‘PREVENTION AND HEALTH: FROM COMPLEX LIFE COURSE TO SIMPLE SOLUTIONS’

PROF. DR. O.H. FRANCO

‘PREVENTION AND HEALTH: FROM COMPLEX LIFE COURSE TO SIMPLE SOLUTIONS’

Oplage 1000
Omslagfoto Levien Willemse, Rotterdam
Ontwerp Ontwerpwerk, Den Haag
Drukwerk Canon Business Services

ISBN 978-94-914-6216-0

‘PREVENTION AND HEALTH: FROM COMPLEX LIFE COURSE TO SIMPLE SOLUTIONS’

REDE

Uitgesproken ter gelegenheid van
het aanvaarden van het ambt
van hoogleraar Epidemiologische basis
van preventieve geneeskunde
i.h.b. cardiovasculaire aandoeningen
aan het Erasmus MC, faculteit van
de Erasmus Universiteit Rotterdam
op 3 mei 2013

door

PROF. DR. O.H. FRANCO

Mijnheer de Rector Magnificus, Leden van het College van Bestuur van de Erasmus Universiteit, Mijnheer de Decaan van de Faculteit Geneeskunde en Gezondheidswetenschappen, Leden van de Raad van Bestuur van het Erasmus MC, Geachte vertegenwoordigers van de studenten, dear family, friends, collegues, dames en heren.

Introduction

Curiosity... As I said one day 11 years ago during the student address at the 2002 NIHES graduation, it was curiosity that took me from Colombia to the Netherlands and led my career into medicine. It is also curiosity that has delineated my scientific journey through medicine to cardiovascular surgery, psychiatric epidemiology, cardiovascular epidemiology, public health, ageing, and now preventive medicine. A journey guided by curiosity – centred on a personal quest to serve and simplify, to make what is abstract simple and understandable. A journey with the sole objective of facilitating change and making tangible to all what is generally reserved for just a few.

A joyful and eventful journey that has taken me through different places and has guided my own personal and scientific evolution – a never-ending odyssey with quite a clear 'Ithaca' departure port, but hopefully with unexpected destinations. A journey I hope has just started.

And today I would like to share with you a glimpse of my personal journey, of what has brought me to be here today as I accept with humility the responsibility of representing preventive medicine within the department of epidemiology, Erasmus MC and Erasmus University – and accept the considerable task of contributing to the advancement and dissemination of the field.

In this lecture I will take you through a chronological, geographical but especially conceptual journey that is aimed at simplifying the complexities of preventive medicine, health, the human life course, and populations
But why preventive medicine? Why would my journey take me to this particular field?

Preventive medicine is one of the oldest fields in medicine – one which, as its name suggests, should be at the forefront of medical care and should in principle anticipate all the other fields of medicine. Although the origins of preventive medicine take us back to ancient times, the field was only consolidated in the 19th century with the postulation and demonstration of the germ theory. While it might sound hilarious to audiences today, the dominating principle throughout most of humankind's history was that infections, disease and death were mainly due to God's plan or to sheer luck.

Origins of preventive medicine

The first indications of an understanding of the transmissibility of disease and the possibility of preventing it can be found in Babylon 4000 years ago. Babylonians considered that disease could be caused and spread by insects. They nonetheless blamed Baal-Zebub, the god **of flie**s and insects.

It took centuries for the natural causes of disease to be considered and before medicine diverged independently from religion and philosophy – a process that started on the Dodecanese island of Kos, at the *asklepieion* where a young Hippocrates started his training 2400 years ago. *Asklepieia* were centres for care and training, the academic medical centres of ancient Greece. The name *asklepieion* is derived from the Greek god of medicine Asklepios, who was the mortal son of Apollo – the god of the sun – called the healer. Asklepios inherited the capacity to heal from his father. He was so successful, history recounts, that Hades, the god of hell, complained to Zeus about the great reduction in his clientele, whereupon Zeus took care of Asklepios with one of his thunderbolts.

Asklepios himself had descendants. Among them, his daughters contributed greatly to the early origins of medicine and preventive medicine: Panacea, the cure for all; Meditrea – to some, the origin of the name medicine – and particularly Hygieia, goddess of health and prevention. These were the forefathers of preventive medicine, who Hippocrates brought together in his great contribution to the establishment of the ethical principles of the medical profession, the Hippocratic Oath:

"I swear by Apollo, the healer, Asklepios, Hygieia, and Panacea, and I take to witness all the gods, all the goddesses, to keep according to my ability and my judgment, the following Oath and agreement..."

Besides its great contribution to the establishment of medicine as a profession, Hippocratic medicine provided the foundations for preventive medicine: Hippocrates taught of natural causes for disease, and considered that the cure should also be based on natural solutions, including physical activity, adequate dietary habits, and sufficient sleep. Hippocrates was also the first to use the terms *epidemic* and *endemic* to describe occurrence of disease. Nevertheless, by blaming bad odours and airs – the miasmatic theory of disease – Hippocratic medicine failed to understand the nature, origin and transmission of infections, or find a solution to it.

Subsequent advances in preventive medicine proceeded at a much slower pace. Hippocratic medicine and miasmatic concepts persisted as the example of best practice, and for centuries humankind was brought to the brink of extinction by periodic outbreaks and pandemics caused by illnesses such as the plague, syphilis, anthrax, leprosy, influenza and smallpox. The struggle to understand the nature of the origins and preventability of infectious diseases persisted, and only through painfully slow advances was humankind able to survive.

In the 16th century, Fracastoro from Padua, Italy – to some, the world's first epidemiologist – described the possibility that infections were a cause and epidemics a consequence. He noted that contagion was caused by infective seeds (*seminaria*) which were so small they could not be seen.

In Delft a century later, Leeuwenhoek's use of a microscope enabled him to see the infective seeds described by Fracastoro. He called them animalcules. He nonetheless failed to make the connection with disease.

It was not until the late 18th century that the first real advances in the battle against infections were achieved by the British physician Edward Jenner, who noticed how dairymaids who had had cowpox were immune to smallpox. Aiming to prevent the development of smallpox, he began to inoculate people with the bovine disease – a process later called vaccination, from the Latin word for cow: *vacca*.

It nevertheless took six more decades before the dots were joined and the origins of infections were clarified. At a symposium on spontaneous generation at the Sorbonne in 1864, Louis Pasteur presented the germ theory to the world, and "officially" gave birth to preventive medicine. Pasteur, and, later, Robert Koch, further described the causative organisms of many diseases. Between them, they laid the foundations of the golden age of medical discovery, which reached a pinnacle in the early 20th century with the discoveries of antibiotics and DDT.

Combined with centuries of improvement in hygiene, sanitation and socioeconomic conditions, the world was changed dramatically by improvements in infection control, prevention and treatment.

The 20th century

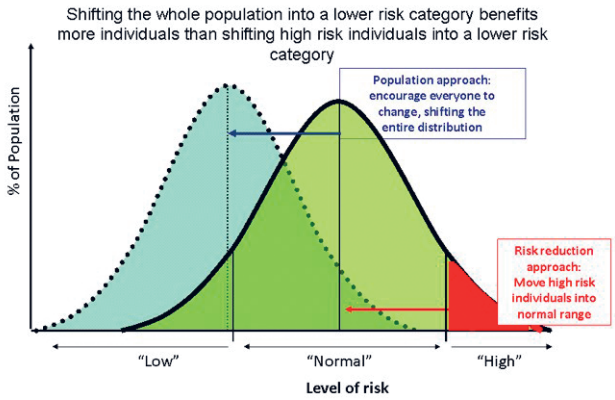
As the 20th century proceeded, great changes occurred. I would like to focus in two of them: the redistribution of disease and the redistribution of the population.

The redistribution of disease

In 1900, the three main causes of mortality in the US were three communicable diseases: tuberculosis, pneumonia, and diarrhoea. By the year 2000, the three main causes of mortality were coronary heart disease, cancer, and stroke. This was also the case in Europe – for men and women alike. In fact, by 2008, coronary heart disease and stroke were the number one and number two causes of mortality worldwide.

But cardiovascular disease is not a modern disease. Recently, scientists took 137 mummies from Egypt, Peru and other locations, and ran them through a scanner to determine how many and to what extent they would have atherosclerosis, a process linked to cardiovascular diseases. They discovered the presence of atherosclerosis in approximately three mummies in ten, and that this presence increased proportionately to the mummy's age at death.

Although cardiovascular disease has long been among us, it took us many centuries to understand its causes, and also to understand the factors that could increase the risk of certain individuals developing it. And for this we all owe a great deal to the small town of Framingham in Massachusetts... and to the Framingham Heart Study. Starting in 1948, the Framingham heart study – together with other population studies – shed light on the causes and risk factors that would lead populations to develop cardiovascular disease. Over time, we were able to identify various risk factors, such as gender, smoking, physical inactivity, and blood pressure. Doctors and scientists would then measure these risk factors in individuals, and, to take just one example, that blood pressure above a particular level would be considered a disease – "hypertension" – and that a lower level would be "normotension".



Observing this way of dealing with cardiovascular risk factors, George Pickering, a physician from the UK, said there's no such thing as hypertension! While the distinction may be necessary for practical reasons, it does not reflect the nature of the disease. As, in most cases, disease factors are actually distributed normally in the population, we all share them to a certain degree. It is the same for cholesterol, which might change between populations: sometimes the distribution is skewed towards normality or abnormality, but it is generally a normal distribution for cardiovascular risk factors.

Dr. Pickering further observed that it would be arbitrary and rather artificial to select a particular cut-off level – let's say 140 or 160 millimetres of mercury for systolic blood pressure – and to describe everyone else above that level as hypertensive: this does not describe the nature of the risk factor, since the question is not who has it or who doesn't, but to what degree we *all* have it. In Dr. Pickering's own words: "the sharp distinction between health and disease is a medical artefact for which nature, if consulted, provides no support. This is difficult for doctors to understand, because this is a departure from binary thought. Medicine can count up to two, not beyond." This persistence of a binary approach may be a hangover from the history of infections and the management of infectious diseases, where you define a case, diagnose it, treat it, and cure it.

George Pickering's ideas were taken further by one of his students, Geoffrey Rose, also from England. Continuing Pickering's line of thought, Dr Rose remarked that by observing the normal distribution of risk factors in populations, most of the interventions or actions we take to prevent and treat cardiovascular disease focus mainly on identifying those at higher risk – the tail of the distribution, with the highest

risk within the population. This is what we normally call the high-risk approach. We treat these people in the tail of the distribution and try to make them normal. He further observed that the greatest gain might be made if the whole distribution of the population, the "big mountain" were shifted "positively" towards normality. That would mean small changes in every one of us, and perhaps small individual gains – but great gains for populations.

In the example of dealing with blood pressure, the high-risk approach would entail treating those with hypertension or blood pressure above a particular level, and attempting to move them into normality (what we see as "normality" tends to be the common distribution within the rest of the members of the population). While the population approach would mean reducing blood pressure levels in the entire population and therefore shifting the entire population distribution towards normality.

Most attempts to treat and prevent cardiovascular disease so far have focused on the high-risk approach. Have we been successful? By 2010, the levels of mortality due to cardiovascular diseases were approximately a quarter of those observed in 1950. The fact that this has been possible was thanks to a large number of different discoveries – medicines such as beta-blockers and statins – and interventions such as catheterization and CABG. But we can also see a dramatic increase in the number of interventions being performed in the population. Between 1980 and 2010, for example, the number of catheterizations quadrupled. This has had an enormous impact on the cost of treatment – which is not expected to fall. Far from it: in the coming twenty years, it is expected to double.

Despite the great advances we have achieved in managing cardiovascular disease and preventing mortality, and despite the great investment that has been dedicated to the management of cardiovascular disease, let me just remind you that, in 2008, coronary diseases and stroke were the world's two top causes of mortality. It is clear that a new strategy is needed – a different way of thinking and tackling these diseases. A revolution in care!

Which is precisely what took place on 28 June 2003 – the day that marked the dawn of a new era in preventive care, cardiovascular disease prevention, and medicine in general: the polyera.

For good reasons and for bad, I believe that we may speak in future in terms of BP and AP – before and after the polyera, or before and after the polypill, the latter being the concept that gave birth to the polyera: a strategy to reduce cardiovascular disease by 80 percent!

The polypill consisted of six different pills combined into a single pill. Professors Wald and Law from London recommended giving this pill to everyone above age 55, or to everyone with established cardiovascular disease. In other words, stop screening: no more screening for cardiovascular diseases, no more blood-pressure measurements, and no more cholesterol measurements. As soon as you turn 55, you get the polypill.

It has taken a while, but nowadays we are very close to having the polypill on the market, and many polypills are being produced by various pharmaceutical companies. In a year or two, it may not be rare to find neighbours, friends or family, or even ourselves, taking the polypill. And indeed, the polypill might have a substantial effect in reducing the burden of cardiovascular disease.

Nevertheless, it is worth considering that if everyone over the age of 55 is treated with the polypill, the economic impact could be enormous. Not only that, but the polypill might also produce adverse effects in approximately fifteen percent of those taking it – among people who are otherwise healthy.

Rather than a population approach, the polypill strategy seems to be a high-risk approach *disguised* as a population approach, because what it effectively does is to treat the tail of the distribution – those with the highest risk, those aged 55 years and over – without taking account of the fact that a high risk of cardiovascular disease is shared amongst us all. While it might produce palliative solutions or short-term, perhaps mid-term solutions, it will not dramatically change the distribution of the risk factors in the population.

Given these considerations, I thought of proposing a population approach, a more natural, safer and probably tastier strategy than the polypill: the polymeal. The polymeal would be like the polypill – a combination of six ingredients – but rather than drugs, it would be foods: garlic, fruits, vegetables, almonds, fish, wine and chocolate. It is not a diet. It is a set of ingredients, a set of tools that you can incorporate within your own diet, and add to your shopping cart by replacing one product with the other. In theory, it could reduce cardiovascular disease by 75% and increase life-expectancy by six years. And if combined with other population approaches such as non-smoking or increased physical activity, it could further reduce the risk of developing cardiovascular disease, possibly increasing life expectancy by 14 years. Fourteen extra years in a population that is already living longer – and that's the second 20th-century change I'd like to talk about today.

The redistribution of the population

In the last 150 years, humankind has witnessed a linear and continuous increase in life expectancy by over 45 years. This has been due mainly to improvements in hygiene and sanitation; to reductions in child mortality, and more recently perhaps also to reductions in adult mortality. With this increase in the number of years that individuals can expect to remain alive, societies have experienced an important redistribution: a redistribution of age in the population. From having a lot of children and not so many elderly populations, we moved to an increase in the number of old people. This is good news, as we can all live until later in life... hopefully. We have seen that the probability we will reach old age is increasing. But this has also meant a new challenge for humankind: what are we going to do with these people? How would they be maintained? Cared for? How are we going to help them to live these years well? These questions led a term to be coined – healthy ageing.

What is healthy ageing? To explain it, I will first talk about ageing. Is there such thing as ageing?

To explain ageing, I like to use the analogy of a spring, in which I compare the human being to a spring. First, a spring has a base, which I'll parallel with the genetic factors of the human being. Then there's the spring itself, the physical structure that is surrounded by the environment, which can itself affect the spring. For example, a corrosive environment can damage the spring's capacity to extend and recoil. Throughout the spring's life, it has to deal with weights, with stressors – things in human beings such as an infection, or breaking up with your boyfriend, or having to give an inaugural lecture. The weight, the stressor, is presented to the spring, thereby generating a change in the spring's extension: the spring loses its original form. Once the weight is removed, the spring recovers its original form. This is what we call resilience, the capacity to accommodate oneself to the presence of challenges. Over time, as the spring deals again and again with different weights, it gradually loses its capacity to recover its original form, its resilience. Until it reaches a time when there is no more recovery, when function ceases and death occurs.

This means that ageing is not a process that starts when you turn 70 or 80. Ageing starts when life starts, and continues into infancy, adolescence, middle age, elderliness. Ageing is a synonym of being alive; it determines the accumulation of time, and thus the accumulation of interaction and exposures, both positive and negative. And as ageing is an everyday process, it's every day that we actively shape the trajectories of the health and life we will have later. The process of ageing does not start when you turn 70. The decisions we take during our daily lives – trivial decisions, will challenge our health and life considerably. And these decisions have long-lasting effects on our health and life.

Barker and others observed this in the 1980s, and described how it was possible during foetal life and infancy that various events – let's take nutrition or infections – would shape the physiological structure of things such as the cardiovascular system, and would dictate that some children would have a higher risk of developing cardiovascular disease later in life. They called it programming.

I think programming actually occurs every day in our lives. Today I might be programming myself for next week's holiday, for my life at age 80, and even for the possibility of reaching that age. Every day, every decision, everything that happens will have an influence, and might differentiate the trajectories we will follow later in life in terms of health or disease. Programming does not occur just at the physiological or pathological level, but may also occur for behaviours and lifestyle factors.

There may indeed be critical periods. I call them golden opportunities. Golden opportunities to understand better how individuals and populations deviate from health to disease, or return to health, or stay healthy; the mechanisms and possible interventions that we can introduce or help the population with, to improve their future. Golden opportunities such as example infancy, when you move from high school to university, or when you move out of your job and enter retirement. Among women, golden opportunities such as pregnancy.

But what about health? How can health be defined? If ageing is the accumulation of time, experiences and exposures throughout our lives, what is health? WHO defines health as a state of complete well-being, and not merely as the absence of disease and infirmity. However, disease and disability occur at different degrees and grades throughout our lives; they are not just present or absent at any given time. Within the days and months – at different times – we have different degrees of disease and disability. The same is for health: it occurs in different grades. It is not yes or no, present or absent. And, in fact, health, disease and disability can occur at the same time in the same individual, in different degrees. They are not mutually exclusive.

Healthy ageing can therefore be defined as the degree of health present at different times during the life course. It is never too late to change or improve the degree of health, irrespective of the degree of the disease. Because health is absent only when we die, there is always a degree of health to maintain, and a degree of health we can aspire to recover. It is really never too late to do something about it, just as it is never too early.

The 21st century

After the great redistributions of the 20th century and the changes that accompanied them, the 21st century now provides scientists and societies with a new set of challenges. Inherent to the first is the fact reported by the Global Burden of Diseases Study in 2010: that cardiovascular disease has consolidated its position as the world's number one cause of mortality, morbidity and disability. At the same time, the risk factors that might lead to cardiovascular disease (and other non-communicable disorders) have become very prominent among the world's top ten risk factors for mortality and overall disease burden: factors such as blood pressure, smoking, poor diet, physical inactivity and alcohol intake.

The second challenge is that the "ageing of the population" (or the increase in the possibility of living into old age) are both continuing to increase. This century, we can expect to see populations whose average life expectancy at birth exceeds 100 years.

While there are challenges of another sort – for example, war and nuclear conflicts would impact the population, almost certainly reversing many of the advances we have achieved in terms of better health and life expectancy – I consider that there are at least five more key challenges for the 21st century: (i) to prevent cardiovascular disease, (ii) to improve population trajectories of health and ageing, (iii) to reduce health, social and gender inequalities, (iv) to achieve sustainable population growth, and (v) to deal with climate change and its impacts.

Because these challenges require a collective effort, the research I conduct focuses on tackling the first two challenges. This research is conducted within the two groups I lead: the Cardiovascular Epidemiology Group and ErasmusAGE, and also within my external collaborations. I would now like to describe these two groups in more detail:

The Cardiovascular Epidemiology group

The Cardiovascular Epidemiology group focuses on increasing the understanding of cardio-metabolic disorders in order to improve their adequate prevention and treatment. These disorders include cardiovascular disease, coronary heart diseases, stroke, diabetes, and metabolic syndrome. While our main focus lies on primary prevention (thus avoiding cardiovascular disease in healthy populations), secondary prevention is also an area of interest. For most of our research activities, we use data from the Rotterdam Study, which is led by Professor Hofman, our head of department. We owe the success of the

Rotterdam Study to the contributions of many technicians and scientists, but especially to thousands of Rotterdamers living in Ommoord, Rotterdam. The Study started in 1990, with approximately 8 000 people over age 55, who have been followed-up regularly. A great deal of information has been collected, not only on lifestyle factors, imaging, disease, mortality, and genetic factors, in general a wealth of detailed information. Now we have approximately 15 000 people, who we will continue to observe into the future.

Within the cardiovascular group we aim to tackle cardiovascular disease from different angles. We have five specific groups, each with its own focus, but all working interactively.

One group focuses on cardiovascular disease prediction and women's cardiovascular health, aiming to improve the early identification of individuals who will develop cardiovascular disease later in life. This group also focuses on improving the prevention and management of cardiovascular disease in women. After all, more women die from cardiovascular diseases than men.

We also have a group that focuses on imaging and uses the latest imaging technology to improve the prevention and management of cardiovascular disease.

Now that more populations are surviving their first event of coronary heart disease or stroke, other conditions are becoming more prevalent – heart failure, pulmonary hypertension, atrial fibrillation – one of our groups focus on these conditions while also focusing on the prevention of secondary events among those with established cardiovascular disease.

We have a group on lifestyle and primary prevention that focuses on understanding how nutrition, physical activity, sun exposure and adequate sleep could help to prevent cardiovascular diseases.

And then there's a group focusing on the role that could be played by cardiovascular biomarkers and genetic factors in contributing to our understanding of the mechanisms that lead to cardiovascular disease.

We have established strong collaborations around the globe, not to mention in Europe and the Netherlands. I would like to mention just a few from Erasmus MC – in the clinical departments, the Department of Public Health, and others: Eric Sijnbrands, Eric Boersma, Ewout Steyerberg, Robin Peeters, and Aad van der Lugt. I greatly look forward to further consolidating these collaborations in the coming years, and to moving forward in our goal of tackling cardiovascular diseases.

ErasmusAGE

The second group is ErasmusAGE, the Rotterdam Intergenerational Ageing Research Center, which focuses on understanding health. But what does "health" mean? Initially all efforts have been binary – "present or not?" Hopefully, we are also going to be able to measure health better in the future. What it means to be healthy from the beginning of life until later life; what it means to be healthy at different points of time; how we can live healthily, since we don't all live an immaculate trajectory of health throughout our lives; and how we can actually maintain health as long as possible – or return to health.

In ErasmusAGE, we are trying to change the traditional approach to research and medicine. Generally, scientific and medical work is conducted in silos: cardiovascular disease, neurological disorders, locomotor, etc. In ErasmusAGE we take a horizontal approach – we try to bring together expertise from different areas, focusing in three tiers. The first is to take a horizontal approach to defining child health. The second tier is maternal health, and the third is health in middle age and the elderly.

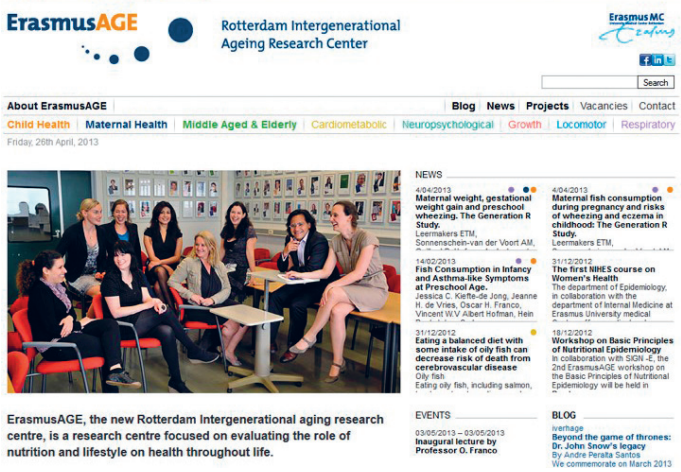
Here, too, we have established many collaborative ventures with different institutions in the world, including some in the Netherlands, and once again I would like to mention a few from Erasmus MC – this time not only from clinical departments but also biostatistics. They include Professor Johan de Jongste, Professor Emanuel Lesaffre, Professor Eric Steegers and Professor Regine Steegers. In the context of health in middle age and the elderly, we are collaborating with colleagues from Delft, Leiden and the Medical Delta on the vitality program, which is trying to improve vitality among the elderly.

In ErasmusAGE we bring a life-course perspective to health and ageing. We aim to define health at the various time points we view as golden opportunities or critical periods, and also wish to understand how the presence of health in one modifies the other.

Each input within ErasmusAGE tries to contribute to this overall perspective of health across the life-course. As well as lifestyle factors, defining optimal nutrition, identifying the behaviours behind the lifestyle factors and how they all modify health for example in children optimal health, but also different areas of health (cardio-metabolic health, respiratory health, etc). We want to translate this into potential interventions, or facilitate strategies that can help to maintain health and inform the development of policies that can help populations to stay healthy.

We work on five methodological steps that range from using systematic reviews and meta-analyses, establishing international consortia, and also using original studies, mainly the Rotterdam Study, and Generation R (led by Vincent Jaddoe). The Generation R study is a birth cohort that started approximately ten years ago with 10 000 pregnant women and children, who have regularly been followed-up. There is also a lot of information in terms of lifestyle, disease, and multiple additional factors. And we are also very grateful to all the participants in Generation R.

We have a new website for ErasmusAGE (www.erasmusage.com) that I would like to invite you to visit. We also have a blog, news, and events. Feel free to comment on the blog!



The future of preventive medicine

Is there a future for preventive medicine in the 21st century? In my opinion, the options can be summarized in four principles: integration, evidence, simplicity and dissemination.

1. **Integration**: Multiple levels of prevention have been defined, primary, secondary, tertiary, quaternary, etc. But while this is important for practical issues, most of the interventions that are necessary for prevention should be offered to all of us irrespective of our degree of health and disease. Levels of prevention should be integrated and provided on a continuous basis. I have already mentioned the population approach or the high-risk approach – whether we should use this one, or whether we should use the other. But it isn't necessary to choose: we need them

both. We need to be able to prevent those at the highest risk from falling into disease, and at the same time we need to move the population and improve the health of all. So it isn't one or the other: it's both.

2. **Evidence-based prevention**: Like any other field in medicine, preventive medicine is a scientific field and should be based on the best of available evidence. It remains a challenge to design studies that test interventions such as nutrition in populations, but these are challenges we must overcome in the future, or at least start to tackle. The key to prevention is to provide the best advice for individuals and populations by using the best available evidence on the basis of a model similar to that of evidence-based medicine.

3. **Simplicity**: If we want individuals and populations to implement our advice, it has to be understandable and it has to be clear and succinct. I would like to summarize the messages that are the key to prevention in a single word – hygiene. It comes from Hygieia, the goddess of health and prevention. Hygiene refers to activities aimed at prevention in individuals – what the French call hygiène de vie. It is not just cleanliness – it is not just about keeping your hands clean, but about keeping your body clean, avoiding interaction with toxins (such as inadequate dietary factors, alcohol, smoking, etc) and about helping your body to cope with the exposure to these stressors by having a proper regard for physical activity and good sleep. At the societal level, a healthy society requires a healthy environment. Reducing contamination, reducing pollution, providing adequate sanitation and healthcare facilities; making it easier for individuals to adopt a healthy lifestyle. And proper housing, of course. This is hygiene at the population level. Though the message might be simple – hygiene – its implementation remain a challenge. In 2010 we saw that approximately 70 percent of US populations – including adults and children – did not have a properly healthy diet. It is simple but not easy – but it is possible. And this takes me back to my origins, to Colombia, to Bogota. Bogota has implemented strong policies to promote physical activity. For example, every weekend, streets that are normally crowded and full of cars are blocked for people to practice sports. When should we do hygiene? All the time. Who should do hygiene? All of us. Everyone can do it. It's perfectly possible. All the old, the young, the fat, the thin – absolutely all of us without exception can do it.

4. And that brings me to the last point for the future of preventive medicine – **dissemination**. Preventive medicine should be at the core of all areas of healthcare. And I hope that in the future I will be able to contribute to consolidating the importance of preventive medicine in all areas of healthcare. And I hope this importance will only increase. I also hope that prevention will achieve so much relevance and presence in all areas that its success will make my role here obsolete.

Ladies and gentlemen, during this inaugural lecture we have visited different places, concepts and eras as I have shared my personal view of science, medicine and preventive medicine. To a certain extent, it is uncertain what the future will bring, but I think – and I hope that by now you will agree with me – that the role of preventive medicine in society can only increase. After all, it's an essential ingredient for survival and sustainability.

In the coming years it will be my task to help consolidate the field of prevention by spreading the word among colleagues, students and society, and by contributing to the accumulation of evidence that can serve as a platform for the deployment of evidence-based prevention.

Word of gratitude

This of course, I won't do alone, as everything I have accomplished has been thanks to the contribution and support that I have gratefully received from so many – who I hope time and the *pedel* will allow me to mention today.

First, protocol allowing, I would like to thank God for all the things I'll summarise as my being allowed to be here, and as it being possible for all of you to join me today. Until recently, I never imagined that such a day could be possible.

I would like to thank the College van Bestuur of Erasmus University Rotterdam, the Board of Directors of Erasmus MC, and the Dean for the opportunity they have given me to take this position and for the trust they have put in me.

Professor Hofman, Dear Bert, as I once said... It is because of Prof. Hofman that I became an epidemiologist. Thank you, Bert. for your trust, support and guidance. I couldn't have a better boss and I am looking forward to many years working together.

Yvonne and Huib, thanks for supervising me in my initial steps into Epidemiology.

Luc, Chris, Wilma, Ewout, Anna and Johan, thank you for guiding me through my PhD and my first steps within the field of public health. Aileen and Celia, thank you for guiding me further through public health.

To Frans and Mike, I am grateful for your having forced me so kindly into the field of ageing.

Thank you also to my former colleagues at MGZ and Unilever; and, in England, the Universities of Warwick and Cambridge, and also the NHS.

I would also like to thank my colleagues – as Henning described in his address – the football team of the Department of Epidemiology: Henning, Arfan, Bruno, Myriam, Mijke, Vincent, Cornelia... and all members of the department for the warm welcome and great times together.

Other colleagues at ErasmusMC, Nihes, the legal department, Generation R and Rotterdam Study: Eric Sijnbrands, Eric Boersma, Fernando, Andre, Solange, Tamar, Andre, Caroline, Carola, Ernst, Isabella, Francesco, Astrid, Monique, Annet, Bianca, Mariska, Soeja, Annete, Koos, Hermaine, Mevrouw Kroon, Jolanda, Robin, Lex, Harry, Emmy and Emmanuel.

I have been blessed with two fantastic groups and I would like to thank them for the hard work and warm companionship.

Members of ErasmusAGE

Charlotte, Janine, Audrey, Adriana, Edith, Ester, Lisan, Joost, Ayesha, Sanaz, Anne, Henning, Jenna, Ingrid, Anna, Trudy, Myrte, Thirsa, Gaby, Lisanne, Paula, Geri, Nasos, Andre, Eduardo and Nicole

Members of the cardiovascular epidemiology group:

Abbas, Anouk, Mohsen, Jan, Thijs, Maryam, Bouwe, Maarten, Symen, Raha, Cristina, Toos, Saskia, Mariana, Paul, Francesco, Jacqueline, Jessica, Klodian, Teun, Frank, Marte, Mateus, and Inge.

Amigos de la iglesia.

Friends and family in the Netherlands (Jettie, Willem, Martin, Wim, Ted, Bert, Alex, Mar), other members of my wife's family, and also my wife's colleagues.

Familia, Padres, Horacio, Benicia; Amparo, Vicky, Piero, Sophia, Sylvia, Lucia, Ivan, William and Twinky, *les agradezco por todos los momentos, las oportunidades, los momentos felices y gracias por todo su apoyo y carino.*

Michelle, Ty: Curiosity might have taken me here, my family gave me the initial motivation; Michelle, you have been my inspiration. Thank you Ty!!! The last months have been a bit of a bumpier ride than usual – thank you for understanding and being there for me, and thanks for all your love.

Dear audience, I thank you for your presence and your attention.

Ik heb gezegd.

Deze publicatie betreft een oratie aan
de Erasmus Universiteit Rotterdam

ISBN 978-94-914-6216-0

Erasmus MC
Universitair Medisch Centrum Rotterdam