caused by common risk factors, or whether cancer risk is influenced by diabetes duration and treatments.

Using the CHANCES study, the objective of this proposal was to evaluate the association between diabetes and the risk of cancer incidence (overall and by anatomical sites). We also aimed at determining whether associations between diabetes and cancer differ when incorporating some common risk factors (e.g. physical inactivity and obesity). The potential contributions of specific treatments and the duration of diabetes will be assessed in more detailed future analyses. At a later stage, a mediation analysis will be applied to investigate the role of diabetes as a mediator in these associations, and estimate the percentage that can be explained by diabetes. A causal mediation analysis will also be carried out, to investigate the natural direct effect of physical activity and obesity on cancer, as well as its indirect effect through diabetes.

To evaluate the association between diabetes and cancer risk, multivariable cox proportional hazards models were applied. Contrary to expectations, preliminary analyses showed that diabetes was significantly inversely associated with total cancer in all subjects, in the age-adjusted studies. However, after the implementation of adjustments for confounders, no statistically significant association was observed. In these preliminary analyses, there was little evidence to indicate an association between diabetes status and the risk of total cancer. Further analyses looking at specific anatomical sites of cancer as well as potential differences between men and women are ongoing.

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Plasma concentrations of B vitamins and the risk of cardiovascular disease at older ages

The risk of contracting different diseases has been linked to various vitamins. Among them, vitamins B9 (folic acid, folate) and vitamin B12 have been suspected for some time to be associated with the risk of cardiovascular diseases.

Several partners collaborating in the CHANCES consortium investigated the association between plasma concentrations of vitamins B9 and B12 and the risk of cardiovascular diseases and mortality in more than 5,000 men and women aged between 45 and 69. The results suggested a strong association of total and cardiovascular mortality with plasma folate: persons in the highest quarter of plasma concentrations had about 30% lower risk of dying from any cause in general and from cardiovascular disease in particular, compared to people in the lowest quarter of folate concentrations. On the contrary, the study did not detect any association between mortality and concentrations of vitamin B12.

These findings are consistent with previous observational studies. Clinical trials of folate supplementation have not found convincing evidence that folate can protect against cardiovascular diseases, but these trials were conducted among patients with existing diseases rather than among healthy persons who have yet to develop cardiovascular disease.

Both vitamins can be found in foods, particularly in dark green leafy vegetables (folate) and meat, eggs and milk (vitamin B12). Folate and B12 are also linked to other diseases – low intake of folate before and during pregnancy is associated with congenital malformations, while vitamin B12 is associated with a specific form of anaemia.

Nutritional supplements containing folate and vitamin B12 are commonly available in most countries, while the enhancement of food (mainly flour) has been implemented in many countries to prevent neural tube defects in newborns. If the results of this (and other) observational studies are correct, folate supplements and fortification may also help reducing the risk of cardiovascular diseases in adult and older persons.

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Smoking and cardiovascular disease in older adults

Smoking is a major modifiable risk factor for disease and death; hence giving up smoking helps reduce smoking-related risks. Regarding all-cause mortality, large studies have confirmed this applies even to older populations. Nonetheless, insufficient research has been carried out on the elderly concerning the cardiovascular risks of smoking and the potential benefits that quitting smoking can have on cardiovascular health, despite the fact that most cardiovascular events occur in older adults.

We used data from 25 cohorts participating in the CHANCES consortium. Overall, 503,905 subjects aged 60 and over were included in this study, 37,952 of whom died of cardiovascular disease. Our results showed that smoking strongly contributed to acute coronary events, strokes and cardiovascular deaths. Smokers had twice as much risk of cardiovascular mortality compared with individuals who had never smoked (HR: 2.07; 95 %-CI: 1.82–2.36); the risk of dying of cardiovascular disease was advanced in smokers by 5.5 years. The risk of experiencing acute coronary events for smokers was also roughly twice as big (HR: 1.98; 95%-CI: 1.75–2.25), and 1.6 times greater in the case of strokes (HR: 1.58; 95%-CI: 1.40–1.78). The excess risk from smoking increased with higher levels of cigarette consumption, while the increased excess risk among former smokers (e.g. HR for cardiovascular mortality: 1.37; 95%-CI: 1.25–1.49) dropped with time after smoking cessation in a dose-response manner.

Using data from a large number of cohorts from all over Europe and the United States, we corroborated and further expanded evidence from previous studies, showing that smoking is a powerful independent risk factor concerning cardiovascular events and mortality among older adults. We demonstrated that quitting smoking can help reduce the cardiovascular excess risk caused by smoking, even among the elderly.

This study has important implications for public health. Considering the increase in the number of older people and the greater occurrence of cardiovascular events and mortality at advanced age, there is tremendous potential in the field of smoking and cardiovascular disease prevention among the elderly. Given the current trends in demographic aging, smoking cessation programmes should focus on older smokers as well, so as to curb the burden of smoking-associated disease and mortality.

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Obesity and risk of cardiovascular disease, a brief summary

Obesity is an important risk factor for cardiovascular disease (CVD). It is estimated that 44% of the diabetes burden and 23% of the ischaemic heart disease burden can be attributed to obesity. Several studies have demonstrated that abdominal obesity, measured using waist circumference (WC), may be a better predictor of disease risk than overall obesity, measured using body mass index (BMI). Abdominal predictors may be of particular relevance to the elderly, due to age-related changes in body composition, such as a decrease in muscle mass, an increase in fat mass and loss of height. As a result, BMI in the elderly may underestimate adiposity, and therefore the cardiovascular risk.

Our aim was to investigate the association between obesity (BMI) and abdominal obesity (WC) and the risk of CVD. In order to do this, we observed five large European cohorts (MORGAM, Tromsø, Epic-Elderly, SENECA and Rotterdam Elderly Study; total numbers ~82,954) which were initially healthy, but then accumulated large numbers of incident cardiovascular events (N~3240 events in men; N=~1480 events in women). The subjects were aged 50 and over. Cox proportional hazards models evaluated the association between waist circumference and CVD after adjustments for age, smoking and BMI were carried out.

We found an association between WC and CVD after the adjustment for BMI at least in men aged 50-69, although in older age (70-79) it may not be as strong a predictor as we expected. Men are at a higher risk of CVD if they are overweight and have a large waist or if they are overweight and have medium waists. Those with a healthy BMI and larger waists are not at greater risk. Women are at higher risk of CVD if they are obese and have a large waist circumference.

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What Role does socio-economic position play in the development of type 2 diabetes in older adults?

Type 2 diabetes (T2D) is a global public health problem. Although the prevalence of T2D is rising throughout the entire population, the epidemic is increasing at a greater rate amongst individuals with lower socio-economic position (SEP). Only a limited number of studies that have investigated how potential mediating factors affect the association between SEP and T2D currently exists. Hence, the aim of this study was to examine the effect of mediating factors on the relationship between SEP and T2D in older adults, using education as the main indicator of SEP.

Study subjects were participants in the ESTHER study, an on-going population-based cohort study. Cox proportional hazards models were used to investigate the effect of potential mediating factors on the relationship between SEP and T2D. The contribution of each individual risk factor was calculated using the formula: $(HR_{BASE\ MODEL} - HR_{ADJUSTED\ MODEL}) / (HR_{BASE\ MODEL} - 1) \times 100\%$, where the base model was adjusted for age, gender and family history of diabetes. In particular, the magnitude of change in the hazard ratios for the highest education category was compared with the hazard ratios of the participants in the lowest education category, adjusting for each individual risk factor separately.

During a median follow-up period of 7.9±2.5 years, 636 participants developed T2D. An inverse association was observed between increasing education and incident T2D (HR=0.71, 95% CI: 0.60-0.84 for medium education and HR=0.49, 95% CI: 0.34-0.72 for higher education). When Cox proportional hazards models were used to consider the contribution of each individual risk factor on the relationship between SEP and T2D, it was found that body mass index had the largest effect of all individual risk factors.

Our results indicate that lower SEP is associated with an increased risk of T2D in older adults. This analysis contributed successfully to the investigation of the mechanism by which SEP affects T2D in older adults. Body mass index explained the majority of the relationship between SEP and T2D, accounting for 20% of their association.

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Fruit and vegetable intake and risk of incident of type 2 diabetes: results from the consortium on health and ageing network of cohorts in Europe and the United States (CHANCES)

Although the genetic basis of type 2 diabetes (T2DM) has yet to be identified, there is strong evidence that modifiable risk factors such as obesity and a sedentary life style are the disease's non-genetic determinants. However, there is limited information to support any definitive recommendations concerning the role of diet in the development of T2DM. The results of the latest meta-analysis suggests that an increased consumption of green leafy vegetables may reduce the incidence of diabetes, with either no association or weak associations demonstrated for total fruit and vegetable intake; however, the observation regarding green leafy vegetables is based on a limited number of studies.

We investigated the relationship between T2DM and fruit and vegetable intake using data from the NIH-AARP study and the EPIC elderly study (that includes Spain, Greece, Netherlands and Sweden). All participants below the age of 50 and/or with a history of cancer, diabetes or coronary heart disease were excluded from the analysis. Multivariate logistic regression analysis was used to calculate the odds ratio of T2DM comparing the highest with the lowest estimated portions of fruit, vegetable, green leafy vegetables and cabbage intake. The analysis was adjusted for age, sex, body mass index, physical activity, energy intake, alcohol consumption, education and smoking.

Summary estimates comparing the highest with the lowest estimated portions of fruit, vegetable or green leafy vegetable intake were not associated with a reduction in risk of type 2 diabetes. However, independent results from the NIH-AARP study showed that fruit and green leafy vegetable intake was associated with a reduced risk of type 2 diabetes.

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Cancer affects mortality, morbidity and disability levels of middle-aged and elderly populations

The disease burden caused by cancer was quantified in the CHANCES project using a metric called disability-adjusted life-years (DALYs). This metric consists of the sum of years of life lost due to premature mortality and the years lived with disability. Data was gathered from five studies of middle-aged and elderly populations in Europe.

After an average of 11 years of follow-up, 10,454 cancer patients were identified, 4,400 of whom died of their disease. A total of 34,891 DALYs was lost due to cancer and the distribution among the sexes was almost equal. Lung cancer was responsible for the largest number of lost DALYs (23%), followed by colorectal (15%), prostate (10%) and breast cancer (9%). Mortality (80% of DALYs) predominated over disability. Current and former cigarette smoking was the risk factor responsible for the greatest cancer burden (45% for lung cancer).

Cancer is a serious cause of mortality, morbidity and disability. Even if the disease burden attributed to cancer is predominantly caused by mortality, some cancers carry a significant weight of disability. There are considerable opportunities to improve the overall health status in Europe when it comes to malignancies, primarily by strengthening efforts for better cancer prevention and treatment programmes, but also by improving the quality of life and the palliative care for cancer patients.

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Overweight duration in the elderly and cancer risk: a study of cohorts in Europe and the United States

Recent studies have shown that the risk of cancer related to obesity increases with time, suggesting that a larger share of current and future cancer burden depends on years lived with excess weight. The aim of this study was to estimate how the burden of cancer is linked to cumulative high body mass index (BMI) in the elderly.

We included study participants from seven European and one US cohort study with at least two BMI measurements during follow-up (n=335,273). BMI trajectories were modeled across ages, using a quadratic growth model. Predicted BMI values were then used to calculate overweight duration (BMI>=25) and weighted overweight years (OWY), taking into account the degree of overweight over time. Cox proportional hazard models were applied to determine the cancer risk associated with overweight duration and the fraction of cancer cases attributable to overweight at any age was estimated.

Being overweight for longer periods of time was strongly associated with the incidence of obesity-related cancer (overall Hazard Ratio (HR) per 10-yr increment: 1.68; 95%CI: 1.48-1.91 in Europe, HR: 1.14; 95% CI: 1.09-1.19 in the US), post-menopausal breast (HR: 1.72; 95%CI: 1.39-2.14 in Europe) and colorectal cancer (HR: 1.62; 95%CI: 1.34-1.95 in Europe). Risks associated with a longer overweight duration were higher in men (overall HR per 100 units of OWY: 1.51; 95%CI: 1.35-1.68 in Europe, HR: 1.84; 95% CI: 1.37-2.48 in the US) than in women (HR: 1.32; 95%CI: 1.23-1.42 in Europe, HR: 1.68; 95% CI: 1.37-2.05 in the US) and were attenuated by smoking. For post-menopausal breast cancer, increased risks were confined to women who had never used hormonal replacement therapy (HRT) (HR: 1.35; 95%CI: 1.21-1.51 in the US). In Europe, 16% of all obesity-related cancers could be attributed to being overweight at any age (24% in never smokers) while in the US the percentage was 12% (14% in never smokers). In the US, 22% of all post-menopausal breast cancers in women who never used HRT could be ascribed to having ever been overweight.

These findings provide further insights into the role that longterm overweight plays in causing cancer. This information is vital for the development of effective and targeted cancer prevention strategies.

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Obesity and central obesity in relation to cancer risk among the elderly: preliminary results from CHANCES

Overweight and obesity are related to a substantial proportion of all cancers. There are unresolved questions concerning the most appropriate indicator of adiposity to predict cancer risk, particularly in the elderly, and potential interactions of adiposity with other risk factors such as smoking or physical activity. There is also evidence that central adiposity may be associated with increased cancer risk even in people with normal body mass index (BMI).

Our aims were to (i) to investigate various anthropometric indicators of adiposity and their association with cancer risk as well as assess effect modification according to age, sex, smoking and physical activity; and (ii) to investigate associations between indicators of central adiposity and cancer risk by BMI subgroups.

Participants from seven European cohorts with at least two weight measurements during follow-up and age >50 at baseline (n=38,563) were included in the study. Risk of obesity-related cancer (i.e. cancers of the breast, colon, rectum, pancreas, kidney, gallbladder, and endometrium) was calculated using Cox proportional hazards models with age as the underlying time metric, stratifying by cohort and sex and adjusting for age at entry, daily smoking (never, former, current), daily average alcohol consumption (g/d), education, and vigorous physical activity (yes, no). Models for waist circumference (WC) and hip circumference (HC) were additionally adjusted for height. Residuals of indicators of central adiposity (WC, HC, and waist-to-hip ratio, WHR) were used to estimate cancer risk independently of overall adiposity (BMI). Heterogeneity across cohorts and population subgroups was investigated using random-effects meta-analyses.

In theses cohorts of elderly men and women from Europe, indicators of overall adiposity (BMI) and central adiposity (WC and HC) were each separately associated with an increased risk of obesity-related cancer, but not waist-to-hip ratio (WHR). Only BMI was associated with an increased obesity-related cancer risk independently of other adiposity indicators. Moderate-to-large heterogeneity among cohorts was observed. There was no evidence pointing to effect modification by age, sex, smoking, physical activity, and BMI subgroups.

Various anthropometric indicators of adiposity are associated with an increased risk of obesity-related cancer in European elderly populations. BMI appears to be the most relevant adiposity indicator for cancer risk prediction in these populations. Refined analyses are ongoing to investigate observed heterogeneity among cohorts.

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Pre-diagnostic vitamin D concentrations and cancer risks in older individuals: an analysis of cohorts in the CHANCES consortium

The associations of circulating 25-hydroxyvitamin D [25(OH)D] concentrations with total and site-specific cancer incidence have been examined in several epidemiological studies; overall, findings have been inconclusive. Regarding the association of vitamin D with cancer incidence in older populations, very little is known.

We assessed the association of pre-diagnostic serum 25(OH)D levels with the incidence of all cancers combined, as well as the more specific incidence of lung, colorectal, breast, prostate and lymphoid malignancies among older adults. Pre-diagnostic 25(OH)D concentrations and cancer incidence were available for 15,486 older adults (mean age: 63, range: 50-84 years) from the CHANCES consortium on health and ageing. These subjects came from 2 cohort studies (ESTHER in Germany and TROMSØ in Norway) and a subset of previously published nested-case control data from a cohort study (EPIC-Elderly – Greece, Denmark, Netherlands, Spain and Sweden). Cox proportional hazards or logistic regression were used to derive multivariable adjusted hazard and odds ratios, respectively, and their 95% confidence intervals across categories of 25(OH)D. Meta-analyses with random effects models were used to pool study-specific risk estimates.

Overall, there was no significant association between 25(OH)D concentrations and incidence of most of the cancers assessed. However, there was some evidence pointing to increased breast cancer and decreased lymphoma risk with higher 25(OH)D concentrations. Our meta-analyses, with individual participant data from three large European population-based cohort studies, provide at best limited support for the hypothesis that vitamin D may have a major effect in cancer development and prevention among European older adults.

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Quantification of the smoking-associated risk of total and site-specific cancer incidence and mortality with rate advancement periods: results from the CHANCES consortium

Even though the detrimental impact of smoking was established several decades ago, the smoking epidemic continues in many parts of the world. The lack of progress in the fight against this epidemic could be partially explained by a difficulty in communicating the relevant risks involved. Risk advancement periods (RAPs) have been proposed as an alternative measure to enhance quantification and the communication of risk factor impact on the occurrence of chronic, age-related diseases.

We estimated for the first time RAPs for baseline smoking status and time since smoking cessation for cancers that were found to be associated with smoking in older men and women. A total of 856,834 participants from 18 cohort studies were included in the study. During a mean 12 years of follow-up, 135,445 incident cancers and 51,412 cancer deaths were registered. Being or having been a smoker was associated with advancement in the risk of developing or dying of cancer. This advancement ranged from 1.8 years (breast cancer) to 30 years (lung cancer) among smokers, compared to individuals who never smoked. Additionally, longer time since smoking cessation significantly delayed the incidence and death of cancer, with RAPs from 3 years (colorectal cancer) that went up to 17 years (lung cancer). No significant differences were observed between genders or age groups.

Our results suggest that, even at older age, being a current or a former smoker considerably advances the risk of developing and dying of cancer compared to individuals who have never smoked. Nevertheless, in the case of the elderly, time since cessation is still relevant and can have an impact in reducing the risk of cancer.

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Alcohol and the risk of cancer: preliminary results from CHANCES

Background. Alcohol intake has been associated with an increased risk of cancer in the upper aero-digestive tract, liver, colorectal and female breast, as reported by IARC and WCRF/AICR. In this study we laid the ground for the estimation of the association between alcohol use and the risk of specific cancer sites in the CHANCES consortium, within the framework of competing risks analysis.

Method. Participants from 9 European cohorts (AARP, ESTHER, five EPIC Elderly cohorts [SP, GR, SW, DK, NL], the MORGAM Prime Belfast and the Thrømso study) were included in the analysis (N=618,564). Cox proportional hazards models were used to compute hazard ratios (HR), and 95% CI, for categories of baseline alcohol use. Models were systematically adjusted according to cohort, age at recruitment, BMI and height (continuous), as well as smoking status. Sex-specific analyses were consistently carried out. Study subjects that reported a history of cancer before recruitment (prevalent) (N=11,334), had missing information on alcohol use (N=3,250) or any other adjustment variable were excluded (N=13,873). Competing risks analysis was used to compute cumulative incidence curves.

Results. During follow-up, a total of 3,746 upper aero-digestive tract (UADT), 11,946 female breast, 1,215 liver and 10,047 colorectal cancers were observed. Alcohol use was strongly associated with UADT cancer and female breast cancers. Regarding liver cancers, a lack of association was observed in women, whereby in men heavy alcohol users (greater than 60 g/day) showed a 35% significant increase risk compared to moderate users (0.1 to 5 g/day). Finally, alcohol use was convincingly linked to colorectal cancer risk in men, while a weaker association was observed in women. Estimates of absolute risks of developing colorectal and breast cancers, in women and men respectively, for individuals aged 60 years at baseline according to heavy and moderate alcohol use, displayed a monotonic increase over time.

Conclusion. The contribution of alcohol use in the development of UADT, breast, liver and colorectal cancer was primarily confirmed in this study of European and American populations. We laid the ground for more exhaustive assessments of the relationship between alcohol use and the risk of developing other cancer types, including prostate, pancreatic, melanoma, but also Hodgkin's and Non-Hodgkin's lymphomas, kidney and cervical cancer. Absolute risks of specific cancer types for different levels of exposure at given ages over time can account for the competing force of overall mortality. Therefore, they can provide an accurate tool for the evaluation of the burden of chronic diseases in the general population.

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Hip fractures affect mortality, morbidity and disability levels of middle-aged and elderly populations

The disease burden caused by hip fractures was quantified in the CHANCES project using a metric called disability-adjusted life-years (DALYs). This metric consists of the sum of years of life lost due to premature mortality and the years lived with disability. Data was gathered from four studies of middle-aged and elderly populations, in Europe and the United States.

After an average of more than 12 years of follow-up, 3,642 incident cases of hip fracture were identified. A total of 2,993 DALYs were lost due to hip fractures, 24% of which belonged to the 70-74 age group. The disability caused by the hip fractures was responsible for 80% of the lost DALYs.

Hip fracture is a serious cause of disability as well as mortality among the elderly. Future interventions should focus on shortening recovery time and reducing long-term disability after a fracture incident, but also on stepping up efforts for a better primary prevention of falls in the elderly.

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The effects of education and marital status on the risk of hip fracture in older men and women
Results from the CHANCES project

Osteoporotic fractures present a major public health problem worldwide, in terms of morbidity, mortality and cost. Hip fracture is the most serious osteoporotic fracture, contributing the most to this burden. The risk of falling increases with age and is somewhat higher in elderly women than in elderly men. Since the proportion of the elderly in the population is growing, it is estimated that the incidence of hip fractures will significantly increase in the future. This leads to the necessity of identifying risk factors that are, ideally, causally associated with hip fracture incidence and to the subsequent implementation of preventive actions to lower the risk. Many risk factors have been identified so far, including low body mass index (BMI), increased height and reduced exposure to sunlight. However, findings regarding the association between hip fracture risk and education or marital status are generally limited.

The question arising is whether lower education or living alone are risk factors for hip fracture. In CHANCES, we combined data from seven cohorts in Europe and the United States composing a sample of 150,000 individuals ≥60y who were followed on average ≥10y, in order to investigate this hypothesis. We found that the risk of hip fracture was reduced by 16% among those with higher education compared to those with lower. This association was more pronounced among women and was independent, over and beyond the influence of other factors, such as age, tobacco smoking, physical activity, BMI, height, energy intake, alcohol consumption and co-morbidity.

We also observed a significantly higher risk of hip fracture among individuals living alone, especially those aged 60-69, by 17% as opposed to those being married or cohabiting. The risk actually dropped to 12% after controlling for the differences in the aforementioned factors (e.g. age, tobacco smoking) but remained borderline significant. The latter finding is consistent with research suggesting that there is a beneficial association of marriage with healthy behaviors or that older individuals living alone are more prone to bad behaviors and suffer from mental disabilities.

Our results stress the importance of education and marital status, in the identification of older individuals at higher risk of hip fracture and in the implementation of relevant interventions.

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Cognitive decline and cognitive disorders

The main focus of the study is cognitive decline and dementia disorders among the elderly. All cognitive disorders follow upon organic brain lesions that cause the cognitive or intellectual symptoms. These disorders, which include Alzheimer's disease, are of great importance, as they both cause individual suffering and have a big impact on healthcare systems all across Europe.

This study went through a large number of CHANCES cohorts reflecting diseases in the elderly populations. It found that only a few of the cohorts have focused on cognitive disorders, which implies that the number of existing variables is limited and only includes, for instance, the MMSE (Mini Mental State Examination) and some other memory tests. Common variable definitions and cohort descriptions have, however, been produced, as well as harmonisation rules. All these have been incorporated into a common Wiki database, an excellent source of information regarding all CHANCES datasets. Studies within these datasets have been initiated in order to obtain further information about the effects of sedentary lifestyle, dietary patterns, cerebrovascular diseases and socio-economic status on cognitive decline in the elderly. So far, studies in this area have indicated that the continuation of smoking is linked to reduced memory function in the elderly, but this does not apply to lipids.

To this day, the only database that primarily focuses on Alzheimer's disease is the Swedish Alzheimer Registry, which includes about 400 patients with confirmed Alzheimer's disease along with preclinical biobank samples. Using these patients' preclinical blood samples, many biochemical analyses are currently carried out, in order to learn more about the preclinical pathophysiology of Alzheimer's disease and the potential preclinical indications of this disorder. Results include clear indications that the Herpes virus is linked to the development of Alzheimer's disease, as an increase in the activity of this virus is observed about 10 years before the onset of symptoms.

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Cognitive performance and decline

Within the CHANCES project, we investigated possible associations of nutritional factors with cognitive performance later in life, focusing on the dietary intake of fats and the adherence to the Mediterranean diet pattern. We also investigated the link between cognitive performance and mortality.

We used 8 cohorts from different centres participating in the CHANCES consortium (7 from Europe, 1 from the USA) to seek associations of dietary fats with cognitive performance later in life. Assessed fat groups included: i) saturated fats (SFA), ii) monounsaturated fats (MUFA) and iii) polyunsaturated fats (PUFA). After meta-analyzing the results from the 8 participating cohorts, we found no association between SFA or MUFA with cognitive performance, while greater consumption of PUFA seem to slightly improve cognitive performance (with borderline statistical significance).

Moreover, in our search for associations of an adherence to the Mediterranean diet (MD) pattern with cognitive decline later in life, we used data from Greece, a country where Mediterranean dietary habits are common. Adherence to the MD was measured by the MD score (between the years 1994-1999). A cognitive performance scale was administered twice to each participant, initially in 2004-2006 and then again in 2011-2012. Differences between the 2 assessments reflected cognitive decline. A strong inverse association between the MD score and cognitive decline was found. When MD components were studied individually, a strong inverse association between vegetable intake and cognitive decline was found. In other words, close adherence to the Mediterranean diet pattern, especially regarding a sufficient intake of vegetables, appears to be protective against cognitive decline.

Finally, with respect to the relationship between cognitive performance and mortality, we used 8 cohorts from different centers participating in the CHANCES project (7 from Europe, 1 from the USA). We found that cognitive performance had a strong inverse association with age-adjusted mortality, independently of other risk factors that are known to affect mortality. In other words, cognitive impairment is by itself a risk factor for earlier death.

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Educational inequalities in health among the elderly: Evidence from the CHANCES cohorts

A persistent disadvantage of low against high education, that affects a number of health indicators, was re-confirmed, using the CHANCES cohorts, among the elderly in Europe. Nonetheless, the degree of education-related inequality in health differs consistently across European countries.

Identifying the effect of educational inequality in the prevalence and occurrence of (chronic) disease and self-rated health across different countries – hence also different health care systems – is an important task in health equity research. The association between socio-economic status and health for the general population, both within and across countries, has already been the main focus of previous research. This study looked at education-based inequalities in people aged 50 and over. Using objective health information, such as the occurrence of coronary heart disease or fractures, and self-assessed (subjective) health from the CHANCES cohorts, helped provide detailed information on educational health inequalities among the elderly. Education arguably has the greatest effect on health, depending on age, which is what makes the focus on education-related inequalities interesting. Education is not only a measure of social stratification; it is also related to people's material and non-material resources. It is a well-established fact that education acquired earlier in life influences health at an older age.

Using the concentration index as the most common way of measuring relative inequality, analysis of the CHANCES cohorts showed that education-related inequality in self-rated health is mostly observed in Greece, in the case of both men and women. The most equal distribution among men was found in Poland and Switzerland, while among women it was observed in Poland, Estonia and Germany. Inequalities among men in the occurrence of fractures were once again greater in Greece, followed by Germany, Denmark, France, Belgium and the Czech Republic, whereas the women's list was topped by Italy and Spain. Regarding coronary heart disease, researchers found greater education-related inequalities in Greece than in Sweden, Germany and the Czech Republic for men and greater inequalities in Greece than the Czech Republic and Denmark for women. These results demonstrate the disproportionate distribution of health indicators among educational groups across European countries.

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Does self-perceived health predict the mortality of the elderly? Results from the consortium on health and ageing network of cohorts in Europe and the United States (CHANCES)

It is common in questionnaires assessing population health to find a question referring to Self Perceived Health (SPH). The question is usually simple, along the lines of "In general, how would you rate your health?" with answers typically ranging from "poor" to "excellent". Many studies in Europe, US and Japan have examined the usefulness of this simple question in assessing health - in the majority of these studies, people considering their health as "poor" had a mortality rate twice as great compared to those perceiving themselves as being in "excellent" health. This survival decline could be most important among elderly people, due to the inevitable increased morbidity and mortality of this age group. But is this association real or is it driven by sociodemographic or lifestyle differences among people and, more importantly, by differences in diagnosed health conditions? Moreover, what is the profile of people who tend to consider their health as good/excellent rather than fair or bad?

In CHANCES we investigated the aforementioned questions, using seven cohorts including 384,327 participants ≥60 years, 86,364 of whom were deceased at the time of the analysis. We observed a consistent trend of increased mortality by about 35% for those with "fair" SPH and of about 100% for those rating their health as "(very) bad" compared to those with SPH rated as "good/very good/excellent". This increase in mortality cannot be attributed to differences in health problems among the people observed nor can it be attributed to differences with respect to age, sex, smoking, weight, alcohol drinking, education or marital status.

We further noted that males (as opposed to females) with normal weight (as opposed to being overweight/obese), no cardiovascular diseases, diabetes mellitus or cancer (as opposed to having at least one of those), highly educated (as opposed to having at maximum primary education), and who perform vigorous physical activity (as opposed to not performing such physical activity) tend to rate themselves as having good health rather than fair or poor.

These results may be of great interest to Public Health policy makers since it seems that one question can provide a satisfactory description of the "objective" (that is post-diagnosis) health of an elder.

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Educational gradients in the effects of health shocks on early retirement: Evidence from CHANCES cohorts

Poor health is a major cause of early retirement, which, in turn, leads to the double disadvantage of poor health combined with poverty. But bad health does not affect everyone in the same way and education plays an important role in explaining who retires after experiencing a major health shock. With regards to men, it was noted that poorly educated workers suffer disproportionally from negative health shocks and are more likely to take early retirement, compared to more educated workers. When it comes to women, nonetheless, results showed the opposite. Less educated female workers are less likely to retire early, compared to those who are better educated.

Despite the increase in life expectancy over the past decades, many older workers leave the labor force earlier than the official retirement age. Other than economic incentives, poor health has also been cited as one of the most important causes of early retirement. It has been shown that the socio-economic status in general and education in particular have a soothing effect on the shock caused by health incidents, which understandably affects participation in the labor force. Using the CHANCES cohorts, the relationship between health and work in older workers, close to retirement, as well as the importance of education in this relationship was re-examined. In particular, adverse health events such as coronary heart disease (CHD), strokes, cancer, or hip fractures that occurred during the follow-up were analysed.

Individuals who reported leaving the labor force before the official retirement age either for health reasons or because they were unemployed were classified as early retirees. Labor force exit due to poor health is generally reflected in the so-called disability insurance pathway, available to workers in most European countries before they are eligible for a regular pension. Retirement via unemployment is another pathway frequently used among older workers in Europe who are not eligible for disability insurance benefits. Discrete-time event history (logit) analysis was used to examine the impact of the aforementioned health incidents on labor force exit and the education-related heterogeneity in the labor-supply effects of negative health events. Overall, results indicate that health shocks do in fact influence the work force towards early retirement, but the moderating role of education in this process differs across the sexes.

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Adaptation to adverse health events: the role of education and experience. Evidence from the CHANCES cohorts

How do people perceive their own health? How is this perception related to adverse health events and how does that relationship change over time? New evidence from the CHANCES cohorts clearly indicates that individuals' health self-ratings are affected by the onset of disease, but that individuals are also able to adapt to adverse health shocks. Individuals with higher social and cognitive status – as measured by college education – in particular seem to suffer less from an adverse health event. The same applies to individuals without previous experience of a severe illness.

At a time of demographic change and advances in medical technology, people are more likely to survive a severe illness. They live longer and thus possibly experience more adverse health events during their course of life than ever before. Recent studies focus on the general well-being or self-rated health of individuals who either experienced some kind of adverse life event or have to live with disability of functional impairment due to illness. Motivated by the psychological adaptation theory – which states that people's well-being initially reacts to positive and negative life events but adjusts to a baseline level over time – factors that promote or impair adaptation to the onset of severe illnesses, such as cancer or stroke, were studied among people aged 50 and over across Europe. Evidence was indeed found of partial, but not full, adaptation over time.

Further attention was given to the role of formal education and previous experience with such adverse health events. Results suggest that neither education nor previous experience seem to facilitate adaptation over time. However, better-educated individuals react more favorably to adverse health events, something that might be explained by the fact that they have better cognitive and economic resources and different ways of handling (health) information. On the contrary, being diagnosed with a severe illness impairs subjective well-being to a greater extent for experienced individuals. This can be explained by a cumulative effect, i.e. that those individuals' well-being is even more strongly impaired by an additional health shock.

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Age at menopause between 40 and 50 lowers a woman's survival

Past studies have indicated that women who experience menopause at an earlier age have a higher risk of subsequent mortality. Several researchers have looked into the issue, but all previous studies were small, hence not allowing firm conclusions.

As a part of the CHANCES project, we were able to gather data from seven different studies that included over 58,000 women. The results confirmed that earlier menopause was associated with increased mortality. Women who went through menopause between 40 and 44 years of age had a 16% higher chance of dying compared with women who experienced menopause between 50 and 54 years. The chance of dying was 9% higher in women going through menopause between the ages of 45 and 49. The women who took part in the studies came from different European countries, including the United Kingdom, Sweden, Greece and Lithuania. Differences between countries such as age structure as well as other factors, like smoking, were taken into account. The relationship between age at menopause and survival was roughly similar within each country.

On average, a woman will experience menopause at 50 years of age. It can be as early as 35 or even younger and as late as 60. Menopause is caused by either the lack of eggs available in your ovaries or dysfunctional eggs. As a consequence, levels of estrogen (female sex hormones) begin to drop and this hormonal change has been linked to several diseases, such as breast cancer. Most likely it is this drop in estrogen levels that plays a role in the relationship between age at menopause and survival.

The issue at stake is whether age at menopause is the cause of increased mortality risk or whether it reflects something else, which is the 'true' cause of the lower survival. For instance, earlier menopause may be a marker of poor health, which in turn may also lead to a higher risk of death.

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Never too old to eat healthy

Background: The world's population is ageing, a development that increases the prevalence of chronic diseases, especially cardiovascular diseases and cancer. A long, lasting life is envisaged without the burden of disease. Therefore, current research focuses on risk factors, such as a healthy diet, which may decrease the occurrence of chronic diseases even at advanced age. Earlier studies, examining the role of a healthy diet in the elderly, applied different analysis strategies. Consequently, comparability across studies is limited, preventing overall conclusions concerning the role of a healthy diet in the elderly.

Methods and subjects: Eleven prospective cohort studies among elderly people (N=396,391) from Europe and the United States, collaborating in the CHANCES consortium, were analysed. A healthy diet was defined based on the 2003 World Health Organization (WHO) "nutrient intake goals" and the 2007 World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) food group recommendations. The recommendations were operationalised, using the Healthy Diet Indicator (HDI) and the WCRF/AICR diet score. The association between a healthy diet and risk of all-cause mortality and CVD mortality was studied using the WHO recommendations, which aim at the prevention of chronic diseases in general. The cancer specific WCRF/AICR recommendations were applied to study the association between a healthy diet and cancer risk. Diet disease associations were assessed in each cohort separately, using Cox-proportional hazards regression. Cohort specific hazard ratios (HR) were pooled by random effects meta-analysis.

Results: An increase of 10 HDI points (range total score 0 to 70 points) was significantly associated with a decreased risk of all-cause mortality (HR: 0.90 and 95% confidence interval (CI): 0.87-0.93). The HR estimate was equivalent to a two-year increase in life expectancy. We found a significant inverse association between an increase of 10 HDI points and CVD mortality for Southern European countries and the US (HR: 0.87, 95% CI: 0.79-0.96), whereas no significant association was found for Northern, Central and Eastern Europe. A 1-point increase for the WCRF/AICR diet score (range 0-4) was associated with a significantly 7% decreased risk in developing any type of cancer. Greatest risk reduction was found between a 1-point increase in WCRF/AICR diet score and colorectal cancer (HR: 0.85 and 95% CI: 0.81-0.89).

Conclusion: Dietary indices based on globally defined dietary recommendations by WHO and WCRF/AICR were found to be associated with all-cause and CVD mortality and cancer risk in old age. Public health interventions targeted on the elderly should not focus on one definition of a "healthy diet" but rather on a smart combination of available evidence, to optimally account for CVD as well as cancer specific outcomes.

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Vitamin D and mortality: meta-analysis of individual participant data from a large consortium of cohort studies from Europe and the United States

Several studies have linked low serum 25-hydroxyvitamin D concentrations (25(OH)D) to mortality. Nonetheless, so far there have not been reports based on age, sex, season and country specific results from a large consortium of cohort studies.

We conducted an individual data meta-analysis of eight population-based cohort studies from Europe and the United States, comprising 26,018 men and women aged 50-79 years of age in total. Concentrations of 25(OH)D varied strongly by season (higher in summer), country (higher in US and Northern Europe) and sex (higher in men), whereas no consistent trend with age was observed. During the follow-up, 6,695 study participants passed away, with 2,624 dying of cardiovascular diseases and 2,227 of cancer. For each cohort and analysis, 25(OH)D quintiles were defined according to cohort and sub-group specific cut-off values. The comparison of bottom against top quintiles resulted in a pooled risk ratio [95%CI] of 1.57 [1.36-1.81] for all-cause mortality. Risk ratios for cardiovascular mortality were similar in magnitude to the risk ratios of all-cause mortality in subjects, regardless of whether they had or did not have a history of cardiovascular disease at baseline. Regarding cancer mortality, an association was only observed among subjects with a history of cancer (risk ratio, 1.70 [1.00; 2.88]). Analyses carried out using all quintiles, suggest curvilinear inverse dose-response curves for the aforementioned relationships. Significant and specific differences related to age, sex, season or country, were not detected.

Despite strong variations of 25(OH)D levels according to country, sex and season of blood collection, the association between 25(OH)D level and all-cause as well as cause-specific mortality was remarkably consistent. Targeted, long-term randomized controlled trials are necessary in order to explore whether vitamin D supplementation can reduce mortality from cardiovascular diseases, cancer and other causes, in individuals with the relatively lowest 25(OH)D concentrations.

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Biomarkers

The CHANCES project (Consortium on Health and Ageing: Network of Cohorts in Europe and the United States) is a collaborative large-scale integrating project. Funded by the European Commission (FP7), it aims at producing evidence on ageing-related health characteristics and determinants in Europe. CHANCES focuses on four groups of chronic diseases: cancer, cardiovascular diseases and diabetes, osteoporosis and fractures, cognitive function and psychiatric disorders, all of which are major contributors to the burden of disease in the elderly.

In the work-package on Biomarkers (WP9), the aim was to identify a set of biomarkers that can act as a general predictor of health in the elderly, and which correlates with the absence or presence of various age-related chronic diseases, such as cancer, diabetes and CVD, osteoporosis, cognition and total mortality, studied in WP3 to WP7. Initially, an inventory was made of the biomarkers that have been measured in the various cohorts. Then, a set of biomarkers were selected, related to ageing and diseases, to complete the existing data set of biomarkers. As strongly suggested by the EC, emphasis was laid on cohorts from Central and East-European origin (HAPIEE cohorts from Krakow, Prague and Kaunas) as well as the ESTHER cohort (Germany). In these cohorts, 177,695 biomarkers were measured in 15,732 serum samples. In addition to biomarkers of nutrition (folate, vitamin B12, vitamin D, magnesium) and disease (kidney and liver function, inflammation), biomarkers of oxidative stress, antioxidant and redox status were measured for the first time in this particular combination. These biomarkers represent a number of adverse processes in the body that cause oxidation damage to cells and organs and are thought to be linked to the risk of diseases and ageing.

It appeared that nutrition biomarkers folate, vitamin D and magnesium had a significant negative correlation with cardiovascular disease, cancer (vitamin D only) and total mortality. The biomarkers for oxidative stress (Reactive Oxygen Metabolites) and redox status (Total Thiol Levels) have significant correlations with cardiovascular diseases, total mortality, cancer (ROM only) and frailty (severe ageing).

A combination of these biomarkers gives valuable information about the processes that lead to chronic diseases and the ageing process. Lifestyle changes and/or supplementation could prevent these adverse effects of ageing.

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Genetic factors are often associated with diseases early in life

Genetic factors are often associated with diseases early in life. Indeed major genes with large effects express young, e.g., major mutations in the LDL-receptor leading to dyslipidemia in young men at the prime of their lives (around age 30 years), with subsequent myocardial infarction before 50 years. There is increasing evidence that genes may also be involved in the oldest old.

The nature of the genes is different - they are typically common and have small effects by themselves. However, if these effects are added up together into a genetic risk score, they become major players in the population risk of disease - particularly as they work in concert with typical risk factors such as obesity and smoking. In CHANCES we showed that the joint effect of the common genes on the risk of high cholesterol levels is as bad as those effects of single genes leading to disease at young age. The common variants involved in late onset act as grasshoppers - one is a harmless insect but a 1000 is a dangerous plague.

We further noted that the effect of these genes adds up to effects of obesity on lipid levels in the blood. We saw a similar effect of common low risk genes on the risk factors of stroke, one of the major disabling diseases in the elderly. This raises the question of whether we should also screen for genes in the elderly to prevent disability and death. We are planning similar analyses for osteoporosis and dementia.

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Health Module – a brief instrument to assess the health of older persons

Healthy ageing is a multidimensional concept that considers people's ability to maintain optimal health and live independently for as long as possible. There is no single measure of healthy ageing; instead, different indicators include physical and cognitive functions, mental health, quality of life, social participation and engagement.

One of the aims of the CHANCES project was to compile a brief yet comprehensive instrument to assess the crucial aspects of older persons' health, in a manner that can be comparable across countries. Hence, in this large collaboration, several partners jointly created the Health Module. Widely used and validated questions were combined with objective assessments of physical and cognitive functioning to create the Module. It has three levels of complexity that range from a core module to optional measurements; this is important so as to provide flexibility while maintaining comparability.

Because this combination of questions and physical tests has not been used before, the Health Module was tested in four different European populations: Northern Ireland, Greece, Sweden and Poland. These pilot studies confirmed that the questionnaire was easily understood and well-received by the vast majority of elderly participants.

Batteries of questions were related to a common subject, confirming its suitability to capture their themes. Associations between different domains were in the expected directions. For instance, questions such as how much time a participant felt lonely during the past week, all pointed to depression. In addition to the validity of the questionnaire, the time it takes to complete the Health Module is also important. The aim was to construct a measurement tool whose implementation lasts 45 minutes; indeed, in the pilot study, most participants were able to complete the module within this time frame.

Overall, the Health Module proved to be valid, acceptable, easy to complete and a relatively quick instrument to assess health ageing. Because of the flexibility provided by the three levels of complexity, the Health Module is easy to use by other researchers and study groups as well, so as to provide comparable data from different populations.

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The added value of CHANCES: An EU-funded project created valuable resources for the study of the improvement of the ageing population's health

The CHANCES project has brought together 15 population studies and networks of population studies from 23 countries for the research of health and its determinants as well as the possibilities of improving the health of the ageing population. The project is coming to an end, but the network itself, trained young researchers, the harmonised data and the developed study methods are valuable resources in themselves and can also lead to future international research collaborations.

The network of researchers from 21 European countries, the United States and Australia studied cancer, cardiovascular disease, diabetes, fractures and osteoporosis, cognitive impairment and dementia, disability and frailty, multi-morbidity and mortality, and the impact of their respective risk factors on the ageing population. To facilitate this joint effort, the wide network made extensive use of the internet, a wiki server in particular. The data harmonisation was coordinated by the National Institute for Health and Welfare of Finland.

This summary refers to the presentation "CHANCES Networking – implications for future research" by Kari Kuulasmaa and to the poster "Data Harmonization," created by Tarja Palosaari, Teemu Niiranen, Heli Tapanainen and Kari Kuulasmaa.

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PHOTOS

The Workshop

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CHANCES Posters Presentation

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PHOTOS

SPEAKERS

A. Trichopoulou
Hellenic Health Foundation (HHF)

Opening of the Workshop

M. van den Berg
European Commission

European Innovation Partnership on Active and Healthy Ageing

P. Boffetta
Hellenic Health Foundation (HHF)

Setting up CHANCES

K. Kuulasmaa
National Institute for Health and Welfare (THL)

CHANCES networking: Implications for future research

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Results from the CHANCES projects

B. Schöttker
German Cancer Research Center (DKFZ)

Vitamin D and all-cause mortality in older adults

C. Bamia
Hellenic Health Foundation (HHF)

Self-perceived health & mortality among the elders

N. Jankovic
Wageningen University (WU)
Institut für Medizinische Informatik, Biometrie und Epidemiologie (IMIBE)

Healthy ageing through a healthy diet-Never too old to eat healthy?!

K. Tsilidis
Hellenic Health Foundation (HHF)

Years of life lost due to premature mortality and disability because of cancer (DALYs)

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Results from the CHANCES projects

E. Jansen
National Institute for Public Health and the Environment (RIVM)

Biomarkers of ageing and disease

I. de Vivo
Harvard School of Public Health

Overview of the role of telomere length in the ageing process

I. Bergdahl
Umeå University

The association of the Herpes simplex infection with the risk of Alzheimer's disease among the elderly

M. Bobak
University College London (UCL)

Development of a common Health Tool for the assessment of health and ageing-related outcomes in Europe

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Results from the CHANCES projects

U. Mons
German Cancer Research Center (DKFZ)

Smoking and cardiovascular disease in older adults

M. Katsoulis
Hellenic Health Foundation (HHF)

Cognitive decline in older adults

Ph. Orfanos
University of Athens (UoA)

The effects of education, marital status and other factors on the risk of hip fracture in older men and women

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Public Health Policy for elder adults: the experience of 3 European countries

P. Lagiou
University of Athens (UoA)
Harvard School of Public Health

Chair

M. Chauliac
Direction générale de la santé

Nutrition Policy for the elders - the experience of France

T. Niiranen
National Institute for Health and Welfare (THL)

Social networking among the elders - the experience of Finland

M. Gabrijelcic
National Institute of Public Health

Increasing physical activity among the elders - the experience of Slovenia

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Bringing together researchers and policy makers

H. Jürges
Bergische Universität Wuppertal (BUW)
(replacing Prof. Miguel A. Martínez-Gonzalez)

The impact of ongoing studies on healthy and active ageing: the case of SHARE

H. Brenner
German Cancer Research Center (DKFZ)

Where should research focus on, with respect to the elderly "phenomenon" from a Public Health perspective?

D. Boumpas
University of Athens (UoA)

The role of research funding bodies

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