A matter of life and health

Life satisfaction, personality and mortality in two populations of elders

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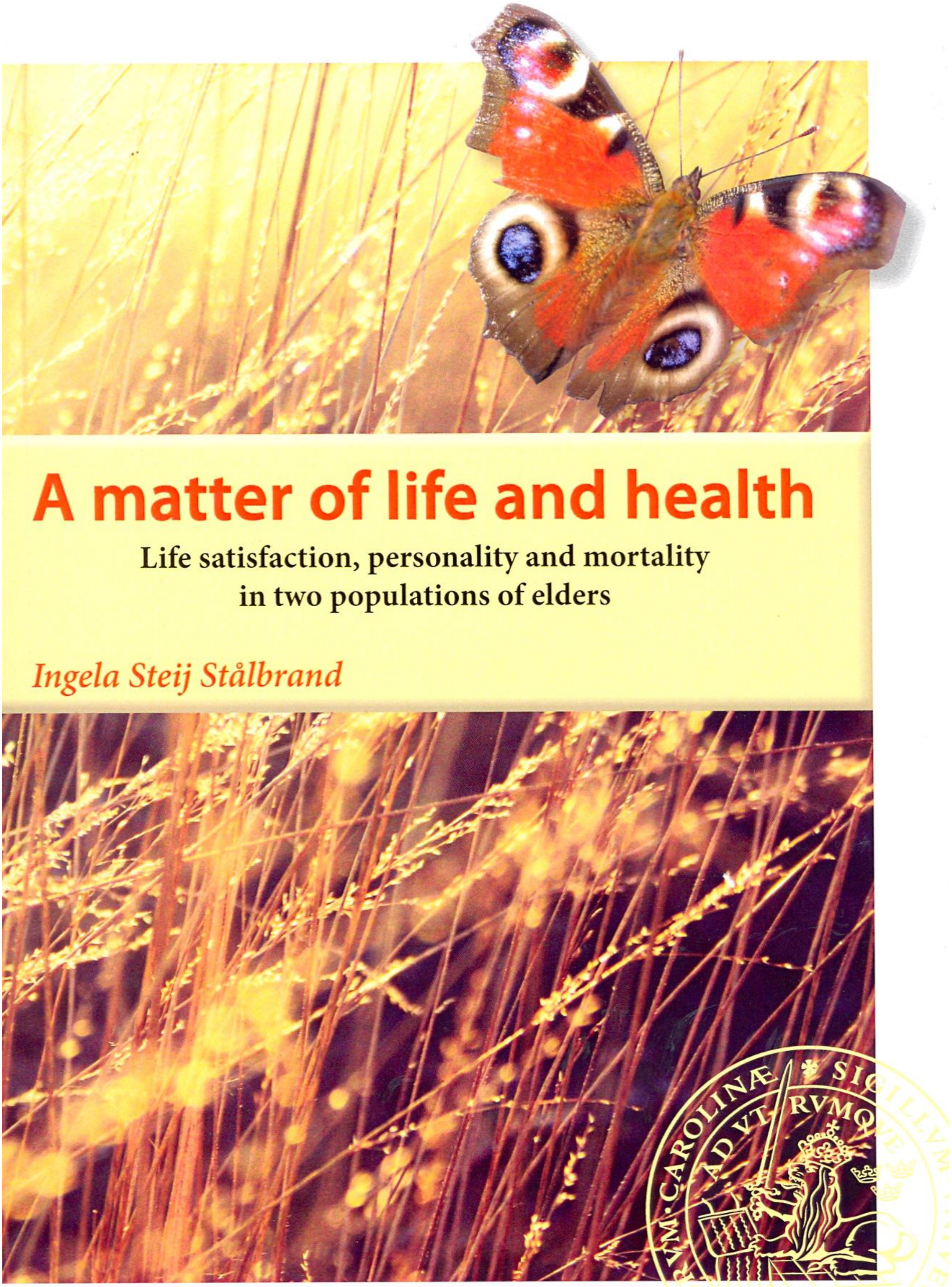

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“Analogous to the transformation of trees from spring to winter, our hair changes from chestnut to white, our waistline becomes portly, our eyes acquire crow’s feet, and our frequency of making love shifts from three times a week to twice a month.

But equally important, our ability to love and be loved not does diminish with age. At the beach we pick up grand kids instead of sweethearts, but our capacity for joy is undiminished.”

George Eman Vaillant

List of Papers

This thesis is based on the following papers, which will be referred to in the text by their Roman numerals. Reprint was made with permission from International Journal of Behavioral Medicine.

I

Steij Stålbrand, I., Svensson, T., Elmståhl, S., Horstmann, V., Hagberg, B., Dehlin, O. and Samuelsson, G. (2007). Subjective Health and Illness, Coping and Life Satisfaction in an 80-Year-Old Swedish Population - Implications for Mortality. *International Journal of Behavioral Medicine, 14*(3), 173-180.

II

Steij Stålbrand, I., Svensson, T., Elmståhl, S. and Horstmann, V. How do different combinations of the number of diseases and experienced symptoms relate to life satisfaction? *Submitted*

III

Steij Stålbrand, I. and Elmståhl, S. The relation between personality and life satisfaction in four groups of elders. *Manuscript*

Abbreviations used in this thesis

SEM	Structural Equation Modelling
CFI	Comparative Fit Index
RMSEA	Root Mean Square Error of Approximation
ADL	Activity of Daily Life
iADL	instrumental Activity of Daily Life
QoL	Quality of Life
SWB	Subjective Well-Being
FFT / FFM	Five Factor Theory / Five Factor Model
SI	Social Investment perspective
LS	Life Satisfaction
MUS	Medically Unexplained Symptoms
GQL	Gothenburg Quality of Life Instrument
LOC	Locus Of Control
HLC	Health Locus Of Control
IHLC	Internal Locus Of Control
PHLC	Powerful others Locus Of Control
CHLC	Chance Locus Of Control
SOC	Selective Optimization with Compensation

Abstract

The aims of the present thesis were to explore and describe elderly people's morbidity and experience of symptoms in relation to life satisfaction, personality and mortality. *(I, II and III)* To learn from the individuals who have high life satisfaction in spite of the fact that they have concurrent medical diagnoses and conditions. (*I and III)* To reason how positive factors and strengths might help the individuals who experience ill-health even though they don't have diagnoses to any great extent. *(I and III)*

The present thesis includes three empirical studies examining elder individuals (60-93 years).

Study I was a longitudinal study that concluded that the experience of subjective signs of illness carries the same mortality risks as diseases. Objective signs of disease often do not concur in a simple way with the subjective experience of health. Experiencing symptoms and/or having diseases is related to the same increased mortality risk during a 15-year follow-up of an elderly population in Sweden.

Study II was a theoretical explorative cross-sectional study of two cohorts, which conclusion was that it's important to consider symptoms as well as diagnoses when having life satisfaction as an outcome. The three different models explored in this study might serve different purposes depending on the research question or context, e.g. intervention, treatment or care.

Study III was a cross-sectional study of several cohorts with a large total range of ages. The conclusion in the third study was that personality showed to be an important factor to consider when life satisfaction is outcome in studies including older, often multimorbid, populations. Especially the personality trait of extraversion showed to be important in relation to higher life satisfaction with standardized estimates ranging from 0.69 - 0.88 in a structural model that fitted the data fairly well: $\chi^2(392)$ was 1696.5, $p < 0.001$, RMSEA = 0.04 and CFI = 0.83.

The three traits of neuroticism, extraversion and openness showed to have relation to life satisfaction in different ways, in different groups.

The conclusions drawn from the three studies are that perspectives of risks as well as perspectives of strengths are necessary and complementary in order to get a good picture of interactions – how positive and negative emotions, experiences, thoughts and behaviours are interconnected in stressful situations, such as ageing or ill health. Incorporating positive features provides great potential for improving prognoses, an understanding of and greater conceptualization of subjective wellbeing. The integration of both strengths and weaknesses can improve predictions of disease, increase our understanding of resilience, enhance our scientific knowledge and lead to a revolutionary understanding of wellbeing.

Acknowledgements

Where do I start? This journey has been long, sometimes tortuous, and many persons have been important for the fact that I finally reached the finish line. I have as a graduate student had the opportunity to meet many interesting, helpful people who shared their kindness and knowledge. That especially applies to all older people who I personally met and who gave me both support for my thesis and a great many valuable and stimulating meetings, experiences and insights. Many thanks to you all! Besides the participants in the studies, there are a large number of people I want to show my gratitude to and I sincerely hope that I will not forget anyone. If so would be the case, remember that your help was still highly appreciated!

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education, the network and the opportunities that the Institute has given me both as a graduate student and for the future. I would like to extend special thanks to Professor Ingalill Rahm Hallberg for always having shown support for me. Your commitment to the graduate students of the Vårdal Institute has been impressive and you are a role model for me as a female academic. Of all the co-workers at the Vårdal Institute, all their friendly and helpful staff, I would particularly like to thank Professor Anna-Karin Edberg and Professor Synneve Dahlin Ivanoff: you all spread joy and knowledge and in that way you were important for me at the workshops.

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"Do not forget that I love you today also!"

Malmö, 24 March 2011

Ingela Steij Stålbrand

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Papers I – III

Appendix I – II

Introduction

An ageing world – The Silver Tsunami

We face a demographic change – The Silver Tsunami. The name refers to the fact that the proportion of elderly will increase worldwide and particularly in the developing countries. This will lead to consequences at all levels: globally, socially, economically, and not least at the individual level.

A report by the United Nations (2001) dramatically paints a picture of the present situation, and what we may face in the future. It is a fundamental change and global phenomenon affecting every man, woman and child. In countries where the ageing process started later, there will be less time for adaptation. This change has no historical precedent: we will witness an even more rapid demographic change of the ageing population than in the past century. This will continue, and we will never again experience a society where the younger generations are in majority. This substantial change will provide profound implications in many areas.

During the next 50 years we can expect the proportion of elderly over 60 years of age to double. In Sweden, which already has the highest proportion of elderly people over 80 years, the proportion will increase further. In early 1990, just over one in five people were 80 or older and already in 2025 the proportion is expected to increase to almost every third person (Fratiglioni & von Strauss, 2006). Persons aged 80 or older are now the fastest growing segment of all ages of life (Halling, Fridh, & Ovhed, 2006). For example, the number of centenarians has increased from 21 in 1919, 127 in 1970 to 1407 in 2007! In 2050 the life expectancy is estimated to be 86 years for women and 84 for men (Svensson & Iwarsson, 2009).

The general reason for this global change in demography is that our health has improved as well as our economy. Ever since the 1500s, mortality has dropped as the infant mortality rate declined, infectious diseases have been combated and in some cases even become extinct. New and improved technologies, medical knowledge and treatments have been developed, with the result that today we survive that which we have previously died of, such as cardiovascular diseases (Crimmins, 2004).

Despite this, the “golden years” are often referred to in negative terms compared to all other life ages. This is remarkable as the increasing number of years alive in combination with reported better perceived health must be seen as one of society’s greatest achievements!

Increasing age is nevertheless associated with deteriorating health. Physiological changes, chronic diseases and other health problems are more common in the old age than earlier in life. Being ill also increases vulnerability to incur more morbidity, which in turn affects both mortality and quality of life (Landi, et al., 2010).

Since the 70’s and 80’s, however, several researchers noted an increase in reported good health, but also increased levels of morbidity and disability coming into play, suggesting a complex interaction between personal factors and ill-health in itself (Crimmins, 2004). In other words: more elderly people live with multiple medical conditions, but with less disability and also with better perceived health than in the past.

To understand these complex relationships one must take into account the dynamic processes and factors such as prevalence of disease, how age and ill-health interact, how diseases actually affect people, environment, social and psychological factors but also how morbidity affects mortality, autonomy and quality of life. All of these processes and factors are largely culturally determined (Landi, et al., 2010). Although culture will not be the focus of this thesis, an exploration of more general and individual psychological and medical levels will be accommodated.

In this thesis, no specific diagnosis will be examined, but rather the perception of health and illness in the form of the number of objective diagnoses and self reported symptoms. Four groups of health experiences and illnesses are presented and described below and these groups will be explored in relation to the concepts of life satisfaction, personality and mortality. In other words, the entire spectrum from the individual’s manifest ill-health to perceived good health will be explored, and concepts such as comorbidity and multimorbidity will be used and expanded.

Morbidity

In several studies, most common diseases and medical conditions are cardiovascular diseases (e.g. hypertension and heart failure), mental disorders (e.g. dementia and depression) and joint problems (e.g. arthritis) and these conditions increase with age. Sex and level of education have proven to be strong factors in affecting health, meaning in general that older, less educated women have the highest risk of getting sick (Marengoni, Winblad, Karp, & Fratiglioni, 2008).

Table 1 (Appendix I) with data from Good Ageing in Skåne – GÅS (presented in method part), shows in more detail the lifetime prevalence of diagnoses in five counties in southern Sweden, and the data showed to be in line with previous research.

The data also showed that 20% of the elderly over 75 years of age do not have serious chronic diseases at all (Fratiglioni & von Strauss, 2006). In earlier studies 73% of elderly people report no disability, and after 85 years of age, 40% of the population remain fully functional (Vaillant & Mukamal, 2001). The data from GÅS shows that in the ages between 60 and 89, as much as 7% report never to have had a diagnosis during their entire lifetime! These persons must not be overlooked, but instead explored because they may hold the answer to why some are experiencing good health sometimes in spite of diagnosed diseases or other medical conditions, one or more. This knowledge is extremely important as a complement to the knowledge about risk factors as the latter provides no answers about how good health can be maintained and promoted.

However, older people tend to have not only one single disease or medical condition but the predominating disease pattern is rather multimorbidity (Fratiglioni & von Strauss, 2006; Landi, et al., 2010). Multimorbidity signifies in general terms a person that has several concurrent diseases or medical conditions. Multimorbidity is already the most common pattern of illness in the elderly population although prevalence varies greatly from study to study. Prevalence ranges from 25% to 98%, but the studies generally show that at least 50% over the age of 60 are considered to have multiple diagnoses and that the presence of multimorbidity increases sharply with age (Fratiglioni, 2010; Landi, et al., 2010; van den Akker, Buntinx, Metsemakers, Roos, & Knottnerus, 1998). The large difference in prevalence depends on which definitions of morbidity are used, the time span used, type of data and the target group being studied, which clearly illustrates the complexity of the research (Crimmins, 2004).

Concepts of morbidity

There are several different ways and concepts for describing an individual with several illnesses or medical conditions at once: polypathology, multiple pathology or multiple disorders are just some examples that are being used.

About 30 years ago, comorbidity was introduced as a concept, but since comorbidity does not cover all situations, multimorbidity has emerged as an alternative during the last decade. The concept of multimorbidity has gained much interest and engagement both in research and clinic. The two terms are used in many different, sometimes ambiguous and confusing ways (Fortin, et al., 2004; van den Akker, Buntinx, & Knottnerus, 1996). With some variations, however, the concepts can still be distinguished.

Comorbidity means having an additional disease associated with a given disease, e.g. depression and cancer (Feinstein, 1970; Kraemer, 1995). The researcher might initially decide that cancer is the starting point and then examine what other diseases occur in the context of the primary cancer diagnosis as well as the effects on health, diagnosis, treatment and prognosis.

Multimorbidity, on the other hand, takes no account of the specific conditions that exist but is merely quantitatively determined. A person that has two or more diseases or medical conditions is considered multimorbid. The concept of multimorbidity might include only chronic diseases, or include a range of several, medical conditions as well as complex health problems such as disability and impairments (Byles, D'Este, Parkinson, O'Connell, & Treloar, 2005; Fortin, Bravo, Hudon, Vanasse, & Lapointe, 2005; Hudon, Fortin, & Vanasse, 2005; Schram, et al., 2008; van den Akker, et al., 1996; Yancik, et al., 2007).

Considering this mixture of combinations of diseases and medical conditions with varying severity and/or different functional and biological processes, it might be tremendously more complex to measure and analyze multimorbidity than focusing on comorbidity (Yancik, et al., 2007).

Do we need both concepts?

An initial, and very relevant, question we should ask ourselves is if there is a true need of both of these concepts, i.e. what are their specific values. The simple answer to that question is that it depends on what you want to explore. If you are studying how a specific disease is prevalent and can be addressed in treatment or research, the disease-specific concept of comorbidity appears to be appropriate. However, to examine more general principles of morbidity and processes, we should use the concept of multimorbidity.

So far, research has been focusing on morbidity in a disease-specific manner but there are more and more proponents for a more general approach, as reflected in the increasing, but still scarce, number of studies and articles that have been generated in the last decade (Fortin, Lapointe, Hudon, & Vanasse, 2005). Already back in the late 1970s Cassel noted (1976) that in several studies, a remarkable number of similar risk factors were the origin for a large number of, however very different, diseases. Also Syme (1996) did an evaluation of the research done on cardiovascular diseases in the last 50 years. The research area of cardiovascular diseases is one of the largest disease-specific areas with particular reasons for incurring that kind of morbidity. The study showed that overall, disease-specific causes could explain about 40% of the events which means that about 60% could *not* be explained with specific reasons. It can therefore be concluded that research on what makes certain people susceptible to disease and others not, needs to be supplemented by more general-oriented research.

To study and focus on one disease at a time can be effective for expanding knowledge about diseases and their carriers that have only these diseases, but such an approach also creates fragmentation in relation to the co- and multimorbid individuals. A disease-specific approach cannot possibly reflect the complexity of multimorbidity (Halling, et al., 2006; Noel, Frueh, Larme, & Pugh, 2005). Unfortunately, in clinical trials often those individuals who have two or more diseases are excluded because they “mess things up” in data processing and interpretation of results (Fortin, Lapointe, et al., 2005).

There are a large number of practical guidelines, educational programs and treatments that target specific diseases, in many cases chronic ones, and a few strategic plans have recently been developed or are being developed that are oriented towards the people we call vulnerable or frail patients. As of yet, nothing of the sort has been done towards the multimorbid individuals (Ekerstad, Lofmark, & Carlsson, 2010; Fortin, Lapointe, et al., 2005).

In the studies performed on the multimorbid populations, outcomes as mortality, hospitalization length, re-admissions and disability have been used and what repeatedly emerges both from a care and management perspective as well as from those with multiple illnesses themselves is that they perceive themselves and are being perceived as problems (Fortin, et al., 2004; Noel, Frueh, Larme, & Pugh, 2005). Lack of autonomy, rapid decline in health, polypharmacy, under- and maltreatment and lack of direction in treatments are repeatedly reported (Halling, et al., 2006; Noel, et al., 2005). These problems are not exclusive to those with multiple illnesses. These are problems that are reported by both those who have only one single disease and by those with no established diagnosis but who nevertheless repeatedly frequent health care seeking help for their concerns and symptoms. However, it seems that these problems are magnified in the group with multiple diseases, but to what extent – if they are added or multiplied in an exponential fashion – is unclear (Noel, et al., 2005).

It is becoming increasingly clear that it is neither desirable nor realistic to expect a uniform definition of multimorbidity (Byles, et al., 2005). Current objectives, issues and outcome variables are critical and decisive when this kind of concept is constructed and measured, and since they tend to differ greatly it is impossible to find consensus. However, when defining concepts like these we need to find a perfect balance between simplicity and complexity. This is crucial in order not to simplify the concepts and their operationalization in a way that they no longer reflect reality, and at the same time not to make the concepts too complex to be used in a constructive and applicable way (Yancik, et al., 2007). Developing preventive intervention and identifying high-risk groups are examples of urgent tasks, especially in general practice (van den Akker, et al., 1996; van den Akker, Buntinx, Metsemakers, & Knottnerus, 2000).

Outcomes and indices of morbidity

Whatever definition is used, previous studies have shown correlation between comorbidity, multimorbidity and health care utilization, physical functioning, mortality, psychosocial factors (e.g. life events, housing, social networks), and quality of life in general as well as health-related quality of life in particular (Byles, et al., 2005; Fortin, et al., 2004; Fratiglioni & von Strauss, 2006; Gijsen, et al., 2001; van den

Akker, Buntinx, Metsemakers, van der Aa, & Knottnerus, 2001). Results also suggest that physical health deteriorates more than the psychological (Fortin, et al., 2006). Health care costs, but above all does the individual burden of illness cost, as it increases with the number of diagnoses and medical conditions.

However, psychological factors such as personality, attitudes, coping and subjective well-being in terms of symptoms or the concept of life satisfaction, have not been investigated to any great extent. This is interesting and noteworthy since by studying them we could probably get some answers to the contradictory gap between objective diagnosed illness and the subjective experience of health. It has repeatedly been shown in studies that morbidity does not automatically and necessarily lead to the individual feeling ill. These crucial "make or break factors" should be studied in order to enhance and complement the knowledge now available about the risks and causes of ill-health.

There are a number of indices available to define co- and multimorbidity in relation to outcomes such as those previously listed – The Charlson Index (CI) (Charlson, Pompei, Ales, & MacKenzie, 1987), The Comorbidity Symptom Scale (Crabtree, Gray, Hildreth, O'Connell, & Brown, 2000), and the CIRS(G) (Miller, et al., 1992) are just some examples (de Groot, Beckerman, Lankhorst, & Bouter, 2003; Gijsen, et al., 2001; Tooth, Hockey, Byles, & Dobson, 2008). The indices that include health experiencing in any way, such as symptoms, are strongly correlated with physical function (ADL), health status, anxiety and depression, but there are for example studies that advise against utilizing the widely used CI when health related quality of life is the outcome variable (Fortin, Hudon, et al., 2005; Tooth, et al., 2008). However, none of these indices are primarily designed for associations with life satisfaction, or even quality of life.

Interviews, questionnaires, physical examinations, medical chart reviews and coded databases are methods used to obtain data, but in the end, the common denominator for all the sources is how qualified and reliable the individuals themselves are for remembering and reproducing what diagnoses and ailments they suffers from. This ability is strongly associated with the personal knowledge and memory of that individual (de Groot, et al., 2003). This suggests that one should find the dimensions that are easy to embrace as an individual and consequently also to report.

For the same reasons the number of diagnoses alone would give a simplified picture, one cannot simply use only the number of symptoms (Tooth, et al., 2008). A combination of both objective and subjective measures of ill-health might be a better choice. Therefore, in this thesis, the number of diagnoses will be combined with the number of symptoms in order to create four groups of older people with varying degrees of experiencing health. This is done in order to be able to distinguish, explore and describe specific groups mirrored by the concepts of comorbidity and multimorbidity and their relation to mortality and personality but first and foremost: life satisfaction.

Where are we lacking knowledge?

Studies have predominantly explored the concept of multimorbidity from a clinical perspective, and costs have been calculated in monetary terms (Fratiglioni & von Strauss, 2006). From there the clinical importance is apparent. We all have lots to gain if the population is feeling good, suffer less and are independent as long as possible. Population based studies, as well as studies on the mechanisms that explain why some people are more vulnerable and prone to illness than others, are also needed (Norris, et al., 2008; Syme, 1996; Tooth, et al., 2008). Psychological variables such as personality, attitudes and coping are obviously needed when addressing those questions (Friedman & Booth-Kewley, 1987; Thomas, 1988; van den Akker, et al., 2000).

Knowledge of the perspective of those individuals with multiple diseases, both quantitative and qualitative, that is easy to absorb and apply in different contexts, is also called for to make sure that good care will be provided and people are treated in a good way. Since there is, for most multimorbid individuals, no hope of a cure, we require more knowledge about life satisfaction and quality of life (Norris, et al., 2008). Multimorbidity is something that exists in all ages but especially in the older age groups. We need knowledge that we can use when planning future interventions, health care and direction, and therefore we need to increase the age spans and not exclusively focus on those who are already elderly, frail and critically ill. We also need to follow people over time to see causes and effects in relation to different definitions and outcomes (Fortin, Lapointe, et al., 2005; Gijsen, et al., 2001).

Aims of the thesis

Imagine four people. They are all of the same age, same sex, have the same education, same marital status, and the same number of children in similar ages. In short: they are comparable with each other. They also have the same diagnosis. The situation is, however, quite different for these four individuals: one has been diagnosed but is not at all disturbed by this and continues with his life as he always did; the other has been diagnosed and because of that he feels almost "extra grateful for the life still given" and there is a strong desire to live life to the fullest; the third person is almost constantly concerned about his illness and builds his life around an identity of being sick; the fourth is aware of his disease and try to do the best of the situation, living consciously with the illness but still tries to fill his life with as much as possible of the important things that life is all about. I have had these four people in the back of my head when illustrating how different life can be for different people, and the questions I asked myself during these years were: What is the difference? What exactly are the mechanisms that are crucial for well-being and experience of good health?

I have seen four groups in front of me, operationalized in various ways in the different studies (exploratory, median, based on morbidity concepts and ranked), but the basic idea is that these groups are composed of different quantitative combinations of symptoms and diseases and by this also reflecting qualitatively different profiles of health experience.

Group 1:	The individuals in this group have few diseases and few symptoms. They are basically the healthiest; they do not have diagnoses nor any symptoms to any great extent.
Group 2:	They have very few or none diseases but still experience several symptoms.
Group 3:	They have several diagnoses but still report few symptoms.
Group 4:	People in this group have several diagnoses and also much discomfort in the form of symptoms.

Healthy group: Low disease / low symptom	**Risk group:** Low disease / high symptom
Salutogenic group: High disease / low symptom	**Unhealthy group:** High disease / high symptom

In the following chapters these groups will be placed in a larger context and a number of concepts such as subjective well-being, life satisfaction, alexithymia, unexplained medical symptoms, personality, resilience, adaptation and coping are presented. This is in order to create a framework for the three conducted studies and the general discussion thereafter.

The aims of the thesis are therefore:

To explore and describe elderly people’s morbidity and experience of symptoms in relation to life satisfaction, personality and mortality. *(I, II and III)*

To learn from the individuals who have high life satisfaction in spite of the fact that they have concurrent medical diagnoses and conditions. (*I and III)*

To reason how positive factors and strengths might help the individuals who experience ill-health even though they don’t have diagnoses to any great extent. *(I and III)*

Theoretical framework

To measure health

Health cannot be measured directly and there is today no single variable that can be used for descriptions of health (Keszei, Novak, & Streiner, 2010). The concept of health has various dimensions: risk factors, diseases, medical conditions, impairments, individual disability or of capacity to meet the expected current social role – dependence/independence/autonomy, in relation to the context, often measured in terms of ADL and IADL, and death. Psychological dimensions such as life satisfaction, quality of life and well-being are other examples. These dimensions have been used separately to study health trends, but they reflect different aspects and are influenced by different processes.

Disease, illness and sickness are three terms that reflect personal health, but from different perspectives: biomedical, psychological and sociological, making it clear that health cannot be considered strictly from one single perspective. We need to adopt an interdisciplinary/multidisciplinary approach where multiple perspectives will be used and this is even more pronounced when you are focusing on elder populations (Friedman & Booth-Kewley, 1987; Mechanic, 1978). This becomes even clearer given the WHO constitution of 1948, the definition of health (*Ottawa Charter for Health Promotion*, 1986):

> *"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.*
>
> *Within the context of health promotion, health has been considered less as an abstract state and more as a means to an end which can be expressed in functional terms as a resource which permits people to lead an individually, socially and economically productive life.*
>
> *Health is a resource for everyday life, not the object of living. It is a positive concept emphasizing social and personal resources as well as physical capabilities."*

This definition includes several perspectives and affects in many ways communities' policies and strategies for promoting health and preventing and curing ill-health both at a structural and an individual level.

Subjective well-being (SWB)

Studies of subjective well-being have gained momentum the last few decades, much as a response to the overwhelming emphasis given to the negative psychological aspects (Diener, 1984; Diener, Suh, Lucas, & Smith, 1999). SWB is a broad general area of research that includes a large number of phenomena and concepts, e.g. happiness, emotional responses, domain-specific satisfaction and life satisfaction (Diener, et al., 1999). There are, in psychology, two main perspectives in SWB: bottom up or top-down theories. These perspectives differ in the philosophical underpinnings and in their implications for our understanding of the concept's nature and for the factors that reflect SWB (Brief, Butcher, George, & Link, 1993; Diener, 1984).

Bottom-up theories basically mean that happiness comes from a summation of pleasant or unpleasant moments and experiences. Simply put: a happy person is happy because he or she is experiencing many happy moments. Life satisfaction is, in this perspective, a combination of satisfaction in a number of specific areas.

Top-down theories emphasize individuals' abilities to experience and react to events and circumstances in a positive or negative way. Representatives of these theories emphasize the direct role of personality and assume that humans have a global tendency to experience life in a positive or negative way and that there are the global dimensions of personality that determine the levels of subjective well-being.

There is evidence vouching for both perspectives, but this is also an indication that integrating the two main perspectives instead of separating them is important in order to justify and defend the concept of SWB (Brief, et al., 1993; Diener, 1984). Health is one of the single most important influencing factors for SWB, especially during the last years in life (George, 2010). However, the strongest associations seem to hold only for subjective perceptions of health (Diener, et al., 1999). Several studies have identified both health and personality as the most important factors for happiness as well as life satisfaction (DeNeve & Cooper, 1998; Diener, 1984). Especially the broad domains of extraversion and neuroticism have been well confirmed and are considered the most relevant predictors of subjective wellbeing (Diener, et al., 1999; Kämpfe &

Mitte, 2010). However, there are also studies in which it is estimated that as much as 80% of the variability of SWB can be explained by genes and heredity, and in light of these results SWB seems almost as difficult to influence as it is to change a person's height (Lykken & Tellegen, 1996), although heritability may be inconsistent across studies (Diener, et al., 1999). Just like in personality research, there is an ongoing debate within the research of SWB, on how consistent it is over time.

Life satisfaction in an ageing context

Life satisfaction is a global concept and one of the indicators of subjective well-being. The concept is oriented towards the whole life span and has both affective and cognitive components. Particularly the cognitive components make the concept attractive to work with and use in interventions, since cognition can be influenced and changed and consequently also the experienced life satisfaction (Heckman, 2003).

Life satisfaction has been shown to have a fairly consistent decline over the life course, but some factors have been shown to lead to a change (Berg, Hoffman, Hassing, McClearn, & Johansson, 2009; Borg, Hallberg, & Blomqvist, 2006; Koivumaa-Honkanen, et al., 2001). For example, closeness to death, the loss of a spouse (particularly for men) and depressive symptoms may render lower levels of life satisfaction over time (Gerstorf, Ram, Fauth, Schupp, & Wagner, 2009). In addition, personality has in different studies been shown to be important for life satisfaction, but also other psychological factors such as self-acceptance, personal growth and autonomy have shown to be strongly related to life satisfaction (Costa & McCrae, 1980; Koivumaa-Honkanen, et al., 2001; Melendez, Tomas, Oliver, & Navarro, 2009).

There are a substantial number of studies that have shown correlation between physical health and life satisfaction, and for example illness, chronic problems, pain and activity in everyday life (ADL and IADL) were associated with life satisfaction. Overall, both the psychological and physical types of well-being are of great importance for life satisfaction. Age seems to have a secondary role, but the correlation between physical and mental well-being, life satisfaction and age is complex and need exploration (Gerstorf, et al., 2009; Melendez, et al., 2009).

The significance of symptoms

Symptoms are painful and/or uncomfortable sensations from one part of the body or from the body as a whole. They can be part of a disease, but can also be effects of anxiety or other feelings and emotions that have their origin in personal problems. Symptoms can be vague without biomedical grounds but are used by patients as a means to communicate personal stress. In other words, symptoms may as well be a cry for help coming from a specific body part as it can be a cry for help in general.

Symptoms can be viewed from three different perspectives: how the body respond to them, how apparent they are for the individuals who experience them, and if/how they should actually be reported. These perspectives are affected by various processes: attributions about causes of the symptom, reward/punishment, values, frequency of contact with doctors, tendency to talk about them or alexithymia (Tibblin, Bengtsson, Furunes, & Lapidus, 1990).

With increasing age the number of diagnoses also increases. These various, often chronic diseases tend to have a significant impact on the mental well-being (Gallegos-Carrillo, et al., 2009). Subjective health complaints are common in the general population, but although a large proportion of patients in health care are presenting symptoms they still stand without a diagnosis and what's worse: without palliation, treatment and cure.

Health problems have two components: organic disease and illness behaviour. Organic disease includes etiology, progression, and pathological tissue and is supported by laboratory testing, clinical studies, or mortality. Illness behaviour, on the other hand, includes the reporting of pain and other symptoms, psychological problems, disability, and health care utilization. In this thesis numerical combinations of both diagnoses and symptoms have therefore been made in order to make an operationalization of health experience.

Various stressful events over a lifetime generate negative feelings, thoughts and memories. If these feelings can be managed with a wide range of adaptive strategies, the person may experience continuing well-being, good health and functioning. Prolonged stress, however, can trigger or exacerbate health problems, including organic disease and illness behaviour, which in turn might contribute to negative feelings and lower life satisfaction.

Medically unexplained symptoms (MUS)

The concept of medically unexplained symptoms (MUS) signifies having multiple physical symptoms that cannot be explained by a biomedical disease, which is very common in primary care and are a heavy burden to many, particularly elderly persons (Hilbert, Martin, Zech, Rauh, & Rief, 2010; olde Hartman, et al., 2009; Ring, Dowrick, Humphris, Davies, & Salmon, 2005). Moreover, they are often regarded and treated as difficult or impossible to help (olde Hartman, et al., 2009; Ring, et al., 2005). Patients with MUS are disabled, have often co-morbid psychiatric disorders, and have an increased risk of being subjected to unnecessary, potentially harmful diagnostic methods and treatments. Another part of the burden of MUS is the general practitioners difficulties in explaining the symptoms to the patient and finding a common understanding needed to achieve security and acceptance of the symptoms and, most importantly, communicating the lack of treatment options.

Already in 200 CE, Galen asserted that only about 20% of the patients who came to see him had physical basis for their symptoms. Modern studies in primary care have shown that a substantial number of all the presented symptoms could not be explained by an somatic cause, making studies of symptoms, their importance and impact, extremely important in order to be able to attain WHO’s definition of health (olde Hartman, et al., 2009; Ray, 2004).

Somatisation is characterized by recurrent and often present MUS, as distinct from hypochondria, which is characterized by excessive fear of illness and the belief of having an undiagnosed physical illness. Factors such as personality traits (including neuroticism), alexithymia and psychiatric comorbidity (including anxiety and depression), have been shown to have association with MUS, but only a limited number of studies have investigated their prognostic value (olde Hartman, et al., 2009). Individuals with a wide range of symptoms have also been shown to have a heightened relative mortality risk (Ladwig, Marten-Mittag, Lacruz, Henningsen, & Creed, 2010).

Alexithymia

Alexithymia can literally be translated as “no words for feelings”. Alexithymic persons have a manifest insufficient insight into their feelings, symptoms and psychological processes. When alexithymic people are asked about their feelings in emotional situations they can experience confusion, give vague answers, report physical condition or describe only behaviour or external factors.

Alexithymia is considered a potential risk factor for symptoms and illness behaviour such as symptom reports, although not necessarily organic disease. However, various psychiatric, behavioural and medical disorders may be more common due to cognitive and emotional deficits hindering the appropriate emotional regulation and thus successful adaptation (Lumley, 2004). Alexithymia may contribute to disorders, obsessive-compulsive or dependent behaviours, bodily hypervigilance and reporting of physical symptoms, and especially organic disease by hampering emotional regulation.

Evidence has shown that alexithymia can be related to poorer life satisfaction. It has been suggested that alexithymia is associated with a limited ability to experience positive emotions and certain personality features such as neuroticism and negative affectivity (Mattila, et al., 2010).

Personality

Personality is generally defined as the characteristics of a person that lead to a consistent pattern of feelings, thoughts and behaviours over time and across situations. The concept is a well researched area and there are a variety of perspectives on what it is, what it consists of, how it develops and changes: biological (temperamental, evolution, genes, and neuroscience), psychodynamic (Freud, 1968), phenomenological (Rogers, 1951), trait (Allport, 1937; Cattell, 1979; Eysenck, 1970), behaviouristic (Pavlov, 1926; Skinner, 1953; Watson, 1929), cognitive (Kelly, 1955), and social-cognitive (Bandura, 1986; Mischel, 1968). Personality has been shown to be a robust predictor of behaviour, major life goals such as relationships, adjustment, health, mortality and life satisfaction (Berg, et al., 2009; McAdams & Olson, 2010).

The Big Five is a well established concept of personality traits that is based on extensive factor analysis. In this theory, personality consists of five broad domains, which in turn consists of different facets. The five broad domains are sometimes shortened OCEAN: Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism (McCrae & Costa, 1987). According to Costa and McCrae's model the domains can in short be described like this:

Openness (to experience) is the ability to estimate an experience for its own sake. Approach can best be described by words such as imagination, originality, broad interests, and willingness to venture into new interests, values and areas.

Conscientiousness (versus undirectedness) involves a perseverance to achieve various objectives and goals, and be able to organize and motivate oneself to achieve them.

Extraversion (or surgency) denotes positive emotions, preferably in social contexts. A person that is considered extraverted is often sociable, friendly, fun-loving and finds pleasure in sharing and socializing with other people.

Agreeableness (versus antagonism) means to be oriented towards the needs of others, which in an altruistic form may mean that one's own needs come second.

Neuroticism (versus emotional stability) is the tendency to deal with difficult situations in a maladaptive way and to experience negative emotions such as anxiety, self-consciousness and insecurity. The domain includes not only emotions but also the behaviour and thoughts that are coloured by negativity and emotional distress.

These domains have in several studies been shown to be heritable, global (both Western and non Western cultures), have analogues in great apes (chimpanzees) and have been shown to change as a consequence of neuro-physiological disease processes (e.g. dementia) (Pervin, Cervone, & John, 2005).

Can personality be changed?

Personality has proven stable over time in several studies. Genes have been shown to have an influence on personality, but since there are a large number of genes identified and shown to interact also with the environment, apparently a complex relationship exists between genes and environment (McAdams & Olson, 2010). There is, since quite a long time now, an ongoing discussion about how changing and dynamic personality actually is and how much influence various life situations might have on the personality (McAdams & Olson, 2010). There are two dominant directions, which takes account of developments and changes over time in the five elements: Five Factor Theory (FFT) (McCrae & Paul T. Costa, 2008) and Social Investment perspective (SI) (Roberts, Wood, & Smith, 2005). There is empirical support for both theoretical approaches.

Representatives of the FFT emphasize the genetic predisposition. According to this perspective the largest personality development takes place during early life and during adolescence. Around the age of 30 the personality is considered relatively fixed. Minor changes may occur but at a slower pace than before the age of 30.

Representatives of SI believe that personality is the result of complex interactions between biological processes and individual reactions to various life changes. These complex changes are due to and interact with universal social roles that most invest themselves in over a lifetime, such as being a child, friend, partner, parent, worker, or an ageing person. These roles tend to occur in relatively fixed phases for the majority of people during their life course regardless of cultural affiliation. Personality traits evolve continuously during life as the roles are added or shifted, even though the years of young adulthood have proven especially remarkable in view of development and change.

Both cross-sectional as well as longitudinal studies, in different cohorts and different nationalities have shown that E, N and O decrease with increasing age, while A and C increase. Women are generally more extraverted, agreeable and conscientious than men. However, some people seem to change more than others and some also in the opposite direction than the general trends. Those changes often occur to people who already exhibit a so-called “mature” personality that includes low N, high A, C and E (McAdams & Olson, 2010).

Personality and SWB, life satisfaction and mortality

The five domains can be divided into two main groups: temperamental and instrumental (DeNeve & Cooper, 1998). The temperamental group includes N and E and the instrumental group A, C and O. The two temperamental domains are those which have a direct impact on subjective well-being (SWB), while the other domains have influence on how to handle different situations in life which in turn affects SWB. However, it has not been shown that N and E are directly responsible for predicting the general indicators of SWB, such as happiness and life satisfaction (DeNeve & Cooper, 1998).

Both N and E have been shown to have complex relationships with mortality and morbidity, as well as a strong correlation with life satisfaction. A high degree of neuroticism has shown to have a negative relationship with life satisfaction and high levels of extraversion have shown a positive connection (Kämpfe & Mitte, 2010). However, most of these studies were performed on individuals younger than 80 years, making the results inappropriate to generalize to older people (Berg, et al., 2009).

Although the changes may seem statistically weak, they might still entail significant consequences for the individual. Mroczek and Spiro (Scollon & Diener, 2006) found for example that for every half standard deviation increase in neuroticism per decade, the result was a 40% increase in mortality and these results occurred even after they controlled for physical health and age.

This demonstrates the importance and need for studies that explore what could potentially affect the personality, i.e. to be able to intervene with the individuals' health status, social environment or social roles in order to increase or at least maintain physical and mental wellbeing.

Disease susceptibility and disease prone personality

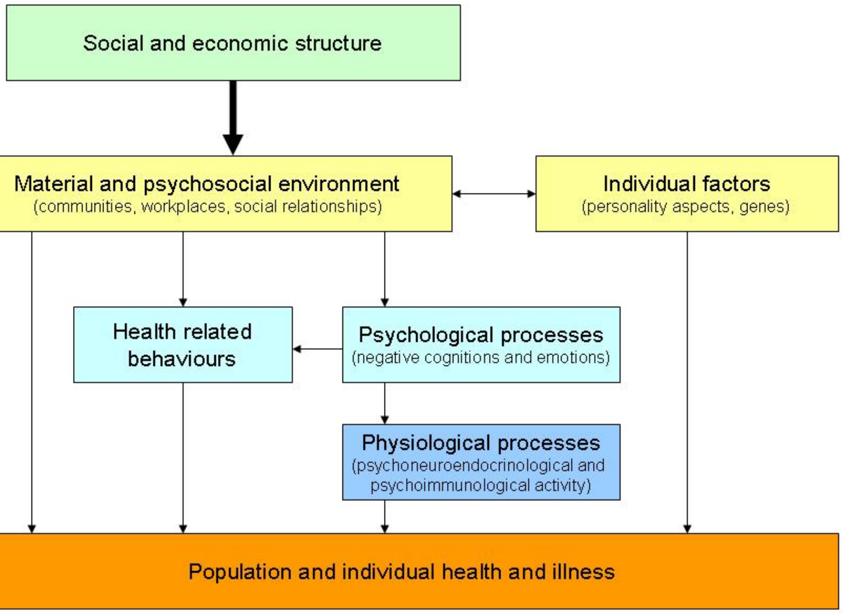
There is currently no good explanation as to why some people are more prone to get sick and others are not. Some may have illness after illness, while others are almost never sick or feel unwell (van den Akker, Vos, & Knottnerus, 2006). Studies in biology, sociology and psychology have examined the various factors and their relationship to health and illness which has led to various theories about the general vulnerability to ill-health, e.g. the geriatric concept of frailty (Balducci, Colloca, Cesari, & Gambassi, 2010; Gallucci, Ongaro, Amici, & Regini, 2009). This approach speaks of general rather than specific factors that cause morbidity. For example, professor emeritus in epidemiology S. Leonard Syme asks how it is possible that after 50 years of research in cardiovascular disease we still do not know how to explain even half of the risk factors for cardiovascular disease and why they incurred, and this despite of the fact that this area is one of the most researched (Syme, 1996).

Also, as early as in the 1970s, Cassel reports that there are a large number of risk factors common to such diverse diseases as tuberculosis, alcoholism, accident-proneness, suicide and schizophrenia, but that these stand remarkably uncommented (Cassel, 1976). The reason for this, according to Cassel, is that researchers tend to be focused on their specific disease diagnosis, clinical target group rather than in a general perspective, or as the proverb states: "one cannot see the forest for the trees".

In traditional Western medicine, clinicians use classification schemes that make it possible to diagnose and make prognoses for different treatment outcomes. However, this approach is not appropriate to use when there are common risk factors. We must therefore find alternative ways to find causes that focus on commonalities rather than differences and specific risk factors (Syme, 1996). There is a growing area of research that focuses on the link between psychosocial factors and immunological function (psychoneuroimmunology). This area is growing rapidly and shows promising potential for greater expertise in an important but hitherto not well understood area (Syme, 1996).

Most chronic diseases are not completely covered, especially regarding the causes and there is no reason to believe that they will be so in the near future. Today, there is no doubt that many illnesses have psychological components: psychological trauma that gives paralysis, fear of a heart attack which creates impotence, or anorexia developed after depression. Many times, if the psychological reason is eliminated, the person might be cured (Friedman & Booth-Kewley, 1987). In spite of this, it is controversial to assert that mental thoughts *lead to* organic disease. At the same time, there is no doubt that psychological stress is closely related to some diseases because there is always a visceral “response” to a mental activity. Physiological and biochemical systems of the body are interrelated and often interdependent (Friedman, 1991; Friedman & Booth-Kewley, 1987). There are several psychosocial factors that are related to many different diseases, which primarily involve many different organ systems. However, the most well-known and disease-specific risk factors only explain and predict only a small percentage of the multiorgan syndromes and diseases (Friedman & Booth-Kewley, 1987). Another problem is that even if we find and identify various risk factors, it has proven very difficult to get people to change their behaviour (Syme, 1996), which suggests that there are stable underlying factors, such as personality.

In epidemiology, a triad consisting of host, agent and environment, argues that a disease arises as a result of new exposure to a pathogenic agent (Thisted, 2003). The consequences of exposure are determined by the degree of pathogenicity of the agent as well as resistance/susceptibility of the host and these two are part of the environment. An extension/parallel to this is the *Socio-Psycho-Physiological hierarchical framework of health and illness* (Sutton, Baum, & Johnston, 2004) that can be pictured as follows:



Simplified, there is always something "happening" in the body, physiological processes as well as psychological processes that affect health and illness. However, the person is always in a context (material and psychosocial environment) that interacts with individual factors such as personality and genes. For example, social setting and relationships can have great impact and may be both promotive and preventive. Personality might "mould" both the environment around them to promote a certain personality development, for example worrying can relate to biological body response (depression). Environment and personality might also influence behaviour.

The link between personality and ill-health is like many questions in research a question of what comes first, the chicken or the egg. Certain aspects of the personality can be viewed as a result of various disease processes (migraine, cancer, dementia) (Friedman & Booth-Kewley, 1987). The personality can also be viewed as the cause of various types of mechanisms:

Personality → (unhealthy) behaviour (smoking, diet, exercise) → disease

Personality (e.g. Type A personality) → direct impact on the physiological mechanisms

Personality ←→ underlying biological structure (e.g. hyper-sensitive neural system based on genes that are evolving over generations, different behaviours, personalities and backgrounds)

Personality can never be pinpointed as the sole cause of disease. Most disease processes are multifactorial, which means that genes and other stressors such as viruses, trauma, age changes and hormones also have an influence. It’s an oversimplification to say that one single factor is the cause of the disease. With that said, in the most humble way possible, personality dimensions have shown to be prohibitive as well as preventative and sometimes downright harmful and these components should therefore be investigated. Since the objective of many interventions is aimed at effectively influencing the subjective psychological well-being in the right direction, there should be more focus on the link between personality and disease.

Perspectives of strengths

Strength or weakness – what does it matter?

When I face my students trying to explain why it is equally important, if not more important, sometimes to focus on what is working instead of what's failing, I use the following scenarios:
"Imagine an elderly lady, Magda, who has fallen and has to go to the hospital with a hip fracture. After surgery, she is lying in bed because of a severe infection. She ends up lying down for so long that she develops bedsores. Then 'sårkonsulter' (nurses with special skills in sores) are summoned to ensure that Magda gets a top mattress, gets appropriate deflection materials and ointments and even nutritional drinks. She is now also 'flipped' from time to time so that blood circulation becomes better and healing can be optimized. After a period of time Magda may eventually return home. The whole situation upsets both Magda and her relatives who think that the health care is worthless, that Magda had to suffer unnecessarily and that it took too much energy to get skilled staff so that the negative situation could finally be reversed. They talk about this to anyone that wants to hear and they do not mince their words."

In this example, the health care system simply reacts when things go wrong and fixes them, but on the road, this practice carries more costs in terms of money for the extra length of stay, materials and expertise necessary. But first and foremost: it carries extra costs in the form of suffering and anxiety for Magda and her family and their loss of confidence in the health care system.

"Now, imagine instead that different types of mattresses for relief are available on the ward, that the personnel is trained in the special complications that may emerge after surgery making them alert to early signs of infections and other problems, that there are routines and procedures in order to 'flip' those patients who cannot do that themselves, that the food being served to the patients is estimated to be nutrient and adjusted in its composition, and that an important part of health care is communication with the patients and their relatives. Magda therefore gets early attention in the infectious process and antibiotics are ordered. Bedsores never occur. Magda can leave the hospital with a good experience of the functioning of health care, of which she and her family only have good things to say."

In this last scenario, there is a perspective of strengths in the care process: the health care system is one step ahead and takes advantage of the body's own healing power if only the external conditions are optimized. Its basic premise is to practice not only that which has proven to work, e.g. evidence about biological processes but also takes each individual into account. It all becomes a positive spiral and although the initial cost might be high for education, training, materials and procedures, in the long run it turns into both savings in terms of suffering and major gains in terms of health, well-being and continued confidence among all the people who will come into contact with the healthcare system.

Ageing well, healthy ageing – is it possible?

Ageing is to get older. None of us really know how, when and why. Ageing is a process, a complex mosaic, an interaction between personal, environmental and genetic variables. Whatever the causes and mechanisms of ageing, the functional reserves in our multiple organ systems are reduced, the prevalence of chronic diseases and medical conditions is increased as well as our vulnerability to stress in different forms. These changes interact and reduce life expectancy and function in the elderly (Balducci, et al., 2010). Therefore, coexistence of all these factors and also the most likely interactions between them make the assessment of an older person's health and well-being extremely challenging.

The risk of developing concomitant chronic diseases, mental limitations or other medical problems increases with age. Some pathological changes and processes are more commonly associated with ageing and affect almost everyone who lives long enough, e.g. dementia, arthritis, hypertension, cancer, diabetes and osteoporosis, which most of them occur primarily among elderly people as well as functional limitations, impairments and geriatric syndromes (e.g. urinary incontinence and falls). The likelihood that a new diagnosis is added to an already existing burden of ill-health and multiple health problems is thus increasing with ageing, and with it the complexity of an older person's health also increases (Yancik, et al., 2007). Ageing is thus a part of everyone's development in which psychological and physical losses are likely (Vaillant & Mukamal, 2001).

Even healthy people can have subclinical pathology in multiple organ systems. Many older men and women experience a gradual decline in physical strength, walking speed, memory and cognitive skills, although they do not have clinically manifest diseases. Coexistence of several such subclinical manifestations and processes complicates the diagnosis, treatment and natural individual health status in elderly people. But despite this, assessments of multimorbidity most often include only manifested diseases, and thereby exclude processes that do not meet the diagnostic criteria (Karlamangla, et al., 2007). If the traditional medical model should move from the morbidity perspective to a performance-centred, prevention of ill health and promotion of health and well-being may become main goals of the public health-care professionals and physicians (Landi, et al., 2010).

The core of well-being includes contentment, satisfaction, or happiness derived from the human functioning as optimally as possible. This does not necessarily mean that the functions are perfect, but it is rather the subjective and relative experience according to the individual's own ambitions. Just as people's health status can change over time, so can their ambitions. They can consequently also be changed in the negative direction, as when a person adapts to poor health and lowers the expectations (McDowell, 2010). This makes the measurement and promotion of health and well-being in the elderly populations a real challenge.

Healthy ageing is a multidimensional and complex concept. Studies that have investigated older people's own definition of what they think is healthy ageing indicate that it goes beyond mere maintenance of physical, mental and social functions even if these three dimensions are still considered to be the most significant. Additional factors such as independence, family, adaptation, personal growth, spirituality and economic security are also very important in this context when the elderly themselves describe healthy ageing (Hung, Kempen, & de Vries, 2010).

From another perspective, ageing can also be described by three other words: *decline, change and development*. *Decline* is a negative word that is not associated with healthy ageing but is still something that is probably most often associated with ageing and generally used. *Change* is a more neutral word, and can be described by quoting George Eman Vaillant's own poetic words (Vaillant & Mukamal, 2001):

> *“Analogous to the transformation of trees from spring to winter, our hair changes from chestnut to white, our waistline becomes portly, our eyes acquire crow’s feet, and our frequency of making love shifts from three times a week to twice a month. But equally important, our ability to love and be loved not does diminish with age. At the beach we pick up grand kids instead of sweethearts, but our capacity for joy is undiminished.”*

The third word is *development*, which may also include maturation. As we all grow old, patience often increases, as well as our acceptance of ourselves and others and our ability to understand that every moment in the present also includes both past and future. The experience that provides maturation can only increase with time (Vaillant & Mukamal, 2001).

An emerging new paradigm: Positive psychology

Since the postwar period, the focus in psychology (and other disciplines) has been on finding risk factors, preventing and treating disease. In fact, the research area of gerontology began by investigating and combating poverty, which is associated with a number of major problems, and emphasis has been on the disadvantaged and sick people (Haber, 2009).

However, since then a large number of people have been born, grown up and are starting to grow old, “The Baby Boomers” (born 1946-1964), whose radical demographic impact on the community was described initially in this thesis (The Silver Tsunami). Most of these people do not see themselves as a cohort in need. In fact, they are generally unable to even see themselves as old, frail, disadvantaged, or dependent (Haber, 2009). This means that we need to add a new direction in gerontology research. We need to learn more about and focus more on health and well-being *in addition* to pathogenic thinking. We therefore need more knowledge that will enable them to achieve their desired lifestyle but also to create sustainable and healthy conditions for the generations to come.

An increasing interest in positive mental health can be traced back to the work of Jahoda and WHO’s definition of health (Jahoda, 1958; *Ottawa Charter for Health Promotion*, 1986). While patient autonomy became a central issue in medical ethics, subjective assessments such as life satisfaction became an increasingly common concept for measuring outcome of health care (McDowell, 2010). WHO International Classification of Functioning, Disability and Health (ICF) (2001) is an example of a focus on function rather than morbidity and pathology that has attracted an increasing influence in recent years. Its focus is on performance rather than measuring negative aspects only, as positive aspects can be protective (Karlamangla, et al., 2007). At the same time, the more pathogenic perspective must naturally be kept in use, since many older adults *are* disadvantaged and in dire need of help.

Successful and healthy ageing

In recent years, research in gerontology has focused on the explanatory variables of what has been called *"successful ageing"* – first explicitly named by Rowe and Kahn (1987) – or "healthy ageing". The concepts refer to the healthiest way for elders to mitigate the effects of pathological ageing. Healthy ageing includes the optimization of the three dimensions identified in the WHO's definition of health: psychological, social and physical functions (Melendez, et al., 2009). Life satisfaction can be viewed as a subjective expression of quality of life and may therefore be regarded as an indicator of successful ageing (Melendez, et al., 2009). In other words, appropriate developments of WHO's three dimensions might affect life satisfaction. In many different models, psychological factors have been shown to be important for predicting mortality and survival, well-being and quality of life. Among other factors personality, cognitive capacity and function, adaptation and coping have been repeatedly highlighted (Hagberg, 2001).

Paul Baltes developed further the concept of successful ageing by a dynamic model of development in a process he called *"selective optimization with compensation"* (SOC) (Baltes, 1987). The process can be described most vividly by Baltes's own illustrative example of the famous pianist Artur Rubenstein (Zarit, 2009). The pianist continued playing the piano and performing concerts even though he had vision loss and other health problems. Baltes's answer to the question of how elder people can manage to age successfully was:

> *He practiced and played fewer musical pieces. That helped him remember the music and play it at a higher level. In Baltes's terms, he "selected" fewer pieces. He practiced more often; in other words, he "optimized" his performance. Knowing that he could not play the piano as fast as when he was young, Rubenstein would deliberately slow down before he reached a fast portion of a musical piece. Then, when he reached the fast portion, it would seem to the audience that he was now playing fast. In Baltes's terms, Rubenstein "compensated" for slowing by playing especially slow before he reached a fast part of a musical piece. (cited in Zarit, 2009)*

Locus of control

Both Rowe and Kahn (1987) and Baltes (1987, 1997) relate control beliefs to positive outcomes later in life. *Locus of control* (LOC) (Rotter, 1966) refers to how an individual perceives and attributes their health to themselves (internal), to powerful others like doctors (external) or to chance, fate or luck (chance). The concept of LOC has its origin in Rotter's social learning theory which proposes observation and imitation of other people's behaviour as fundamental for future behaviour, expectations and valuing of different outcomes in different situations (Rotter, 1954). The more specific concept Health locus of control (HLC) concerns individuals' beliefs about their health (Wallston, Wallston, Kaplan, & Maides, 1976). LOC is considered to be more trait-like rather than state-like and is of the same nature as personality, while HLC may be seen as a disposition to act in a certain manner in different health-related situations and is therefore not as stable as LOC (Wallston, 1992).

Resilience – why are some people still standing up even though they "should not"?

Ill health, loss and the constant emerging of difficult situations are common in old age. Nevertheless, one finds again and again in literature and in reality that the majority of the elderly actually do not develop (psycho)pathology, but rather insist that they are doing well despite illness and other straits (Zarit, 2009). That naturally stimulates the question of what resilience factors there are that provide such "immunity".

The concept of resilience, stemming from both social and health sciences have often been criticized because of uncertainties in both the definitions and terminology (Luthar, Cicchetti, & Becker, 2000). However, there are numerous studies indicating that very specific genetic, biological, psychological, family, community, social and environmental effects may interact and promote positive outcome despite various difficulties. Resilience factors can be seen as synonymous with reduced vulnerability through abilities to adapt to adversity, or “to cope” with them. These resilience factors include various systems that explain the basis for resilience, with a focus on processes that operate at several levels from childhood to old age, promoting and protecting human development across the life course (Davydov, Stewart, Ritchie, & Chaudieu, 2010).

Other factors that have been reported to be potentially important, include intellectual function and cognitive flexibility (positive explanatory style and acceptance), social attachment and social behaviours such as altruism, positive self-image and effective self-regulation of emotions, positive emotions (including optimism and humour), the ability to convert traumatic helplessness into helpfulness, social support, active coping style in confronting a stressor (including exercise and training), ability to recover from negative events and stress inoculation, and the capacity to accommodate the new trauma related information in a positive direction (Davydov, et al., 2010; Seery, Holman, & Silver, 2010).

Different patterns of health might distinguish “healthy” people who do not experience any negative life events, people with impaired health and with many negative life events (the sick and suffering), and people with good perceived health despite negative life events. Reinforcement of resilience factors can have positive effects on other factors. The perspective of strengths and resilience factors is therefore well in line with WHO’s conceptualization of health.

Adaptation – Coping

Psychological flexibility concerns a series of dynamic processes that evolve over time. This can be demonstrated by how a person adapts to the fluctuating demands of different situations, reconfigures mental resources, shifts perspectives, and balances the competing desires and needs in different life domains (Kashdan & Rottenberg, 2010). In addition to the interaction between the individual and the situation, the psychological flexibility also depends on the personality of each individual.

Adaptation is a somewhat broader term than coping and beyond defence mechanisms or protection mechanisms, and also includes those responses that are about to improve and maximize the environmental adaptation. Coping can be viewed as a complex response to a stressful or challenging situation (Foster, 1997). Type of stimuli that activate coping processes can be major life events or changes (stressors), less serious current events (strains), or usual unpleasant daily events that have a cumulative impact (hassles).

When studying coping it can be done either by exploring psychological defence mechanisms, personality traits or the interaction between person and environment in a stressful context. Naturally, it is possible to use a mix of the different perspectives, or to put special emphasis on any of them. Coping, adaptation and resilience are concepts that are based on safety and basic needs. These fundamental needs have been described by Maslow (1954), and reflect the complex processes that are critical for survival, as well as the integrity of the biological homeostatic mechanisms (Foster, 1997). These processes are therefore continuous, which is probably why we are not always fully aware of them. These are thus individual processes that originated in part from genetic conditions, but also from life experiences and lessons learned.

Rationale for the thesis

When there is no longer a cure

We live a paradox right now. We have never had as much knowledge and medical technology as we have now, at the same time as there have never been so many men and women that cannot be cured because they live with chronic medical diseases and conditions. Despite this, we focus almost all our attention on the incidence and prevalence of diseases and deaths related to disease rather than to expand our focus to include also the concepts of quality of life and life satisfaction and how to maintain life satisfaction.

A common goal for the ageing population is to prolong active life, free from major disabilities. Loss of independence is a major cause of impaired quality of life for older people (Balducci, et al., 2010). It is extremely common for older people to be affected by the simultaneous biological pathological processes in several body systems (Yancik, et al., 2007). Moreover, these processes accumulate over a lifetime, and any biological process "leaves traces", which suggests that it is important to take the entire life cycle into account. In this thesis, this is made by morbidity (especially in the third study) as a sum of the number of unique diagnoses over a lifetime. These have thereafter been combined with perceived symptoms in order to create groups reflecting different health experiences, to get an idea of how older people actually experience different types of burden of illness.

A combination of clinically confirmed diseases and subclinical biological processes, such as symptoms, might provide a better picture than just age-stratified analysis of the number of diagnoses that a person has, where and when data is collected, because the latter might be inadequate to represent an individual's morbidity burden.

However, morbidity burden is multidimensional and probably cannot be captured by a single index or way to describe it, but for exploring life satisfaction in this thesis, it seems highly relevant to combine objective signs of diseases with subjective experience of illness.

By identifying various factors, such as personality traits, that promote or hinder elder individuals with different morbidity burdens, we can aid the knowledge used by health care professionals, families and the elders themselves to increase or maintain well-being and life satisfaction as long as possible.

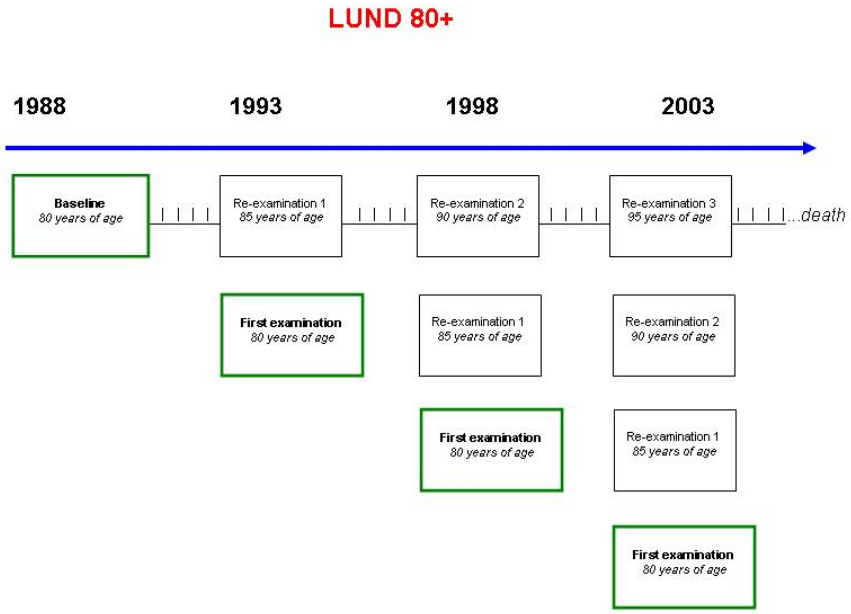
Despite the high prevalence of multimorbidity, little is known about the relationship between subjective well-being and multimorbidity, and it is even less common to consider lifelong burden of diseases. In this thesis, this is, however, related to the subjective experience of health experience, personality, mortality and life satisfaction.

Methods

LUND 80+

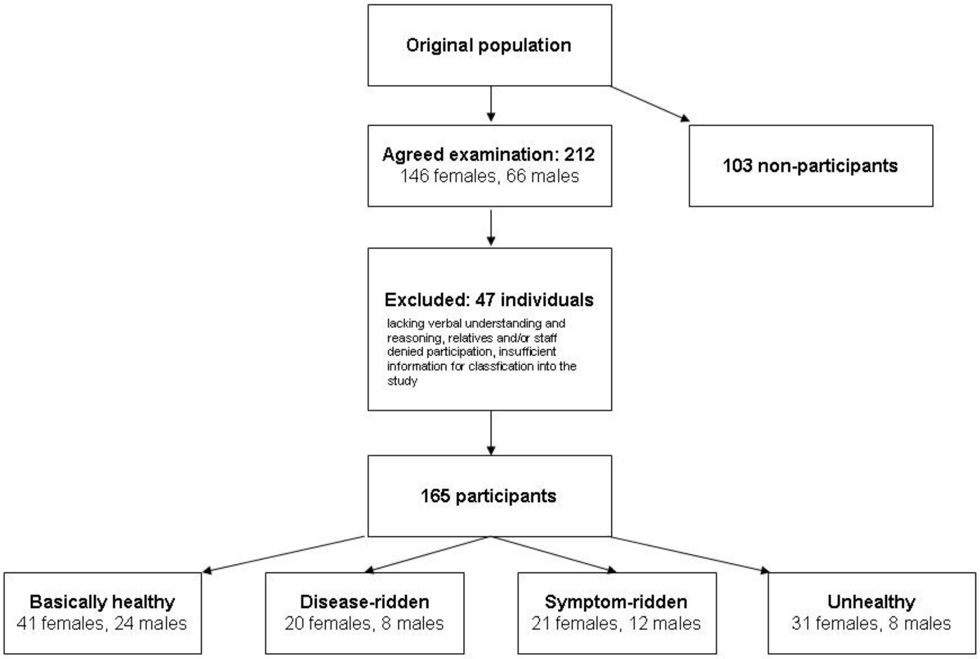
Design

Lund 80+ is a longitudinal population study with sequential design – Lund 80 + – in Lund, a city in the south of Sweden. Data for the two first studies was gathered 1988-1993. There were no discernible differences in gender, marital status or income level between participants and non-participants (McCamish-Svensson, 2002). Participants in institutions were examined and represented in the material.

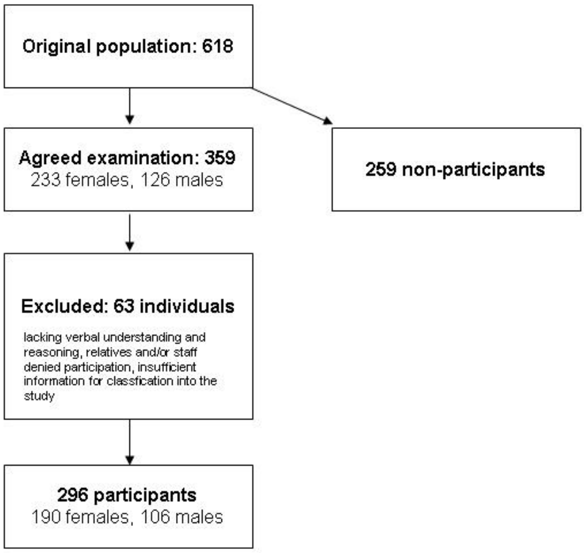


Settings and participants

In study I only individuals born in 1908 – 80 years old in 1988 – from the first examinations were analyzed. The baseline population consisted of 315 individuals, of whom 212 agreed to be examined, 146 females and 66 males. The participation rate was 67%. In the end, 165 participants (113 women and 52 men) were analyzed, after the exclusion of 47 individuals due to impaired cognition, denied participation and incomplete data.



In study II the original population consisted of two cohorts, born 1908 and 1913. They were 618 persons 80 years of age, of whom 359 agreed to be examined, 233 females and 126 males. The participation rate in both cohorts was 58%. After exclusion, due to incomplete data, 296 participants (190 women and 106 men) were finally included in the analyses.



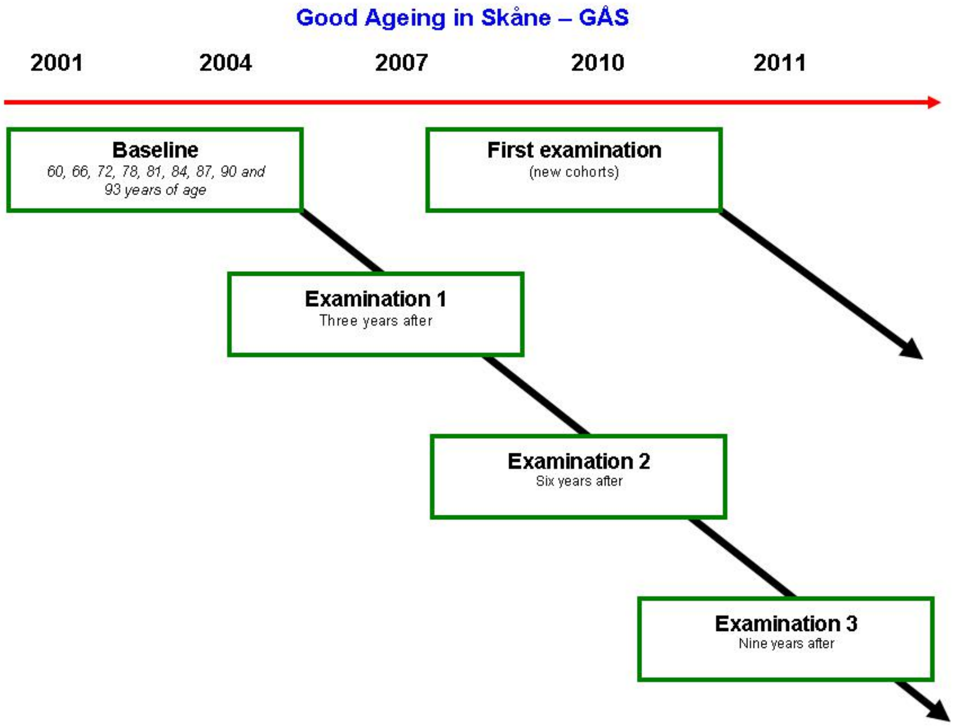
Data collection procedures

The medical examinations and psychological tests were conducted at the local health centre where medical records of the participants were also available to the medical examiner. A physician and a psychologist performed the examinations that took an average of three to four hours per participant. Additional data, such as marital status and education, was gathered by a district nurse. For the participants who could not come to the local health centre, house calls were offered. For details of procedures of data collection see also Svensson et al. (1993).

Good Ageing in Skåne - GÅS

Design

The Swedish National study on Ageing and Care (SNAC) is an ongoing population based, multi centre, cohort study, which started enrolment of participants in 2001 (Lagergren, et al., 2004). The study has four participating centres: Skåne, Blekinge, Nordanstig and the district of Kungsholmen in Stockholm. The participants in this thesis's third study were recruited from the county of Skåne: Gott Åldrande i Skåne – GÅS (Good Ageing in Skåne) (Ekström & Elmståhl, 2006). The county of Skåne is one of the largest county councils in Sweden. Approximately 13% of the Swedish population lives in this region.

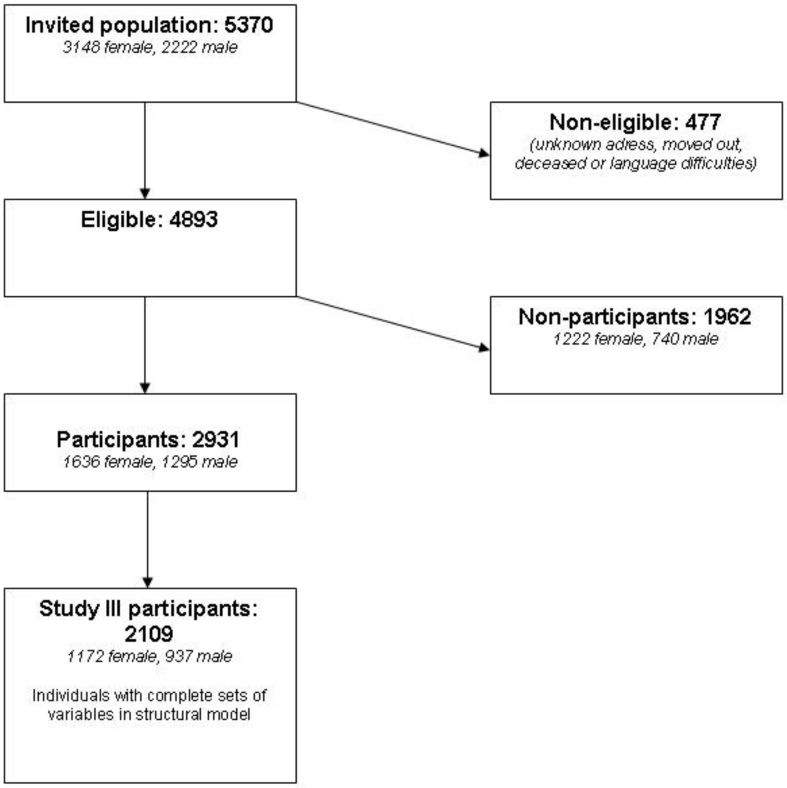


Settings and data collection procedures

The examination was mainly performed at the research outpatient clinic but for disabled participants house calls were also offered at their own homes or sheltered livings. Data collection included clinical and psychological assessments, questionnaires and physical assessments. All staff in the study had extensive and continuous training and monitoring of standards. The medical assessment was performed by a physician according to a predefined research protocol scheme. The standardized questions and tests regarding cognitive functioning and the interview about life events and coping were performed by psychologists or behaviourists specially trained in psychology. Functional assessments were performed by a registered nurse. The self-administered questionnaires comprised questions about life satisfaction, personality, health attitudes and health experience in the form of symptoms. There were experienced medical and office staff assisting in case the participant should feel any doubt in how to answer the questionnaires. Help to complete questions was also offered to participants with writing and visual impairment. Proxy information was retrieved from relatives in cases with cognitive decline. Informed consent was also given by the participant to retrieve information from medical records. All together the whole examination took about 4-6 hours to complete but the participants had the choice to divide the examinations over several visits if they were unable to complete the examinations on a single occasion.

Participants

The GÅS study includes a random sample of men and women from nine age cohorts: 60, 66, 72, 78, 81, 84, 87, 90 and 93 years from five municipalities covering both urban and rural areas using The Municipality Registry. The participants were recruited from February 2001 to July 2004 (baseline). 5370 men and women were invited by letter. Of them 2931 finally accepted the invitation and the participation rate was 60%. Lost participants were 2439, of which 1962 denied participating, 67 did not answer, 281 died during sampling period, 11 moved, and 118 reported sick or difficulties in speaking Swedish. In study III 2109 persons were included in the explorative analyses. Exclusion of 822 individuals was due to incomplete data concerning diagnoses, symptoms, personality and life satisfaction.


Invited population: 5370
3148 female, 2222 male
Non-eligible: 477
(unknown adress, moved out, deceased or language difficulties)
Eligible: 4893
Non-participants: 1962
1222 female, 740 male
Participants: 2931
1636 female, 1295 male
Study III participants: 2109
1172 female, 937 male
Individuals with complete sets of variables in structural model

Measurements used in LUND 80+ and Good Ageing in Skåne (GÅS)

Measurements	**Lund 80+**		**GÅS**
Study	**I**	**II**	**III**
Life satisfaction *(LSIA)*	X	X	X
Depressive symptoms *(CPRS)*	X		
Subjective health *(self-reported question)*	X		
Coping *(interview)*	X		
Mortality *(National Population Registry)*	X		
Health Locus of Control *(MHLoC)*			X
Personality *(NEO-FFI, three domains)*			X
Activities of daily life *(ADL, Modified Katz)*			X
Medical history and status *(examination, International Classification of Diseases – ICD-10)*			X

Diagnoses	**Lund 80+**		**GÅS**
Study	**I**	**II**	**III**
Diagnoses (medical history and examination)			
Diabetes	X	X	
Diagnosed hypertension	X	X	
Angina pectoris	X	X	
Congestive heart failure (CHF)	X	X	
Claudicatio intermittens	X	X	
Stroke/TIA/RIND or other CVL	X	X	
Urinary incontinence	X	X	
Neurologic disease (Parkinson, MS or other)	X	X	
Cancer (tumour disease)	X	X	
Major trauma	X	X	
Hip fracture	X	X	
Other fracture	X	X	

Symptoms **Study**	**Lund 80+** **I**	 **II**	**GÅS** **III**
Symptoms (self-reported checklist)			
Cries easily	X	X	X
Irritability	X	X	X
Difficulty in passing urine	X	X	X
Gloomy/depressed	X	X	X
Nervousness	X	X	X
Poor appetite	X	X	X
General fatigue	X	X	X
Impaired concentration	X	X	X
Nausea	X	X	X
Sleeping disturbance	X	X	X
Difficulty relaxing	X	X	X
Diarrhoea	X	X	X
Exhaustion	X	X	X
Restlessness	X	X	X
Constipation	X	X	X
Abdominal pain	X	X	X
Pain in the joints	X	X	X
Overweight	X	X	X
Coughing	X	X	X
Backache	X	X	X
Loss of weight	X	X	X
Chest pain	X	X	X
Pain in the legs	X	X	X
Sweating	X	X	X
Breathlessness	X	X	X
Difficulty to walk	X	X	X
Feeling cold	X	X	X
Dizziness	X	X	X
Headache	X	X	X
Impaired hearing	X	X	X
Eye problems	X	X	X
Difficulty to speak, express myself			X
Difficulty swallowing			X
Impaired memory ability			X
Urinary incontinence			X
Fecal incontinence			X
Slow-healing ulcers			X

Outcome measures and instruments

Life Satisfaction was measured with Life Satisfaction Index A (LSIA) (Neugarten, Havighurst, & Tobin, 1961), which is a self-rating instrument that consists of statements reflecting psychological well-being in old age. Life satisfaction is multidimensional in character, and, according to Neugarten et al. (1961), consists of five components: *zest* (vs. apathy); *resolution and fortitude*; *congruence* between desired and achieved goals in life; *self-concept* and *mood tone*. The instrument of LSIA includes 20 items that consists of statements reflecting psychological well-being in old age, for example "As I look back on my life, I am fairly well satisfied" and "I expect some interesting and pleasant things to happen to me in the future". To each statement the person could agree or disagree. Negative items were reversed-coded. The sum of the scores ranges from 0 to 20, with higher scores reflecting higher levels of life satisfaction. The instrument has been extensively used and is well validated and tested for reliability and has shown satisfying properties (McDowell, 2006; Shmotkin, 1991). In a meta analysis of 34 different studies using LSI instruments the average reliability was 0.79 with a range between 0.42-0.98 (Wallace & Wheeler, 2002). The alpha internal consistency in study III was 0.66.

To measure *subjective experienced health* the Gothenburg Quality of Life Instrument was used (GQL) (Tibblin, Tibblin, Peciva, Kullman, & Svärdsudd, 1990). The GQL was originally constructed to assess the quality of life of middle-aged men and it consists of two instruments: *a well-being section* – a questionnaire covering social, physical and mental well-being concepts, and *a symptom section* – a questionnaire covering the 30 most common symptoms. This last mentioned questionnaire, in the form of a checklist, was used in the GÅS study (but not the well-being section) in order to visualize symptoms the person might have experienced within the last three months. The checklist originally contains 30 items: exhaustion, sleeping disturbance, general fatigue, depression, being close to tears, irritability, nervousness, impaired concentration, difficulty relaxing, restlessness, difficulty in passing urine, anorexia, nausea, diarrhoea, constipation, abdominal pain, pain in the joints, backache, pain in the legs, feeling cold, sweating, loss of weight, overweight, coughing, chest pain, breathlessness, dizziness, headache, impaired hearing and eye problems. In the GÅS study the following symptoms were added: difficulty to speak/express myself, difficulty swallowing, impaired memory ability, urinary incontinence, fecal incontinence and slow-healing ulcers. The GQL instrument has shown acceptable reliability and validity (Sullivan, et al., 1993). Chronbachs alpha for the GQL symptoms section was 0.88 in the third study.

Previous and present diagnoses. In the first and second study data regarding diagnoses was gathered through the participants' own reports and the doctors' examinations and judgments from a checklist of medical conditions consisting of diabetes, hypertension, angina pectoris, congestive heart failure (CHF), claudicatio intermittens, stroke, urinary incontinence, neurological disease, cancer/tumours, major trauma, hip fracture and non-hip fractures.

In the third study, however, the *number of unique diagnoses under a lifetime* was counted. Diagnoses were classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10) and data was gathered trough an extensive medical assessment as well as inspection of medical journals and therefore data from both historic and present time is represented.

ICD is an international standard classification and categorization of diseases, health related conditions and external causes of disease and injury, devised and published by the World Health Organization (WHO). The Swedish version of the 10th revision of the classification (ICD-10) is published by the Swedish National Board of Health and Welfare (2002). The classification comprises 21 chapters representing different organ systems, categories of diseases, health problems and other reasons for death or contact with the health care delivery system.

The ICD-10 codes are about 14,500 in full number and in the study III they were summarized into 65 groups of diagnoses. This has been done within the chapters that already exist in the classification, and in addition an ageing and life satisfaction perspective has been taken into account. For example: fractures were defined in separate groups, e.g. hip fractures were categorized separately because they are very common among the elderly but also because they can have profound consequences for the person who falls. Also benign neoplasms were categorized separately as they are presumed to have different consequences for the individual than malignant neoplasms.

(See Appendix II – ICD-10 in the GÅS study)

This classification was the basis and the data was cleared of diagnoses reported twice (the same occasion) so that only the number of unique diagnoses per person per lifetime was added to obtain the number of diagnoses per person.

Coping. A modified interview from the Bonn Longitudinal Study on Aging (BOLSA) (Olbrich, 1985) was used to describe coping style. The participants self-reported stressful events and primary choice of coping strategy. Their answers were classified by factor analysis, based on earlier studies, into four dimensions of coping strategies: active, passive, avoiding, and emotional (International Association of Gerontology. Congress (17 : Vancouver : 2001) & Gutman, 2001).

Depressive symptoms, according to the Comprehensive Psychopathological Rating Scale (CPRS), related to the criteria used in ICD-10 (Asberg, Perris, Schalling, & Sedvall, 1978). The instrument consisted of 20 items with ratings of 0, 0.5, 1.0, 1.5, and 2.0 which were dichotomized into “no presence of symptoms” (0–0.5) and “some degree of symptoms” (1.0–2.0).

Subjective health. The individuals’ own rating recorded on a 5-grade Likert scale ranging from 1 (excellent) to 5 (very poor). The variable was dichotomized based on median score: 1–2 as good health and 3–5 as poor health.

Date of death was obtained from National Population Registry.

Marital status was categorized into single, married, divorced and widowed and was based on self-report in a survey.

Education was also self-reported and categorized into the levels: maximum 7 years, 8-9 years, 10-12 years and more than 13 years. Higher education was regarded as more than 7 years ($\geq$8 years).

Personality was measured with a modified version of the NEO Five-factor Inventory (NEO-FFI) which is a short form of the NEO-PI-R (Costa & McCrae, 1989; Costa & McCrae, 1992) that derives from extensive factor analytic research on the structure of personality, based on Costa & McCrae’s five-factor model. In its entirety, NEO PI-R consists of 240 items and the shortened version of the NEO PI-R comprises 60 self-descriptive statements in which participants’ rate the extent to which a statement agrees with their personality. Item-scores range on a scale from strongly disagree (0) to strongly agree (4). In the third study the instrument includes twelve items per domain, i.e. in total 36 items as only three of the five broad domains of the original instrument were included: Neuroticism, Extraversion and Openness, leaving out Conscientiousness and Agreeableness. Chronbachs alpha for internal consistency was 0.82 (N), 0.78 (E) and 0.64 (O) in this study.

Functional status, in the framework of physical dependency, includes data on personal ADL (P-ADL) and instrumental ADL (I-ADL). P-ADL includes bathing, dressing, using the toilet, transferring from bed, continence and feeding oneself, and I-ADL includes cleaning, shopping, transportation and preparing meals.

In the third study, with GÅS data, ADL was measured by means of the ADL staircase (Hulter-Åsberg & Sonn, 1989) which is an extended version of the ADL index developed by Katz (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963).

Performance in each activity can be graded as independent, partly dependent or dependent. In the GÅS study the number of activities, in which the individual has been categorized as dependent (Hulter-Åsberg & Sonn, 1989) in each section of the staircase, has been calculated resulting in a sum where zero means independent in all activities and ten means dependent in all activities. Chronbachs alpha in this study was 0.73.

Health locus of control (HLC) measures to what extent an individual attributes their health to themselves (internal), to powerful others like doctors (external) or to chance, fate or luck (chance). In study III it was measured by the Multidimensional Health Locus of Control (MHLC) Scales, Form A (Wallston, Wallston, & DeVellis, 1978). In the MHLC the three dimensions are measured by three scales: Internal health locus of control (IHLC), Powerful others health locus of control (PHLC) and Chance health locus of control (CHLC). Every scale has six items: self-descriptive statements in which participants rate the extent to which each statement describes their view, for example worded as “When I get sick I am to blame” or “If I take care of myself, I can avoid illness”. Item-scores ranges on a scale from strongly agree (1) to strongly disagree (5). Low scores on a scale thus meant that the internal, external or chance control was pronounced for the person. The alpha internal consistency was in this study 0.82.

Brief description of the "health experience" groups in the studies

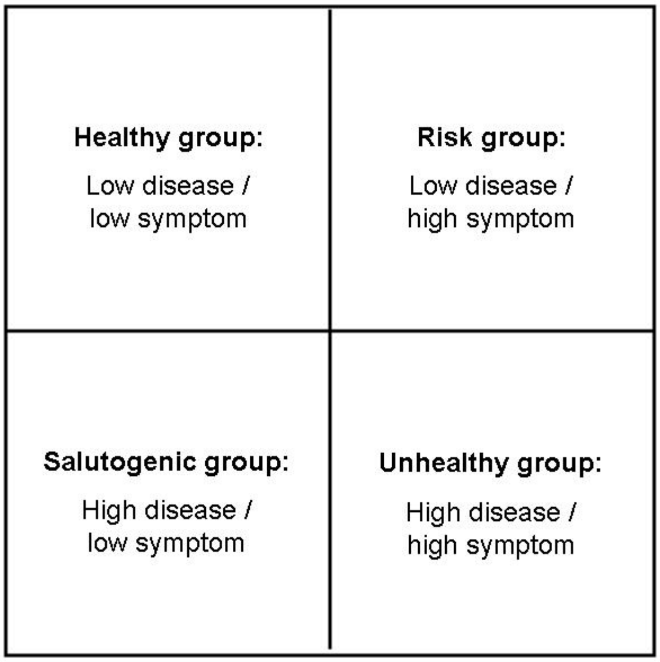
In the three studies there have been various combinations of low and high number of diagnoses and symptoms, which are assumed to reflect various "health experiences". The four groups can conceptually be described as follows (groups named as in the third study):

Low disease / low symptom – Healthy group: Those who do not have many diagnoses, or experience a lot of symptoms but who are eventually likely to progress to one of the other three groups over time.

Low disease / high symptom – Risk group: Those who are assumed to show up time and time again at the health centres with a lot of symptoms but who have no direct diagnosis to treat.

High disease / low symptom – "Salutogenic" group: Those who are assumed to be doing well despite having multiple diagnoses. We can learn many things from this group and its characteristics, and use the knowledge for the other three groups in future interventions designed to increase or maintain life satisfaction.

High disease / high symptom – Unhealthy group: Those who have multiple diagnoses, and also many symptoms. A group of individuals that are assumed to carry a great deal of suffering.



Healthy group: Low disease / low symptom	**Risk group:** Low disease / high symptom
Salutogenic group: High disease / low symptom	**Unhealthy group:** High disease / high symptom

Statistical analysis

In the first study bivariate analyses were performed with depressive symptoms, subjective health, life satisfaction, coping, education, and marital status which were all described in relation to the four new groups in order to investigate differences between the groups. This was done with χ^2 tests according to Pearson. Survival analysis was performed using Cox regression. The mortality was modelled for the four groups, where the basically healthy group was used as the reference group. Gender and entrance age into the study were entered into the regression model to control for these factors. Only two-sided tests were used; p-values below 5% were considered statistically significant. All statistical analyses were carried out using SPSS 11.0.

In the second study descriptions of data were made using frequency tables, median and quartile. Comparisons between independent groups regarding number of diagnoses, experienced symptoms and life satisfaction and also these variables in the subgroups included in three different constructs were performed using Mann-Whitney U-test. P-values below 5% were considered statistically significant. Only two-sided tests were used. All statistical analyses were carried out using SPSS 12.0.

In the third study structural equation modeling was conducted with AMOS (Byrne, 2001) in order to investigate the relationships between personality and life satisfaction in the four groups reflecting health experience. To measure model fit, the following indices were used: The model fit index (CFI) which tests the proportionate improvement in fit by comparing the hypothesized model with the independent model. The value of the CFI should approximate 0.95 for a good fitting model (Hu & Bentler, 1999). The root-mean-square error of approximation (RMSEA) represents closeness of fit, and values approximating 0.06 represents close fit of the model (Hu & Bentler, 1999). Univariate ANOVA was performed to analyze life satisfaction, age, ADL and HLC between groups. P-values below 5% were considered statistically significant. For multiple comparisons Bonferroni post-hoc test was used. Only two-sided tests were used. The statistical analyses of ANOVAs were carried out using PASW Statistics 18.

Ethical approval

The LUND 80+ study was approved by the Ethics Committee at Lund University in 1988.

The GÅS study was approved by the regional research ethics committee at Lund University 2001, Registration no. LU 744-00. The participants provided a written consent to participate in the study and to allow retrieving information from the National Patient Register medical records.

Results

Study I

Steij Stålbrand, I., Svensson, T., Elmståhl, S., Horstmann, V., Hagberg, B., Dehlin, O. and Samuelsson, G. (2007). *Subjective Health and Illness, Coping and Life Satisfaction in an 80-Year-Old Swedish Population - Implications for Mortality.*

The first study was a hypothesis-generating, exploratory longitudinal study including 165 persons, 80 years of age. The outcome of this study was in the form of mortality. For this study, data from the longitudinal population study with sequential design, LUND 80 +, was used.

The results showed that the mortality risks (hazard ratios) were of the same magnitude (1.8-2.2) whether the individuals experienced several symptoms, had several diseases, or a combination of several symptoms and several diseases when compared to the healthy group of respondents.

Cox Regression Analyses, for Ages 80-95 Years, n = 164.

Basically Healthy Group used as Reference.

	Hazard ratio	95% CI	p
Gender			
Men	1.0	-	-
Women	0.7	0.5- 0.9	0.023
Age at examination	1.2	0.9-1.7	0.282
The Four Groups			
Basically healthy	1.0	-	-
Disease-ridden	2.0	1.2-3.2	0.006
Symptom-ridden	2.2	1.4-3.5	0.001
Unhealthy	1.8	1.1-2.8	0.014

Note. Age at examination refers to exact age of entry into the study

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The conclusion from this study was therefore that the experience of subjective signs of illness carries the same mortality risks as diseases. Objective signs of disease often do not concur in a simple way with the subjective experience of health. Experiencing symptoms and/or having diseases are related to the same increased mortality risk during a 15-year follow-up of an elderly population in Sweden.

Moreover, the participants' subjective experience of depressive symptoms, health and illness, level of life satisfaction, and their coping strategies as reported when they were 80 years old proved to be important complementary information in the analyses of the differences between the groups, because the presence of diseases and symptoms in itself could not explain the quite equal doubled risks in mortality. For example, persons who were symptom-ridden (with maximum one disease) and the unhealthy groups (several symptoms as well as diseases) showed similar patterns. The unhealthy group showed the highest prevalence of depressive symptoms. Analysing coping strategies revealed distinct differences between the groups. Active coping strategies, e.g. to seek social support or ask for help, were most employed by the disease-ridden group (those persons with few symptoms in spite of several diseases) and to a lesser extent by the other three groups. The disease-ridden group differed from the other groups in two other specific ways in addition to coping strategy: they had the lowest prevalence of depressive symptoms, and, moreover, they reported the greatest share of high life satisfaction. This may be an indication that coping is indeed a protective mechanism in this group, although not for contracting diseases and prolonging life but retaining well-being.

Study II

Steij Stålbrand, I., Svensson, T., Elmståhl, S., Elmståhl, S. and Horstmann, V. *How do different combinations of the number of diseases and experienced symptoms relate to life satisfaction?*

This descriptive, cohort and cross-sectional study explored how three models, visualizing different health profiles, with different combinations of the number of diseases and experienced symptoms were related to life satisfaction. Data came from LUND 80 + and two cohorts were used: 1908 and 1913. In the study 296 men and women were included.

The results showed that symptoms had a stronger relation to life satisfaction than diagnoses on their own did. The conclusion in the second study was that it's important to consider symptoms as well as diagnoses when having life satisfaction as an outcome. The three different models explored in this study might serve different purposes depending on the research question or context, e.g. intervention, treatment or care.

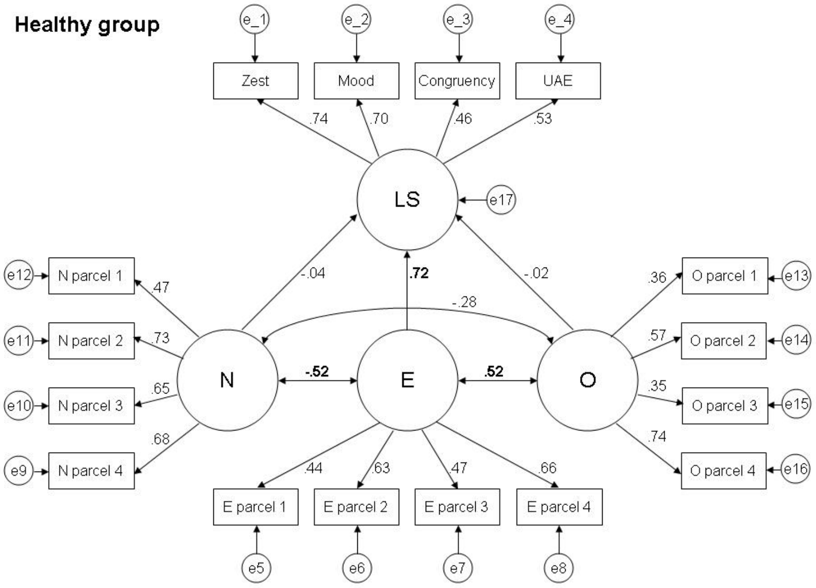
Study III

Steij Stålbrand, I., Elmståhl, S. *The relation between personality and life satisfaction in four groups of elders.*

The third study explored the role of personality in relation to life satisfaction. Data used in the third study came from the research project "Good Ageing in Skåne" (GÅS – Gott Åldrande i Skåne) which is one of four cooperative elements of the national population study SNAC – Swedish National Study of Ageing and Care. The original material was collected during the period February 2001 to June 2004 and includes 2931 individuals aged 60-93 years from five municipalities of Skåne, Sweden: Malmö, Hässleholm, Osby, Eslöv and Ystad. In this third study 2109 men and women were included.

Structural equation modeling was made in addition to univariate ANOVA to explore relations between life satisfaction and three personality traits in four groups reflecting different health experiences.

The conclusion in the third study was that personality showed to be an important factor to consider when life satisfaction is outcome in studies including older, often multimorbid, populations. Especially the personality trait of extraversion showed to be important in relation to higher life satisfaction with standardized estimates ranging from 0.69 - 0.88 in a structural model that fitted the data fairly well: $\chi 2(392)$ was 1696.5, $p < 0.001$, RMSEA = 0.04 and CFI = 0.83. The three traits of neuroticism, extraversion and openness showed to have relation to life satisfaction in different ways, in different groups.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Congruency
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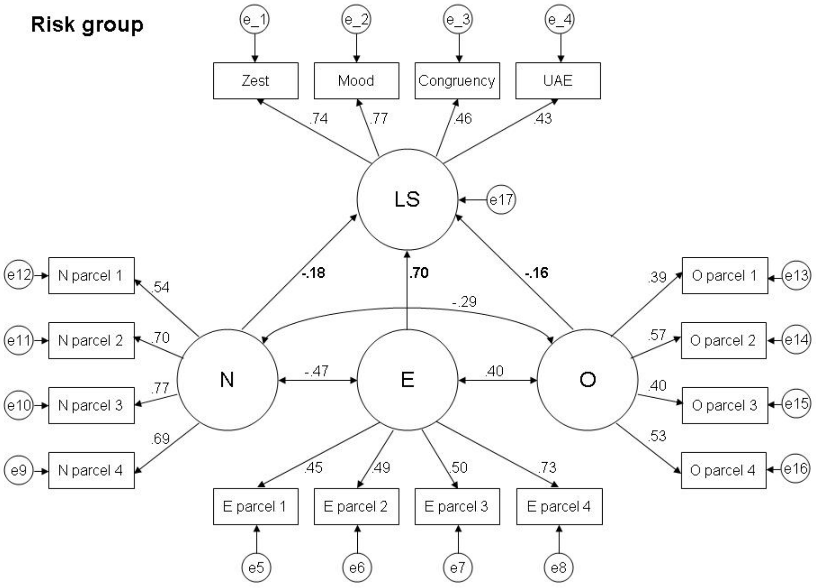
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Mood
Congruency
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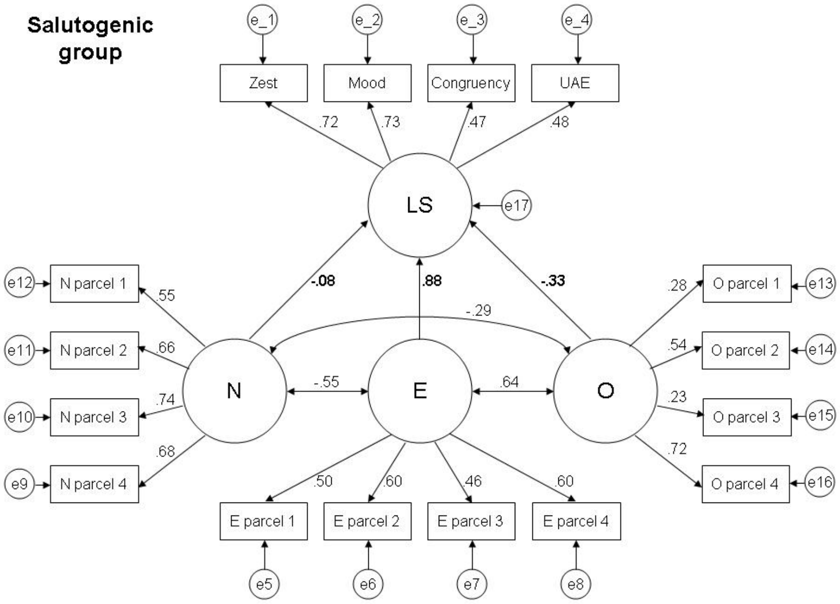
Salutogenic group
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e_2
e_3
e_4
Zest
Mood
Congruency
UAE
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.73
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LS
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e12
N parcel 1
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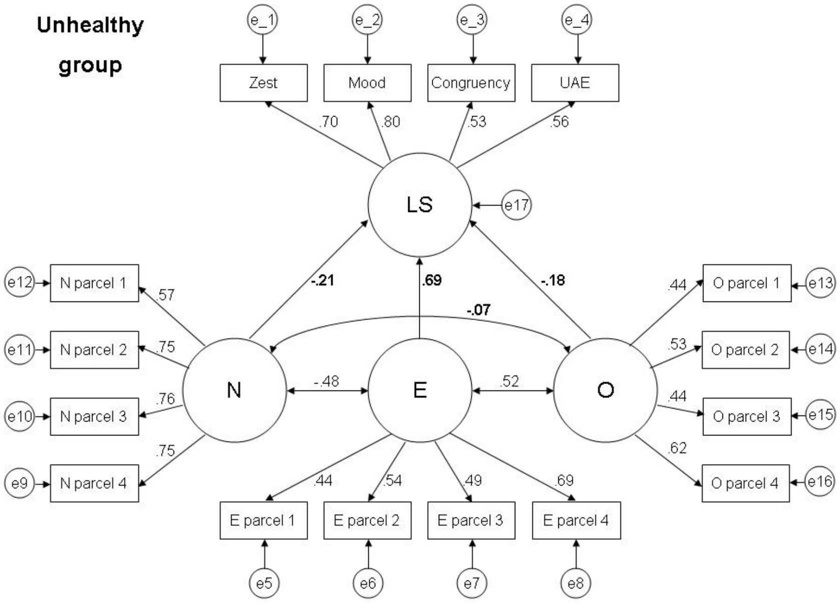
Unhealthy group
e_1
e_2
e_3
e_4
Zest
Mood
Congruency
UAE
.70
.80
.53
.56
LS
e17
e12
N parcel 1
.57
-.21
.69
-.18
.44
O parcel 1
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Moreover, two of the four groups, with fewer symptoms regardless of the number of diagnoses showed to be more physically independent as well as having a higher internal locus of control compared to the two groups with more symptoms regardless of the number of diagnoses. However, more, especially longitudinal, studies are needed to explore the dynamics and role of personality and life satisfaction in relation to locus of control and physical dependence in groups with different burden of health and illness.

General discussion

A comprehensive interpretation and discussion of the results is presented in this chapter. More detailed discussions of the specific findings are included in the three studies that this thesis is based on.

The first aim of this thesis was to explore and describe elderly people's morbidity and experience of symptoms in relation to life satisfaction. The studies indicated altogether complex interactions between biological and psychological processes and prerequisites that play a role for how the person actually feels and behave which verifies past studies (Crimmins, 2004). Indeed it seems like there are general health experiences and behaviours that need to be more explored. Different diseases or conditions of ill-health might not be so different from each other. The results confirm earlier studies regarding e.g. general risk factors and disease-prone personalities (Cassel, 1976; Friedman, 1991; Friedman & Booth-Kewley, 1987; Syme, 1996).

Underlying, more stable structures, such as personality, have an apparent relation with how people evaluate and deal with their situation, including both health and illness in various forms and this was prominent in the third study. Even though we should recognize the importance of the situation as well, the emphasis in this thesis is still on psychological factors rather than social. Stable personality factors, which have proven important for e.g. life satisfaction in earlier studies, were confirmed (Costa & McCrae, 1980; Kämpfe & Mitte, 2010; Melendez, et al., 2009).

Overall, an apparent relation was shown between medical and psychological variables, especially symptoms, both when mortality was outcome as well as life satisfaction and this is well in line with earlier studies (Gerstorf, et al., 2009; Ladwig, et al., 2010; Landi, et al., 2010). The exploration of different groups with and without manifest illness in combination with different health experience showed the complexity of how difficult but important it is to be clear about what different concepts and definitions on morbidity include (and exclude) when analyzing and applying results with different outcomes, also concluded by Yancik et al. (2007).

The second aim was to learn from the individuals who have high life satisfaction in spite of the fact that they have concurrent medical diagnoses and conditions. In the first and third studies factors such as less physical dependence, internal locus of control, active coping strategies and a more extraverted personality trait as well as less neuroticism were salient in relation to higher life satisfaction, results well in line with previous studies (Borg, et al., 2006; Contrada & Goyal, 2004; DeNeve & Cooper, 1998; Hagberg, 2001; Kämpfe & Mitte, 2010; Sutton, et al., 2004). These results are congruent but can still be a contribution to the research field on resilience factors, which needs expansion (Davydov, et al., 2010; Seery, et al., 2010).

However, in this dissertation, factors are examined in data sets with wide age spans also including older participants ranging from 60 to 93 years of age, which have been lacking in earlier studies (Berg, et al., 2009). The factors were also explored in relation to different groups with different health experiences. Especially noteworthy in this thesis was that the group that had several diseases and medical conditions, still showed high satisfaction with life in both the first and third study: firstly, they really distinguished themselves, and secondly, they showed more resemblance with the healthy group, rather than the other group also burdened with several health problems. In addition, the groups with a higher burden of symptoms, regardless of number of diseases and medical conditions, had several things in common.

This shows the importance of finding ways to operationalize, measure and distinguish the groups in order to identify groups that seem extraordinary resilient in order to learn from them and bring that knowledge on to vulnerable groups, both with and without apparent disease but who subjectively experience illness, as Syme also concluded (1996). Grouping in this thesis is based on only the number of symptoms and illnesses, but it still showed possible to distinguish different groups with different health experience with such simple quantitative measures, an issue that has been debated earlier by e.g. Tooth et al. (2008). It remains, however, to examine these groups further to determine what characterizes groups with different health experiences with regard to psychological factors, but also to medical, functional, social, cultural and other lifestyle factors that are related to a healthy life.

The third aim was to reason how positive factors and strengths might help the individuals who experience ill-health even though they don't have diagnoses to any great extent. Both life satisfaction and personality, two important factors in this thesis, have shown to be rather stable over the life course, according to earlier studies (Berg, et al., 2009; Borg, et al., 2006; Koivumaa-Honkanen, et al., 2001; McAdams & Olson, 2010). In this thesis, however, only one of the three studies was longitudinal (Study I). As a consequence, there could be no reasoning about cause and effect, or what exactly the factors of change would be in either personality or life satisfaction, included in the conclusions of this thesis. The key question is: if there is a possibility to change, what would render that change? However, if neither personality nor life satisfaction could be changed, why do we then even bother to try to create interventions with the goal to remain or increase life satisfaction?

The highly relevant and interesting question, investigated by Mroczek and Spiro (in Scollon & Diener, 2006), regarding how small changes in personality traits it takes in order to render a clinical significant change in life satisfaction, also remains to be explored since the relation between mortality and personality weren't analyzed. In this thesis, however, one important intention was to try to separate different groups with different health experience, which proved to give important complementary knowledge about the outcomes of mortality and life satisfaction. Especially in the first study it was apparent that the difference in health experience could be important to consider, if not so in mortality but in the subjective well-being.

The group which was named the "risk group" in the third study and "symptom-ridden" in the first needs further exploration. For now, only assumptions and speculations can be made about the group except that it showed to have as high mortality risk as the groups with several concurrent diseases. A great deal of investigation has been made and concepts such as hypochondria, somatisation and psychosomatisation as well as alexithymia have been included as suggested explanations for the experience of ill-health despite the absence of manifest disease. Research on medical unexplained symptoms (MUS) and alexithymia may give indications of what's needed to be explored in this group. Maybe the assumed lack of diagnoses in this group depends on the patients' lack of words for feelings, which makes their reports on symptoms hard to interpret for the physician? According to earlier research, both MUS and alexithymia have been related to the personality trait of neuroticism, higher mortality risk as well as poorer life satisfaction which is in accordance with the results for this group in this thesis (Ladwig, et al., 2010; Mattila, et al., 2010; olde Hartman, et al., 2009).

Concluding comment and future directions

It is a major ethical dilemma that the multimorbid individuals view themselves as a problem and that they are so perceived even by staff in the health care system (Fortin, et al., 2004; Noel, et al., 2005). This highlights the need for practical guidelines, educational programs, strategic plans and treatments for vulnerable persons, more research and training and protocols to address these groups in health care, in order to counteract the negative views that in the worst case might influence behaviours and attitudes in a non-health-promotive manner. Finally, we also need to develop interventions and identify risk groups in general practice (Ekerstad, et al., 2010; van den Akker, et al., 1996; van den Akker, et al., 2006).

The concept of life satisfaction, as well as the concept of personality, has both cognitive and affective components (Bandura, 1986; Heckman, 2003; Kelly, 1955; Mischel, 1968; Rogers, 1951), which makes it important to explore in relation to social investment perspectives (Roberts, et al., 2005) as there would be possible grounds for identifying possible factors of change in both personality and life satisfaction (Heckman, 2003).

Assuming any change could occur in our personality, first something essential has to “happen” in life that would motivate change. For example, the continual transformation of social roles may be a major factor in how and why we change (anticipated externally or internally motivated). The middle age is the age where most of the roles are associated with responsibility and decision making (family providers, parents, supervisors, etc.). Old age (immediately following middle age), on the other hand, (as well as childhood) includes an acceptance of “paternalism” – the elderly person is expected to conform to others’ decisions. Likewise, it is also expected in the roles of the elderly to withdraw from the social arena. These role transformations are in fact big steps from independence to dependence, whether we like it or not. Given these expectations, the loss of control and empowerment, they may also create a negative context that might have significant impact on well-being and thus health.

The paradox is that we emphasize, now more than ever, personal influence and participation in healthcare decisions in order to achieve a higher sense of control and autonomy (even for the most seriously ill and vulnerable people who may need more support in the decisions instead of “standing alone”). Given the overall expected social roles, this may result in mixed messages that ultimately lead to more confusion (and thus even more dependence). Therefore, a greater balance between the role expectations is required. However, research about these, maybe personality changing, turning points between middle age and old age is scarce (Allemand, Gomez, & Jackson, 2010).

A person needs to connect the change with desirable consequences that make a change appealing. Accordingly, we let the change take place through shifting roles, thoughts and acts, motives, goals, values and strategies, differently than might have previously been done, and subsequently a new stable pattern evolves, hopefully even more adaptive than before in order to achieve higher life satisfaction. Previous studies have shown that older people reach their goals in a more realistic and sensible way than younger people because they realize their limitations and preserve their resources to focus on the goals in life that they considered most important (McAdams & Olson, 2010). This should be something society would want to protect and help support.

It might not be an event in itself that changes the personality, but an entire sequence of events. The person may see the consequences of his or her way of being and therefore see the need to make other choices, to feel better and live longer. Even someone who is not outspoken extraverted can make an active choice. When he/she becomes increasingly isolated due to illness or to a partner’s death, the person can decide to meet more and new people to keep, regain or increase the life satisfaction and quality of life, in order not to deteriorate, become sick or even die much too early. But also, the context must be optimized so that these choices are possible to make. Maybe technical solutions such as social media, webcams and chats will be powerful future tools to be social even for the physically isolated person?

They (all of us) thus impose the cognitive goals for themselves, redefining themselves and their roles, and perhaps reformulate their schemata to know what needs to happen for them to achieve their goals. With this scenario even the personality changes, maybe very slowly, and any outsider may not notice the change within the person in question. But still, it may have a significant impact, both in the short but especially in the long run for the person and that is what matters.

Therefore, interventions may be important and make a difference, but maybe we should not try to alter a personality per se, but rather influence the attitudes of social roles, optimize the context and the cognitive foundations for it, make consequences clear, and provide support to the individuals – within their context and specific conditions. Then they will be able to make active choices and find new or altered roles and as a consequence of this keep, regain or increase their life satisfaction and quality of life. Baltes's model of "selective optimization with compensation" would be highly relevant to put in this context (Baltes, 1987), as well as the concept of "locus of control" because of its roots in social learning theory (Rotter, 1954; Rotter, 1966; Wallston, 1992) and research on coping (Kashdan & Rottenberg, 2010).

However, one may argue why a personality should change at all. If extreme traits in personality are shown and are maladaptive for the individual, it might be in order to try altering them, but in a more subtle way. A change may, especially among the elderly, only make an additional burden if it is forced upon them. Instead, maybe the focus should be on what still works and functions and to optimize that instead of trying to find more problems to solve. And besides: do we have the ethical right to say that one personality is right and the other is wrong? What will be the consequence of that?

What do we need to do then?

To identify and explore a problem is essential in order to discover what needs to be resolved. In order to find solutions we need a more strength-oriented way to think and to seek knowledge. Perspectives of risks as well as perspectives of strengths are necessary and complementary in order to get a good picture of interactions – how positive and negative emotions, experiences, thoughts and behaviours are interconnected in stressful situations, such as ageing or ill health. Incorporating positive features provides great potential for improving prognoses, an understanding of and greater conceptualization of subjective wellbeing. It is not logical to study either negative or positive functions separately, as it reduces the ability to predict, for example, prognoses for the development of diseases. Furthermore, positive and negative features work together to buffer the negative life events. The strength perspective promotes interventions that are designed to reduce the negative as well as to promote the positive, while a unilateral perspective (positive or negative) reduces the scope for appropriate risk groups for interventions. In short: the integration of both strengths and weaknesses can improve predictions of disease, increase our understanding of resilience, enhance our scientific knowledge and lead to a revolutionary understanding of wellbeing by way of understanding our nature in its entirety.

Methodological considerations

This thesis is based on three approaches: a longitudinal study, a theoretical explorative cross-sectional study of two cohorts, and a cross-sectional study of several cohorts with a large total range of ages. Typically those types of designs are not manipulated by the researcher but only observed and measured. Even if conditions are not manipulated, such structures allow disturbances to take place. Longitudinal cohort designs allow for causal conclusions which cross-sectional studies do not. Therefore, the purpose of empirical research is to gain insight into how different factors or variables relate to one another and to check the connections that are specified in advance.

However, there are threats to the findings and conclusions at each stage of the research process and the quality of research is always dependent on the validity and reliability. The potential threats to the findings and conclusions in this thesis will be discussed in terms of construct validity, external validity, internal validity and reliability.

A first conceptual model, including coping, life events and health locus of control in addition to personality, ADL, diseases, symptoms and life satisfaction was the starting point for the last study. Thereafter, measurement models and modifications have been made with exclusion of variables step by step according to statistical method regarding structural equation modelling (Byrne, 2001; Hu & Bentler, 1999), and finally landing in the last model exploring relations between personality and life satisfaction in four groups reflecting different health experience. The steps of exclusion were based on both statistical method employed in structural equation modelling as well as in accordance with earlier studies and theories. The first a priori model was based on a of articles and books of factors important for life satisfaction and health over the life span, in different situations and with different premises (Bengtson, 2009; Berg, et al., 2009; Crimmins, 2004; E. Diener, 1984; Diener, et al., 1999; Friedman, 2000; Friedman & Booth-Kewley, 1987; Gijsen, et al., 2001; Maslow, 1954; Pervin, et al., 2005; Sutton, et al., 2004; Vaillant & Mukamal, 2001). This process of analyses is however not presented in this thesis.

Construct validity

Construct validity refers to how well an instrument measures an abstract psychological concept, such as in this thesis, health and morbidity (Shadish, Cook, & Campbell, 2002). If different instruments correlate with each other, it can mean that the concepts behind the correlation, in part or in full, measure the same thing, and this can be criticized as circular reasoning. It should be noted and taken into account in interpreting the results.

For example, morbidity was measured in terms of diagnoses and symptoms. Diagnoses are artificial labels, designed to provide a uniform basis for medical diagnostics, treatment, prognosis and statistics (such as medical care utilization). However, they say nothing about the actual experience of what the diagnosis stands for, whereas symptoms are expressions of health experience. For example, a person may very well have a condition that enables a diagnosis but does not necessarily produce symptoms. Examples of this are well-medicated conditions such as hypertension, diet-treated diabetes or undetected disease.

Moreover, since the term multimorbidity is one of the key concepts in this thesis, measurements are quantitative and not qualitative in its core. This can very well give a picture of the complexity but not necessarily the severity in morbidity. However, this has been taken into account in the form of the different combinations of symptoms and diagnoses, which may reflect severity of the two concepts more than if they were measured separately. There is no “gold standard” for the concept of multimorbidity so the outcome in question has to be taken into account in order to measure health and morbidity appropriately.

The concepts of neuroticism and symptoms are also interrelated but neuroticism is regarded as part of the personality and thus stable and profound, and symptoms are more temporary and experienced based. It is however very hard to know what is what without a longitudinal design and even then it may be almost impossible to solve that problem.

External validity

External validity concerns the extent to which results can be generalized to other people (Shadish, et al., 2002). The results of the three studies are based on older people, making generalizations to younger age groups inappropriate. As is often the case in population studies, especially in elderly populations, the loss of participants is also of significance for the external validity (Shadish, et al., 2002). The participation rate in the data used is relatively low, which must be observed and noted. One can assume that it is above all the most ill and vulnerable who have declined as well as the most active, as they have other things to fill their time than to participate in extensive, tough and time-consuming investigations. This means that those included in the study are probably more positive of the investigation than those not participating, and that the description of the population made on certain dimensions of health, is either underestimated or overestimated. It is therefore important to compare different studies (both population-based and specific target groups) to determine how representative the material presented really is.

The classification of the assumed groups reflecting different health experiences in this thesis might also be a threat to the external validity. Where the cut-off should go for dichotomization into “highs and lows” is a crucial but complex issue. In the first study, the cut-off for symptoms division was based on the median (for those particular 80 years-olds) and for diseases the limit has been set at two or more to encompass the concept of multimorbidity (more than one disease or medical condition) compared with those without disease, or at most one single disease. In the second study the symptoms had the same cut-off as in the first (median), but for diseases various cut-offs were made between 0, 1, 2 and 3 diagnoses in order to consider whether the limits for cut-off were a factor for life satisfaction, and if so, in what way. In the third study, the underlying reasoning is the same, but the cut-off is ranked for both symptoms and diagnoses into highs and lows and in addition there were a life time of diagnoses included. This might be artificial, but in this thesis, the aim was to identify different health style patterns in an explorative manner and further research is needed in order to enhance the possibilities to generalize to other populations.

Internal validity

Internal validity concerns the extent to which the independent variables can be considered to account for the results and the extent to which alternative explanations for the results are omitted (Shadish, et al., 2002). There are a number of plausible reasons for the results, changes or group differences could be called threats to validity – history, maturation, mortality/differential attrition or experimental bias – are just some examples.

History refers to events outside the study that may affect participants' responses. These are often large scale events (natural disasters, political or structural change, etc.) that may affect participants' attitudes and behaviour so that it becomes impossible to determine whether the outcome depends on independent variables or historical events. When we have such a large age range which is the case in the third study, this must be taken into account, particularly as some participants have experienced both one and two world wars (this is true for LUND 80 + as well) and others that not at all experienced times of war. This may have left bodily or mental traces because of diverse nutritional intake during critical years of development. Similarly, the extremely diverse historical background regarding primary education can make a difference in participants' way of perceiving and responding to questions from the questionnaires or in the interviews.

Individuals participating in studies tend to change during the data collection, experiment or between measurements. For example, elderly and sick people become tired and the ability to concentrate can therefore change as the day gets long. In the GÅS study, efforts were made to remedy this, for example by letting the oldest and most fragile be subjected to the most demanding passes as early as possible in the day, but also by offering the participants to divide the day of participation into smaller parts. Despite this, the question remains if discrepancies in the results depend on fatigue or independent variables after the completion of data collection, and analyzing the time of data collection is therefore needed. However, this has not been made for GÅS data in relation to this thesis.

The threat of mortality/differential attrition occurs when we make our conclusions on the basis of only those participants who have participated from the beginning to the end (Shadish, et al., 2002). However, participants may have dropped out of the study before it is completed or because of the study design itself. If this attrition is systematically related to the study, management of the independent variable, the instruments used, or if these dropouts lead to relevant bias between groups, a whole class of alternative explanations can account for these differences, such as at age and morbidity. It is therefore important to consider those who dropped out or died to see if and how they may differ from those in the study.

Bias due to investigators occurs when they accidentally affect study participants. This may occur when the number of people collecting the data is large as it often is in studies of longitudinal and population-based nature. This threat to validity, however, has been attempted to be suppressed by the continuous monitoring carried out by the standardization of methods. This could also be explored through so-called methodological studies, but this has not been done in explicit way. It has, however, continuously been done in an informal way in the GÅS study. Also the fact that I personally examined more than 800 people in the GÅS study enabled me to collect quite a lot of “silent knowledge”, which I found useful when interpreting the results.

Reliability

Reliability is the consistency of a set of measurements or of a single instrument, often used to describe a test (Shadish, et al., 2002). Reliability counteracts random error. In both LUND 80 + and GÅS the instruments used are well-known and validated instruments. They are based on literature reviews and through consultation between senior researchers in respective disciplines (e.g. geriatrics, gerontology, social studies and psychology). These instruments have thus been selected on solid knowledge. It is also important to consider the continuous methodological work, in order to standardize the data collection as a major part in promoting reliability. However, ways to improve the reliability is to further explore the instrument definitions as well as make longitudinal studies and using them in order to detect significant changes in the responses so different reasons for unreliability can be excluded or managed.

The before mentioned classification of the groups might be a threat to the reliability because they can be difficult to reproduce in other studies. The groups showed, however, to be useful both in relation to mortality (Study I) and life satisfaction (Study II and III) in two different data materials (Lund 80+ and GÅS), indicating that the core concepts of symptoms and diseases are possible to combine in a constructive way if not so in exactly the same way as in this thesis.

Strengths and limitations

The greatest strength of these studies is that they are based on population data, which also has a wide age span. Having data from two population studies with the same or similar concepts and instruments is also a strength as the results can be validated to some extent. It is costly and time consuming to run longitudinal cohort studies, which makes both these materials valuable data to work with. Especially concerning the psychological data this is a great advantage where traditionally there is only limited access.

Also the wide range of different types of collection methods -– interviews, surveys, objective measures, self-assessment, proxy data and medical records – makes the data valid when one can confirm various data in various ways, such as diagnoses.

The limitation of the data regards in particular the large loss of participants, making generalizations of the results somewhat uncertain – the risk of both underestimates as well as overestimates is imminent. Also, the fact that a majority of the data is made up of people with a Swedish background makes generalizations to groups with other ethnicities inadequate. This can be a problem as much of this kind of research is designed to be the basis for future policies and decisions, and thus the knowledge of other ethnic backgrounds will be deficient.

Another question is how much of the research now done in the oldest cohorts, is valid in the future when the past century has been a particularly turbulent time in terms of technological and medical development which may have affected the attitudes and expectations of future health care.

Ethical considerations

The primary ethical question relates to how far one can go to collect data. How many times do we question whether a person wants to participate and where is the line between persuasion and abuse or violation of trust?

It has often been difficult to determine if this limit is exceeded, especially when there are people who are very fragile and not so powerful and clear in their position if they want to participate or not. On the other hand, one can argue that a persuasion that leads to participation in a study (if so reluctantly), is preferable to having an imperfect data set. The consequence is then that those who really need help do not get it because we are not aware of the need. The question remains as to where the ethical boundaries are and how to do this type of empirical studies without exceeding a critical line.

Future research and wish list

We need to follow people over time to see cause and effect in relation to different definitions and outcomes (such as heredity and environment), increased age span and not only focus on those who are already elderly, sick, vulnerable or critical ill. Hence, future studies should be of longitudinal character as knowledge of cause and effect is scarce.

Moreover, we need more qualitative research on the individual's own perception on what health and illness is in order to get the adequate terminology to use in the context of reasonable questions and outcome variables instead of using inadequate definitions to answer important questions. For example, more theoretical development and integration of the concepts subjective well-being, life satisfaction and health are needed.

Experience in clinical practice (or daily life) should have a bidirectional relationship with psychological research, but also other disciplines should be incorporated. In other words: the researcher's observations of the applied settings should serve as a basis for further research ideas but also, the need for systematic study and research, in turn, should affect the practice. Hence, there should be more cooperation and exchanges between academia and the clinical activities and context so that the scientific knowledge we already have today could reach out, but also so that the research we conduct today will provide relevant answers to tomorrow's questions.

Much of this thesis has also focused on supplementing the more pathogenic way to do research with a more strength-based, because we do need both perspectives to know where the problems are but also seek answers to the solutions in order to be able to not only heal but also prevent illness and promote health.

We need more interdisciplinary research as we now have more opportunities than ever to explore abstract concepts with new technical methods, which to some extent has been started in areas such as psychoneuroimmunology.

If there was an opportunity to make a wish list for future studies, for which there currently is not done enough studies, it would contain:

Studying public health experience and behavior e.g. phenomena such as disease prone personality but also concepts such as self-healing personality. Theory-development studies in order to (re)define concepts such as life satisfaction, morbidity and health.

To explore the resilience factors in the group of individuals who are healthy and do methodological studies in order to operationalize, identify and distinguish groups with different health experiences but also to further investigate and monitor over time the specific groups in this thesis.

To explore the cause and effect between personality and health, how personality can change and if so how little is needed for clinically significant effect on people's life satisfaction and mortality.

To explore who the risk groups are and what characterizes them and whether they can possibly be the same people that are considered frail according to geriatric definitions.

Finally, to conduct studies of both intervention and implementation at a structural level of health care.

Conclusion

This thesis is much about change. Even though many questions of cause and effects still remain unanswered in this thesis we are facing a changing demography all around the world. We therefore need to change and highlight perspectives of strengths on health and ill-health which may incorporate solutions to change our healthcare systems and not only pinpoint risks, problems and pathology. We have and are currently developing all kinds of new technology and knowledge that make it possible to reframe and consolidate physical body processes with more abstract concepts such as personality, behaviour and attitudes. We need to know more about if and how, for example, personality can change in order to make effective and appropriate interventions to make sure that life satisfaction and quality of life is optimized for older and often multimorbid men and women. We all need to have an open mind because this concerns every one of us. Now and in the future.

Summary in Swedish / Svensk sammanfattning

En fråga om liv och hälsa

Livstillfredsställelse, personlighet och mortalitet i två äldre populationer

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Enligt en rapport från FN (2001) kan vi under de kommande 50 åren förvänta oss att andelen äldre över 60 år kommer att fördubblas. Ny och förbättrad teknik, medicinsk kunskap och behandling har utvecklats, vilket innebär att vi i dag överlever i större utsträckning det som vi tidigare har dött av, som exempel hjärt-kärlsjukdomar (Crimmins, 2004).

Stigande ålder är dock förknippad med en försämrad hälsa. Fysiologiska förändringar, kroniska sjukdomar och andra hälsoproblem är vanligare i de senare åren än tidigare i livet. Att vara sjuk ökar sårbarheten för att ådra sig mer sjuklighet, vilket i sin tur påverkar både dödlighet och livskvalitet (Landi, et al., 2010). Sedan 1970- och 80-talen konstaterade dock flera forskare en ökning av rapporterad god hälsa, men också ökade nivåer av sjuklighet och funktionshinder, vilket tyder på ett komplext samspel mellan personliga faktorer och ohälsa i sig (Crimmins, 2004). Med andra ord: fler äldre människor lever med flera medicinska tillstånd, men med mindre handikapp och även med bättre upplevd hälsa än tidigare.

Äldre människor tenderar att ha inte bara en enda sjukdom eller ett medicinskt tillstånd, utan det dominerande sjukdomsmönstret är multimorbiditet (Fratiglioni & von Strauss, 2006; Landi, et al, 2010.). Multimorbiditet betyder att en person har flera samtidiga sjukdomar eller medicinska tillstånd. Multimorbiditet är redan det vanligaste mönstret av sjukdom hos den äldre befolkningen men prevalensen varierar mycket mellan olika studier. Prevalensen varierar från 25% till 98%, men generellt sett visar studier att minst 50% under 60 år anses ha flera diagnoser och att förekomsten av multimorbiditet ökar kraftigt med åldern (Fratiglioni, 2010, Landi, et al. , 2010, van den Akker, Buntinx, Metsemakers, Roos, & Knottnerus, 1998).

Redan i slutet av 1970-talet noterade Cassel (1976) att det var ett anmärkningsvärt antal liknande riskfaktorer som var ursprung för ett stort antal, dock mycket olika, sjukdomar. Även Syme (1996) gjorde en utvärdering av den forskning som gjorts om hjärt-kärlsjukdomar under de senaste 50 åren. Hjärt-kärlsjukdomar är ett av de största sjukdomsspecifika forskningsområdena i vilket det anges särskilda riskfaktorer för att ådra sig den typen av sjuklighet. Symes studie visade dock att sjukdomsspecifika orsaker kan totalt sett förklara cirka 40% av sjukdomsfallen vilket innebär att cirka 60% *inte* kunde förklaras med särskilda riskfaktorer eller orsaker. Det kan därför konstateras att forskning om vad som gör vissa människor mottagliga för sjukdomar och andra inte, behöver kompletteras med mer allmänna riskfaktorer.

Att studera och fokusera på en sjukdom i taget kan vara effektivt för att utvidga kunskapen om sjukdomar och deras bärare som endast har dessa sjukdomar, men ett sådant synsätt kan också skapa fragmentering i förhållande till flersjukliga individer. Ett diagnosspecifikt tillvägagångssätt kan omöjligen spegla komplexiteten i multimorbiditet (Halling et al, 2006;. Noel, Frueh, Larme, & Pugh, 2005). Ofta utesluts de personer som har två eller flera sjukdomar i klinisk forskning, eftersom de försvårar databearbetning och tolkning av resultat (Fortin, Lapointe, Hudon, & Vanasse, 2005).

Tidigare studier har visat samband mellan komorbiditet, multimorbiditet och vårdutnyttjande, fysisk förmåga, dödlighet, psykosociala faktorer (t.ex. händelser i livet, boende, sociala nätverk), och kvaliteten på livet i allmänhet samt hälsorelaterad livskvalitet av livet i synnerhet (Byles, D'Este, Parkinson, O'Connell, & Treloar, 2005;. Fortin, et al, 2004; Fratiglioni & von Strauss, 2006;. Gijsen, et al, 2001; van den Akker, Buntinx , Metsemakers, van der Aa, & Knottnerus, 2001). Resultaten tyder också på att fysisk hälsa försämras mer än den psykologiska (Fortin et al., 2006). Sjukvårdskostnader, men framför allt kostnaden i form av individuellt lidande ökar med antalet diagnoser och medicinska tillstånd.

Psykologiska faktorer som personlighet, attityder, coping och subjektivt välbefinnande i termer av symtom eller begreppet livstillfredsställelse, har inte undersökts i någon större utsträckning.

Av samma skäl som enbart antal diagnoser skulle ge en förenklad bild, kan man inte enbart använda antalet symtom för att operationalisera, mäta eller beskriva hälsa och ohälsa (Tooth, Hockey, Byles, & Dobson, 2008). En kombination av både objektiva och subjektiva mått på ohälsa kan vara ett bättre val. I denna avhandling kommer därför antalet diagnoser kombineras med antal symtom i syfte att skapa fyra grupper av äldre personer med olika grader av (o-)hälsoupplevande. Detta görs för att kunna urskilja, undersöka och beskriva specifika grupper och deras dödlighet och personlighet men först och främst: livstillfredsställelse.

Syftet med denna avhandling var att undersöka och beskriva äldres sjuklighet och upplevelse av symtom i förhållande till livstillfredsställelse, personlighet och dödlighet, att lära av de individer som har hög livstillfredsställelse trots att de har flera medicinska diagnoser och villkor samt att resonera hur positiva faktorer och styrkor kan hjälpa individer som upplever ohälsa, trots att de inte har diagnoser i någon större utsträckning.

Avhandlingen består av tre empiriska studier som undersöker äldre personer (60-93 år).

Studie I var en longitudinell studie (15-årsuppföljning) vars slutsats var att upplevelsen av subjektiva tecken på sjukdom bär samma förhöjda dödlighetsrisk som sjukdomarna i sig. Objektiva tecken på sjukdomen överensstämmer ofta inte på ett enkelt sätt med den subjektiva upplevelsen av hälsa.

Studie II var en teoretisk explorativ tvärsnittsstudie av två kohorter med slutsatsen att det är viktigt att tänka på att inkludera både symtom och diagnoser när man har livstillfredsställelse som utfallsmått. Tre olika modeller som utforskades i denna studie kan tjäna olika syften beroende på frågeställning eller sammanhang, t.ex. intervention, behandling eller omvårdnad.

Studie III var en tvärsnittsstudie av flera kohorter med en stor total aldersspridning. Slutsatsen i den tredje studien var att personlighet visade sig vara en viktig faktor att beakta när livstillfredsställelse är utfallsmåttet i studier med äldre, ofta multimorbida, populationer. Speciellt personlighetsdraget extraversion visade sig vara viktigt i relation till högre livstillfredsställelse. De tre personlighetsdragen neurotisk läggning, extraversion och öppenhet visade sig ha samband med livstillfredsställelse på olika sätt, i olika grupper.

Slutsatserna från de tre studierna är att både riskperspektiv och styrkeperspektiv är nödvändigt och kompletterande för att få en bra bild av interaktioner – hur positiva och negativa känslor, erfarenheter, tankar och beteenden är sammankopplade i olika situationer, som åldrande eller ohälsa. Att införliva ett positivt perspektiv ger stora möjligheter att förbättra prognoser, ge en större förståelse för och större konceptualisering av det subjektiva välbefinnandet.

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Study I

Subjective Health and Illness, Coping and Life Satisfaction in an 80-Year-Old Swedish Population - Implications for Mortality

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Subjective Health and Illness, Coping and Life Satisfaction in an 80-Year-Old Swedish Population—Implications for Mortality

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Background: Multimorbidity and illness will become more common due to increased life expectancy. Purpose: This study describes various combinations of diseases and symptoms and explores implications for mortality in a sample of 80-year-olds followed up to 95 years of age. Furthermore, reported subjective health, coping, and life satisfaction is explored. Method: 212 persons, born in 1908, were classified into four groups based on their number of diseases and reported symptoms according to a health examination at the age of 80. These groups were compared regarding standardized measurements of subjective health, depression, coping, life satisfaction, and mortality. Results: The mortality risks, the hazard ratios, were of the same magnitude, 1.8–2.2, whether the persons experienced several symptoms, had several diseases, or a combination of several symptoms and several diseases when compared to the healthy group of respondents. Conclusion: The experience of subjective signs of illness carries the same mortality risks as diseases.

Key words: comorbidity, mortality, coping behavior, elderly, cohort

Multimorbidity—living with multiple concurrent chronic or acute diseases or medical conditions—will become more common in the future due to increased average length of life and the advancement of medical knowledge and medical technologies that prolong survival (Fortin et al., 2004; van den Akker et al., 1996). To our knowledge, no study has explored multimorbidity in association with mortality in an older population. Multimorbidity, in a wider sense, is important to study because it affects not only the person who experiences ill health and distress but also his or her family, friends, and social network. Furthermore, the consequences expand with the number and severity of the diseases involved. It is, however, unusual to study multimorbidity in a wider nosological perspective since most studies have focused on single symptoms and diseases (van den Akker et al., 1998). Only a few more encompassing studies have been reported and even fewer that include elderly populations (van den Akker et al., 2001). Furthermore, these studies are difficult to compare because they differ in the number and kinds of diseases they include, the populations studied, and the methods and definitions employed. According to van den Akker et al. (1998) the prevalence of multimorbidity has been found to be as frequent as up to 78% among 80-year-olds. Other studies report lower proportions but are in most cases limited by the number of diseases they include (van den Akker et al., 2001), a serious restriction since the number and kind of diseases studied has a great impact on the prevalence and incidence of both multimorbidity and comorbidity—the occurrence of a specific combination of diseases. Higher occurrence of multimorbidity can be expected in studies that include larger numbers of diseases (van den Akker et al., 2001). Gender differences have been found concerning both morbidity and mortality, for example, in health profiles and remaining life expectancy (Deeg et al., 2002).

Previously, researchers have studied determinants of morbidity and comorbidity. Aetiological research has in most cases focused on diseases in a medical sense, but little is known about psychological factors that may influence susceptibility to illness and

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disease (van den Akker et al., 2000). Psychological factors have been suggested to play a certain role and especially coping, how stressful events—such as multimorbidity—are appraised and handled, would be relevant to investigate. Results from earlier studies on the link between coping and health have been difficult to compare probably because the concept of coping has been defined and measured in several different ways.

At least two main different definitions of coping have been employed: coping as a personality trait, stressing the relative stability of the individuals' coping measures, and coping as a process, which emphasizes that a number of basic coping behaviors or strategies are used in particular situations.

From early on, two coping dimensions were identified: emotion-focused coping and problem-focused coping. Emotion-focused coping includes strategies and conscious activities to regulate effects. Examples of emotion-focused strategies are to avoid the problem or minimize the consequences. Problem-focused coping, on the other hand, involves strategies to change the situation in itself, for example, to create alternative solutions.

A taxing situation activates the coping process, and often multiple and contrasting emotions are experienced. The coping behavior that follows consists of a wide range of cognitive and behavioral strategies that have problem-solving as well as emotion-regulating functions. It is often maintained that problem-focused coping is especially adaptive in situations that can be changed, whereas emotion-focused coping seems to be adaptive in chronic or unchangeable situations (Folkman & Lazarus, 1980; Folkman et al., 1986). These results, however, generally refer to short-term outcomes that are often measured in terms of current quality of life, for example, subjective health or life satisfaction. In contrast, the risk of dying would constitute an ultimate long-term outcome.

In this study we describe various combinations of diseases and symptoms in an 80-year-old population and explore their implications for mortality from 80 to 95 years of age and stratified for gender. The aim is also to describe depressive symptoms, subjective experience of health, level of life satisfaction, and participants' coping strategies as reported in the respective defined groups when the persons were 80-years-old.

Methods

Subjects

Data are from an ongoing longitudinal population study with sequential design—Lund 80+—in Lund, a town in the south of Sweden (Svensson et al., 1993). In this study, only persons born in 1908 from the first wave were analyzed. The original population consisted of 315 persons, of whom 212 subjects agreed to be examined, 146 females and 66 males. The participation rate was 67%. Also participants in institutions were examined and represented in the original material. There were no significant differences in gender, marital status, or income level between participants and non-participants (McCamish-Svensson, 2002). Another 47 individuals were excluded from this study. They were participants with severe cognitive impairment who could not fulfill the psychometric tests. The exclusion was based on lacking verbal understanding and reasoning. Participants whose relatives and/or staff declined to participate in the study were also excluded. Persons that could manage the tests despite suffering from mild cognitive impairment, measured by the Berger rating scale (Berger, 1980), were, however, included in this study. Participation varied for different variables. Sufficient data to obtain either symptom or disease was missing for seven individuals in the classification, which excluded them from categorization. To conclude: included in this study are individuals having complete information regarding depressive symptoms, subjective health, life satisfaction, and coping—all together 165 individuals.

Instruments

Presence and Absence of 30 Different Symptoms. The Gothenburg Quality of Life Instrument (Tibblin et al., 1990) is a checklist designed to visualize symptoms the person might have experienced within the last three months. The instrument contains 30 items and covers seven domains: depression (exhaustion, sleeping disturbance, general fatigue, depression, cries easily), tension (irritability, nervousness, impaired concentration, difficulty relaxing, restlessness), gastrointestinal/urinary tract symptoms (difficulty in passing urine, anorexia, nausea, diarrhea, constipation, abdominal pain), musculoskeletal symptoms (pain in the joints, backache, pain in the legs), metabolic symptoms (feeling cold, sweating, loss of weight, overweight), heart/lung symptoms (coughing, chest pain, breathlessness), and symptoms related to the head (dizziness, headache, impaired hearing, and eye problems).

Previous and Present Diseases. The persons' own report and doctors' examination and judgment from a checklist of diseases (diabetes, hypertension, angina pectoris, congestive heart failure (CHF), claudicatio intermittens, stroke, urinary incontinence, neurological disease, cancer/tumors, major trauma, hip fracture, and non-hip fractures).

Depressive Symptoms according to the Comprehensive Psychopathological Rating Scale (CPRS) related to the criteria used in ICD-10 (Asberg et al., 1978). The instrument consisted of 20 items with ratings of 0, 0.5, 1.0, 1.5, and 2.0 which were dichotomized into "no presence of symptoms" (0–0.5) and "degree of symptoms" (1.0–2.0).

Subjective Health. The persons' own rating recorded on a 5-grade Likert scale ranging from 1 (excellent) to 5 (very poor). The variable was dichotomized based on median score: 1–2 as good health and 3–5 as poorer health.

Life Satisfaction (LSIA) (Neugarten et al., 1961) measured with 20 items and dichotomized into high and low based on median score (15–20 and 0–14, respectively). The total score was 20, each positive response considered as one point.

Coping. An modified interview from the Bonn Longitudinal Study on Aging (BOLSA) (Olbrich, 1985) was used to describe coping style. The participants' self reported stressful events and primary choice of coping strategy. Their answers were classified by factor analysis, based on earlier studies, into four dimensions of coping strategies: active, passive, avoiding, and emotional (International Association of Gerontology, Congress (17, Vancouver & Gutman, 2001).

Date of Death was obtained from National Population Registry. *Marital status* was categorized into single, married, divorced, and widowed. *Education* was categorized into the levels: maximum 7 years, 8–9 years, 10–12 years, and 13 years or more. Higher education was regarded as more than 7 years.

Categorization into Groups

Based on "presence and absence of 30 different symptoms" and "previously and present diseases," two new variables were constructed: "number of symptoms" and "number of diseases." The number of diseases and symptoms was counted for each person and these sums constituted the base for grouping into four categories. Number of diseases was dichotomized based on empirical data and the focus of the study (multimorbidity) into two groups: none or one disease was classified as "non-morbidity" and two or more diseases were classified as "multimorbidity." The numbers of symptoms were dichotomized based on the median. Having 0–6 symptoms was classified as "few symptoms" and 7–22 symptoms as "many symptoms." The diseases and symptoms were combined by cross tabulation:

"Basically healthy" (0 or 1 disease, 0–6 symptoms)
$n = 65$; 24 men, 41 women

"Disease-ridden" (2–7 diseases, 0–6 symptoms)
$n = 28$; 8 men, 20 women

"Symptom-ridden" (0 or 1 disease, 7–22 symptoms)
$n = 33$; 12 men, 21 women

"Unhealthy group" (2–7 diseases, 7–22 symptoms)
$n = 39$; 8 men, 31 women

Procedure

The medical examinations and psychological tests were conducted at the local health center where medical records of the participants were also available to the medical examiner. A doctor and a psychologist performed the examinations, which took an average of three to four hours per person. Additional data were gathered by a district nurse on, for example, marital status and education. For the participants who could not come to the local health center, house calls were offered.

Statistics

Bivariate analyses were performed with depressive symptoms, subjective health, life satisfaction, coping, education, and marital status which were all described in relation to the four new groups (for definition see above) in order to investigate differences between the groups. This was done with χ^2 tests according to Pearson. Survival analysis was performed using Cox regression. The mortality was modelled for the four groups, where the basically healthy group was taken as the reference group. Gender and entrance age into the study were entered into the regression model to control for these factors. Only two-sided tests were used; p-values below 5% were considered statistically significant. All statistical analyses were carried out using SPSS 11.0. The study was approved by the Ethics Committee at Lund University in 1988.

Results

Influence on Mortality in the Groups

General Mortality in the Groups. When the groups were analysed until 95 years of age, all three groups—disease-ridden, symptom-ridden, and the unhealthy group—had a higher mortality risk than the basically healthy group (Table 1). The hazard ratios ranged from 1.8 to 2.2 for these groups. The hazard ratios did not differ significantly between these three groups.

Table 1. *Cox Regression Analyses for Ages 80–95 Years, $n = 164$ (Basically Healthy Group Used as Reference)*

	Hazard ratio	95% CI	p
Gender			
Men	1	—	—
Women	.7	.5–.9	.023
Age at examination	1.2	.9–1.7	.282
The Four Groups			
Basically healthy	1	—	—
Disease-ridden	2.0	1.2–3.2	.006
Symptom-ridden	2.2	1.4–3.5	.001
Unhealthy	1.8	1.1–2.8	.014

Note: Age at examination refers to exact age of entry into the study.

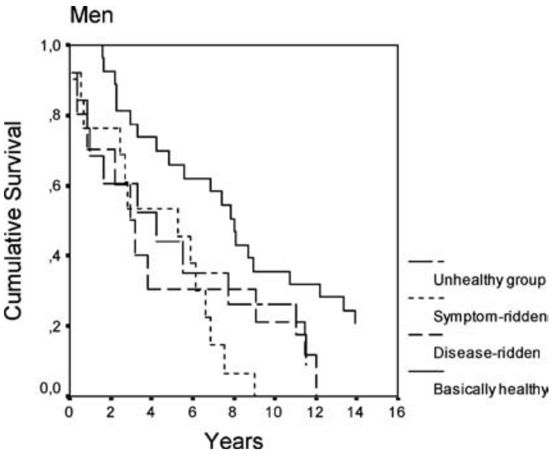

Figure 1. **Survival function at mean of entrance age (men).**

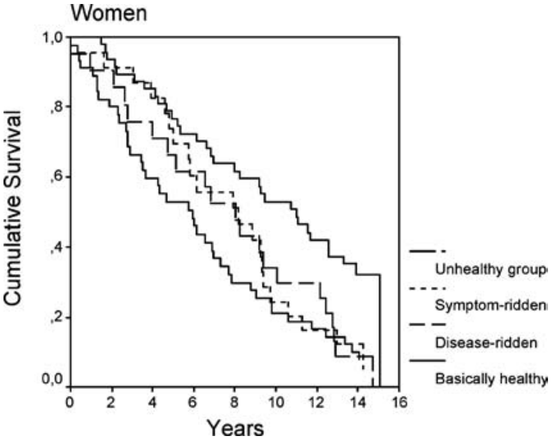

Figure 2. **Survival function at mean of entrance age (women). The upper line represents the Basically healthy group.**

Mortality among Men and Women in the Groups. Although not significant different from the other groups, the men in the symptom-ridden group had the highest hazard ratios. For women the pattern was similar for the three groups, see Figures 1 and 2. Controls for gender and entrance age in the study were entered into the regression model as the cohort was recruited during a whole year (Table 1). The impact of gender showed a lower risk for women.

Alternative Group as Reference. Survival analysis was also performed with the symptom-ridden group as reference to examine whether this group differed in a significant way from the other groups. Only the basically healthy group differed significantly from the symptom-ridden group.

Group Characteristics

Diseases and Symptoms in the Groups. The groups naturally showed differences in quantity of diseases but quite similar types of diseases: cardiovascular conditions, fractures, and urinary incontinence were most prevalent in all groups (Table 2). The specific symptoms were at first glance quite similar in the groups: the most common symptoms were impaired hearing, eye problems, pain in legs, joints, and the back. Also, fatigue was noticed in the unhealthy group. Viewed in symptom domains (described earlier) the groups differed; however, musculoskeletal and symptoms related to the head were the most commonly reported domains of symptoms in three of four groups, whereas in the unhealthy group musculoskeletal symptoms and depression dominated (Table 2). Symptoms related to tension were also prevalent in the symptom-ridden and unhealthy groups (15–36% and 18–36%). In the basically healthy and disease-ridden groups, less than 10% reported tension. The domain of depressive symptoms were likewise more prevalent in the symptom-ridden and unhealthy groups (12–42% and 23–69%), whereas in the basically healthy and disease-ridden group, at the most 23% reported some kind of symptom.

Symptoms of Depression. As shown in Table 3, the four groups differed significantly in depressive symptoms: $\chi^2(3,\ n = 165) = 24.5,\ p < .01$; the highest proportion of depressive symptoms was found in the unhealthy group, whereas the lowest proportion was in the disease-ridden group. The unhealthy group differed significantly from the other three groups when compared pair-wise; all the p-values were lower than .01. There were no significant differences among the basically healthy, the disease-ridden, and the symptom-ridden groups.

Table 2. *Three Most Common Diseases and Symptoms in the Four Groups. (Percentages)*

n	**Basically healthy** **65**	**Disease-ridden** **28**	**Symptom-ridden** **33**	**Unhealthy group** **39**
Diseases	Hypertension (12) Non-hip fractures (12) Congestive heart failure (6)	Non-hip fractures (43) Hypertension (39) Angina pectoris (29)	Hypertension (12) Stroke/TIA/RIND (12) Claudicatio intermittens (9)	Non-hip fractures (54) Hypertension (35) Urinary incontinence (31) Angina pectoris (31)
Symptoms	Impaired hearing (38) Eye problems (34) Leg pain (29)	Leg pain (57) Joint pain (39) Impaired hearing (36)	Leg pain (64) Backache (55) Impaired hearing (48)	Fatigue (69) Leg pain (67) Backache (67)

Note. TIA = Transitoric Ischemic Attack, RIND = Reversible Ischemic Neurological Damage.

Table 3. *Group Characteristics at 80 Years of Age (Percentages)*

n	**Basically healthy** **65**	**Disease-ridden** **28**	**Symptom-ridden** **33**	**Unhealthy group** **39**
Gender				
Men	37	29	36	20
Women	63	71	64	80
Total	100	100	100	100
Marital status				
Single	23	18	15	13
Married	29	36	49	28
Divorced	6	3	12	5
Widowed	42	43	24	54
Total	100	100	100	100
Education				
7 years or less	38	55	61	56
8–9 years	18	15	3	14
10–12 years	16	4	21	16
13 years or more	28	26	15	14
Total	100	100	100	100
Depressive symptoms				
No symptoms	62	64	45	15
Symptoms	38	36	55	85
Total	100^{a*}	100^{b*}	100^{c}	$100^{a*,b*,c}$
Subjective health				
Good health	95	100	79	62
Poorer health	5	0	21	38
Total	$100^{A,b*}$	$100^{c,d*}$	$100^{A,c}$	$100^{b*,d*}$
Life satisfaction				
High life satisfaction	51	61	52	23
Low life satisfaction	49	39	49	78
Total	100^{a}	100^{b*}	100^{C}	$100^{a,b*,C}$
Coping				
Active	5	36	6	13
Passive	23	14	24	26
Avoiding	29	21	27	15
Emotional	43	29	43	46
Total	100^{a}	$100^{a,B}$	100^{B}	100

Note. Similar letters denotes significant differences. Uppercase letters denote $p < .05$, lowercase letters denote $p < .01$, lowercase letters with * denote $p < .001$.

Subjective Experience of Health. Also in the experience of subjective health, the groups differ significantly: $\chi^2(3, n = 165) = 28.04$, $p < .001$; in the unhealthy group, the majority of the participants considered their health as poor (Table 3). In addition, there was a great proportion of the symptom-ridden group that, like the unhealthy group, reported poorer subjective health. No one in the disease-ridden group reported poorer subjective health. The basically healthy and the disease-ridden groups differed significantly in comparisons to the unhealthy group, both p-values lower than .001. Likewise, there were significant differences found between the two groups—basically healthy and disease-ridden on the one hand and symptom-ridden group on the other hand; p-values were lower than .05.

Life Satisfaction. The four groups also differed significantly regarding life satisfaction, $\chi^2(3, n = 165) = 11.69$, $p = .009$; the unhealthy group had the greatest proportion of individuals who considered their life satisfaction to be low (Table 3). In pair-wise comparisons, the basically healthy and disease-ridden groups differed significantly from the unhealthy group with p-values lower than .01. Also the symptom-ridden group differed significantly from the unhealthy group, the p-value was lower than 0.5.

Coping. The groups differed significantly in choice of coping strategies, $\chi^2(9, n = 165) = 21.49$, $p = .011$; the active coping strategies were especially used by the individuals in the disease-ridden group. These strategies were the most unusual strategies used by the other three groups (Table 3). In comparisons in pairs, the basically healthy and the symptom-ridden group differed significantly from the disease-ridden in the choice of coping strategies, with emotional and avoidant coping strategies as the most common; the p-values were lower than .01 and .05, respectively.

Social Descriptives

Marital Status and Level of Education. Marital status was similar in the four groups. It was most common to either be married/cohabiting or to be widowed. Also, the level of education was similar in the groups, although the basically healthy group had a higher proportion of higher education—63% compared to 39–45% in the other groups.

Discussion

In this study, we have described various combinations of diseases and symptoms in an 80-year-old population and explored their implications for mortality until 95 years of age. The results showed that objective diseases, symptoms, or a combination of diseases and symptoms at 80 years of age almost doubled the mortality risk. In other words, it seemed just as risky to experience ill health as to actually have diseases according to examination by a doctor.

An unexpected discovery was the nearly equal mortality risk in the different groups. The unhealthy group, with both multiple diseases and multiple symptoms, did not suffer a higher risk than the other groups, which is especially notable in relation to the symptom-ridden group, which had none or only one disease. The symptom-ridden group did not differ in types of diseases from the other groups, which means that the argument that this group is afflicted with more serious diseases was not supported.

The participants in the disease-ridden group, a group with multiple diseases but with fewer symptoms, survived as long as the participants did in the other groups. This circumstance raises the question whether they had been particularly well attended. An alternative explanation may be if there are other mechanisms that serve in a protective way against subjective ill health, for example, active coping, which was characteristic and common in the disease-ridden group.

The experience of subjective symptoms in the symptom-ridden group is related to an increased mortality risk. Possible explanations might be lack of medical diagnostics (undiscovered diseases), improper or failing treatment of somatic disease among these individuals.

Considering the nature of certain prevalent symptoms in the symptom-ridden group, i.e., the dimension of tension and depression (according to both the Gothenburg Quality of Life Instrument and CPRS), it seems possible that depression might be an overlooked diagnose in this study population. The symptom-ridden and the unhealthy groups showed similar patterns and the unhealthy group showed the highest prevalence of depressive symptoms. Earlier studies have indicated that depression may be a quite common disease but often missed in the elderly population, probably because there is a lack of consensus regarding typical symptoms in the elderly (Frojdh et al., 2003a; Frojdh et al., 2003b).

Some symptoms, such as fatigue or pain, in the elderly are unspecific and could be the result of a multitude of different diseases. A previous study (van den Akker et al., 1998) has shown that having diseases increases the risk to contract additional diseases. However, this would be true for anyone with a diagnosis in this study, and is not exclusive to the symptom-ridden group. Forty-nine persons, approximately 23%, did not have any diagnosis at all, although they can very well have disease. This prevalence is well in agreement with Swedish census data in the age cohort 75 to 84 years (Statistics Sweden, 2000).

Fatigue was in itself a common symptom in both the symptom-ridden and the unhealthy group. In earlier studies, diseases have been related to insomnia, both primary and secondary (Avidan, 2003; Petit et al., 2003; Riemann & Voderholzer, 2003). Sleep difficulties have also been associated with higher mortality in earlier studies (Manabe et al., 2000). This may explain the nearly identical mortality risks in both the symptom-ridden and the unhealthy group.

Another common symptom in all the groups was pain, and especially leg pain, as were fractures in a corresponding way. One possibility is that pain was a manifestation of fractures, and there are several studies that have shown a higher mortality risk among elderly with fractures, especially hip fractures, which may explain the increased mortality risk in the three groups: disease-ridden, symptom-ridden, and unhealthy (Braithwaite et al., 2003).

Analysing coping strategies revealed distinct differences between the groups. Active coping strategies, for example, to seek social support or ask for help,were most employed by the disease-ridden group and to a lesser extent by the other three groups. The disease-ridden group differed from the other groups in two other specific ways in addition to coping strategy: they had the lowest prevalence of depressive symptoms, and, moreover, they reported the greatest share of high life satisfaction. This may be an indication that coping is indeed a protective mechanism in this group, although not for contracting diseases and prolonging life but retaining well-being. Perhaps the high proportion of active coping in the disease-ridden group explains the lack of symptoms due to control and higher life satisfaction. But, on the other hand, the lack of symptoms and the experience of higher life satisfaction might facilitate active coping strategies.

The second most frequent type of strategies employed was the emotional ones, such as feeling sad or scared. The emotion-focused strategies have seemed to be adaptive in chronic and unchangeable situations. Although the emotional strategies were commonly used in all the groups, it may be the combination of active and emotional strategies used by the disease-ridden group that is the most adaptive; in other words, they have "more tools in their toolbox" than the other groups.

The participants' subjective experience of depressive symptoms, health and illness, level of life satisfaction, and their coping strategies as reported when they were 80 years old proved to be important complementary information in the analyses of the differences between the groups, because the presence of diseases and symptoms in itself could not explain the quite equal doubled risks in mortality.

Limitations and Strengths

A limitation of this study concerns the diagnoses. A diagnose might imply several sub-diagnoses and prognoses. As an example, cancer can be of different kind and either lethal or with predominantly good prognosis, and we do not know which kind of diagnosis is more prevalent in which group. Moreover, all diagnoses in a lifetime are counted per person, which means that we cannot control which diseases are new or old. Nor can we tell whether a person has had one or several diagnoses of the same kind.

The low participation rate of men may also limit the interpretations due to gender. Although only two thirds of the population participated in the study, no differences in sociodemographic variables nor in gender or social class were noted between participants and non-participants, which speaks in favor of generalizing findings to the elderly population in general (McCamish-Svensson, 2002).

The proportion of persons with some degree of cognitive impairment in the study, 20%, was similar to the general population. Prevalence of dementia in persons over 80 years of age is estimated to be 10–15% (Dehlin et al., 2000), which gives us reason to believe no major selection bias occurs due to cognitive impairment.

Information on hormonal replacement therapy was not collected in the study and could therefore not be studied as a possible covariate, which would have been interesting.

The strengths of this study are the validated standardized instruments and also the variation in data with both interviews and observations. Furthermore, the study has continuity in the follow-up. Access to Swedish registries gives unique and exact data, for example, entrance age in the study in days, which makes the analyses reliable.

In conclusion, objective signs of disease often do not concur in a simple way with the subjective experience of health. Experiencing symptoms and/or having diseases are related to the same increased mortality risk during a 15-year follow-up of an elderly population in Sweden.

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Study II

How do different combinations of the number of diseases and experienced symptoms relate to life satisfaction?

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Abstract

Objectives: This study explores how three models with different combinations of the number of diseases and experienced symptoms are related to life satisfaction in a population of 296 80-year-olds in southern Sweden. Methods: Three different models, visualizing different health profiles, in the form of reported diseases and experienced symptoms were created and are presented. Results: The results showed that symptoms had a stronger relation to life satisfaction than diseases on their own do. Discussion: It is important to consider not only diseases, but also symptoms when having life satisfaction as an outcome in studies analyzing different concepts of morbidity. The three different models explored in this study may serve different purposes depending on the research question or context, for example intervention, treatment or care.

Keywords: comorbidity, multimorbidity, symptoms, elders, life satisfaction

The complex and diverse concepts of comorbidity and multimorbidity have been used frequently during the last decades as important topics in public health and social work (van den Akker, Buntinx, & Knottnerus, 1996; Yancik, et al., 2007). With some variations, the two concepts can be distinguished as follows. *Comorbidity* means having an additional disease that is associated with a given disease, e.g. depression and cancer (Feinstein, 1970; Kraemer, 1995). *Multimorbidity*, on the other hand, takes no account of the specific conditions but is merely quantitatively determined. An individual who has two or more diseases or medical conditions is regarded as multimorbid. Considering this mixture of combinations of diseases and medical conditions with varying severity and/or different functional and biological processes, it is tremendously more complex to measure and analyze multimorbidity than focusing on comorbidity.

There are a number of different definitions of morbidity but no consensus on what the definitions should include. Some of the concepts include only chronic conditions, and some include both chronic and other medical conditions; some concepts include two or more diagnoses, and others include three or more (Fortin, et al., 2004; Marengoni, 2008; van den Akker, et al., 1996). There are also several instruments and indexes that make gradations of severity in morbidity (Charlson, Pompei, Ales, & MacKenzie, 1987; de Groot, Beckerman, Lankhorst, & Bouter, 2003; Elixhauser, Steiner, Harris, & Coffey, 1998; Greenfield, Apolone, McNeil, & Cleary, 1993; Linn, Linn, & Gurel, 1968; Miller, et al., 1992; Parkerson, Broadhead, & Tse, 1993). However, no one has, to our knowledge, explored what implications these differences in definitions and measurements might have on life satisfaction. Moreover, the researchers haven’t included life satisfaction as a primary outcome or main focus in their concepts when different indexes have been developed and tested. This is remarkable, as the men and women in older populations are often multimorbid. Moreover, as the diseases are mostly chronic, the hope of a cure is non-existent or at least greatly limited. A focus on life satisfaction is therefore of great importance. Different concepts and definitions of morbidity—with and without symptoms—might have different implications on, for example, life satisfaction.

The concept of life satisfaction covers the entire life span, not just current life conditions. Life satisfaction can be regarded as an autobiographical reflection and can be either positive or negative. Current psychological factors and, of course, personal health influence how people respond to retrospective evaluations and this is expressed in terms of psychological well-being (Neugarten, Havighurst, & Tobin, 1961).

For example, experienced symptoms can be regarded as a mediator of life satisfaction, because absence of symptoms can make important goals in life easier to achieve and, by extension, help prepare for a positive life ending, from the individual's own point of view (Erikson, 1982).

The prevalence of both diseases and symptoms is, in previous studies, reported to increase among older people (Parker & Thorslund, 2007), which means that knowledge of how concepts of morbidity are defined and how they are related to different outcomes, e.g. life satisfaction, will be more important to consider as time goes by. Present research, in e.g. epidemiology, is often based on single morbidity concepts, and in many clinical studies the persons with concurrent medical conditions are excluded. Both these circumstances become a problem as the descriptions and conclusions about multimorbid individuals might be insufficient and simplified (Fortin, Lapointe, Hudon, & Vanasse, 2005; Halling, Fridh, & Ovhed, 2006; Noel, Frueh, Larme, & Pugh, 2005).

Unlike previous studies, this study includes the number of symptoms in addition to the number of diseases. Symptoms, especially persistent symptoms, force in one way or another the individual to make some sort of adjustment, whether or not the symptoms lead to a diagnosis and/or a treatment. The combination of symptoms and diseases might provide a more complete picture of a person's wellbeing, since it is based on the individual's subjective experience as well as the physician's assessment, of which the latter is considered in this study to be the objective reflection of the person's health status. To consider both perspectives may also be advantageous in case the individual forgets or withholds certain symptoms or diseases, or even confuses symptoms with a medical condition (Lumley, 2004; Lumley, Neely, & Burger, 2007). Although the number of diseases and experienced symptoms may provide a limited picture of the health of older people, they are used as a prerequisite for creating models visualizing different health profiles in this study. Other health indicators such as personal or instrumental activities of daily living are also important but are outside the focus of this study. In this study different health profiles were visualized by three models that were created by combinations of total number of diseases and experienced symptoms. These three models were put in relation to life satisfaction among 296 80-year-olds in southern Sweden. This was done in order to investigate how different combinations and amounts of diagnoses and symptoms may relate to life satisfaction.

Method

Subjects and setting

Data was obtained from a longitudinal population study with sequential design – Lund 80 + – in Lund, a city in the south of Sweden (Svensson, Dehlin, Hagberg, & Samuelsson, 1993). In this study 296 persons from cohorts born in 1908 and 1913 (first examinations) were analyzed. The original population consisted of 618 persons 80 years of age, of whom 359 subjects agreed to be examined, 233 females and 126 males. The participation rate in both cohorts was 58%. In the cohort of 1908, there were no significant differences in gender, marital status or income level between participants and non-participants (McCamish-Svensson, Samuelsson, Hagberg, Svensson, & Dehlin, 1999). There was, however, a larger proportion of individuals with higher education compared to national average, but in comparison with the corresponding population study H70 studies (Rinder, Roupe, Steen, & Svanborg, 1975) the participants did not differ in cognition (Svensson, et al., 1993) and there is no reason to believe that the cohort of 1913 would differ in another way.

Data collection procedure

Data for this study was gathered 1988-1993. The medical examinations and psychological tests were conducted at the local health center where medical records of the participants were available to the medical examiner as well. A physician and a psychologist performed the examinations, which took an average of three to four hours per person in total. Additional data, such as marital status and education, were gathered by a district nurse. For the participants who could not come to the local health center, house calls were offered. For details of procedures of data collection see also Svensson, et al. (1993).

Exclusion and inclusion

Sixty-three individuals were excluded from the study by different exclusion criteria. Severe cognitive impairment, e.g. lack of verbal understanding and reasoning that made them unable to fulfill the psychometrics tests, was the primary exclusion criteria. Persons who could manage participating in the tests despite suffering from mild cognitive impairment, measured by the Berger rating scale (Berger, 1980), were however included in the study. Furthermore, participants whose relatives and/or staff declined to participate in the study were also excluded. Participation varied for different variables. In the original material participants in institutions were also examined and represented, but unfortunately they were excluded in this particular study due to the lack of sufficient data regarding symptoms, diseases and/or life satisfaction that were needed to classify them and perform the statistical analyses. To conclude: Included in this study are individuals having sufficient information regarding diseases, symptoms and life satisfaction, altogether 296 persons.

Instruments

Presence and absence of 30 different symptoms. The Gothenburg Quality of Life Instrument (GQL) (Tibblin, Tibblin, Peciva, Kullman, & Svärdsudd, 1990) was originally constructed to assess the quality of life of middle-aged men. The GQL consists of two instruments: *a well-being section* – a questionnaire covering social, physical and mental well-being concepts, and *a symptom section* – a questionnaire covering the 30 most common symptoms. This last mentioned questionnaire, in the form of a checklist, was used in this study in order to visualize symptoms the person might have experienced within the last three months. The checklist contains 30 different symptom items and covers seven domains: depression (exhaustion, sleeping disturbance, general fatigue, depression, being close to tears), tension (irritability, nervousness, impaired concentration, difficulty relaxing, restlessness), gastro-intestinal-urinary tract symptoms (difficulty in passing urine, anorexia, nausea, diarrhoea, constipation, abdominal pain), musculoskeletal symptoms (pain in the joints, backache, pain in the legs), metabolic symptoms (feeling cold, sweating, loss of weight, overweight), heart-lung symptoms (coughing, chest pain, breathlessness), and symptoms related to the head (dizziness, headache, impaired hearing, eye problems). The GQL has shown acceptable reliability and validity (Sullivan, et al., 1993).

Previous and present diagnoses. Data regarding diseases and medical history were gathered under a medical examination by combining the persons' own reports and the doctors' examinations and judgments from a checklist of medical conditions consisting of diabetes, hypertension, angina pectoris, congestive heart failure (CHF), claudicatio intermittent, stroke, urinary incontinence, neurological disease, cancer/tumors, major trauma, hip fracture and non-hip fractures.

Life Satisfaction. Life Satisfaction Index A (LSIA) is an instrument that covers general feelings of psychological well-being among older persons in order to identify “successful” aging (Neugarten, et al., 1961). Life satisfaction is measured with 20 items in form of statements such as “As I look back on my life, I am fairly well satisfied” and “I expect some interesting and pleasant things to happen to me in the future”. In other words, the items extend beyond health and tap into well-being over the life course, including economic factors as well as living conditions. To each statement the person could agree or disagree. Total score was 20 points, and each positive response received one point. The instrument has been extensively used and is well validated and tested for reliability and has shown satisfying properties (McDowell, 2006; Shmotkin, 1991). In a meta analysis of 34 different studies using LSI instruments the average reliability was 0.79 with a range between 0.42-0.98 (Wallace & Wheeler, 2002).

Marital status was categorized into single, married, divorced and widowed and was based on self-report in a survey.

Education was also self-reported and categorized into 4 levels: maximum 7 years, 8-9 years, 10-12 years and more than 13 years. Higher education was regarded as more than 7 years (≥8 years). Data on both marital status and level of education were collected only in order to describe the study population.

Construction of three models visualizing health profiles

The aim of this study was to investigate how different combinations and amounts of diseases and symptoms relate to life satisfaction. In order to do this, three models, based on different combinations of the number of diseases and number of symptoms, were constructed to visualize health profiles.

First, based on "presence and absence of 30 different symptoms" and "previous and present diagnoses" two variables were constructed: "number of symptoms" and "number of diseases”. The total number of diseases and symptoms was counted for each person.

Second, the number of symptoms was then dichotomized based on the median. This was done in order to simplify the variable into “few and several”. The continuous variable of number of symptoms didn’t add any more variance in the analyses than the dichotomized variable.

Third, the number of diagnoses was divided into different levels. In order to prepare for *the first model*, the number of diagnoses was divided into "healthy" (no disease), “single disease" (one disease) and "co-/multimorbidity" (≥2 diseases). For *the second model* the number of diagnoses was divided into "not multimorbidity" (0-1 disease) and "co-/multimorbidity" (≥2 diseases) and for *the third model* the number of diagnoses was divided into "healthy" (no disease), “single disease" (one disease), "comorbidity" (2 diseases) and "multimorbidity" (≥3 diseases).

Fourth, the three final models (visualizing different health profiles) in the study were then completed by combining few/several symptoms with the different levels of number of diagnoses described above. This procedure was done in three separate analyses within the same data set.

At last, these three final models of morbidity were then separately analyzed in relation to life satisfaction.

Statistics

Descriptions of data were made using frequency tables, median and quartile. Comparisons between independent groups regarding number of diagnoses, experienced symptoms and life satisfaction were performed using Mann-Whitney U-test. P-values below 5% were considered statistically significant. Only two-sided tests were used. All statistical analyses were carried out using SPSS 12.0. The study was approved by the Ethics Committee at Lund University in 1988.

Results

Three models were created by combining few/several symptoms with the different levels of number of diseases. The models were then separately analyzed in relation to life satisfaction.

The first model distinguishes six groups of individuals who are considered to be healthy, have only a single disease or are multimorbid, with few or several symptoms. This model could significantly distinguish the degree of life satisfaction between the healthy group and the morbid groups, whether they had few or several symptoms. However, no significant differences between the multimorbid with few symptoms and the healthy with several symptoms appear in this model. The model can also significantly distinguish between those who have no morbidity with few symptoms and the co-/multimorbid with several symptoms. In addition, the first model significantly distinguishes between those who are co-/multimorbid with few or several symptoms. (Table 1)

The second model distinguishes, in four groups, those with multiple morbidity from others, with few or several symptoms. The second model can, as well as the first model, significantly distinguish the life satisfaction of the single morbid persons with few symptoms and the co-/multimorbid with several symptoms. Like the first model, the second also significantly differentiates between the co-/multimorbid with few or several symptoms. Unlike the first model, the second model can significantly distinguish between the single morbid and the co-/multimorbid with several symptoms. (Table 1)

The third model distinguishes, in eight groups, healthy individuals from those with single disease, two and three or more diseases, with few or several symptoms. The third model was created to test the definition that specifies multimorbidity as "more than two". The purpose of this nuance is to see whether the limit of multimorbidity between two and three or more diseases has an impact on life satisfaction.

This third model can, as well as the first, significantly distinguish the healthy from the sick regardless of the amount of symptoms. In addition, the construct specifically shows significant differences between the multimorbid person who exhibits few symptoms and the healthy with several symptoms. Like the other two models the third design can significantly distinguish between the healthy/single morbid and the co-/multimorbid with few or several symptoms. Finally, the third model significantly distinguishes between those with two, three or more diseases, but with few symptoms, which the other two models can not. (Table 1)

Number of diseases and symptoms in relation to life satisfaction

When investigating the number of diseases and symptoms separately in relation to life satisfaction, there were negative associations: the more diseases or symptoms, the lower the life satisfaction. Symptoms showed the strongest relation with life satisfaction: r_s (296) -.333, p = 0.000, compared to diseases and life satisfaction: r_s (296) = -.160, p = 0.006.

Life satisfaction gradually decreased as diseases increased from zero to two diseases. The group with two diseases reported the same life satisfaction as the group with three or more diseases. (Table 2)

With regards to symptoms, however, life satisfaction does not modify in a systematic way; the group with the maximum of six symptoms has the highest life satisfaction and the persons with seven or more symptoms have the lowest rate of life satisfaction. It should be noted, however, that the size of the group with the maximum of six symptoms is small and that only 11 people had no symptoms at all. (Table 3)

Symptoms in groups with different numbers of diagnoses

The type of morbidity and symptoms was not the primary focus of this study, but may still be important to describe in order to understand the results of the three models. When simply investigating which symptoms were more common in groups with different numbers of symptoms it showed that the most common symptoms, regardless of group, were visual and hearing problems and pain in the legs, back and joints. In addition to these, the most characteristic symptoms of the group with no diagnosis were sleeping disturbance and being close to tears. For the groups that had two or more diseases it was also common to experience fatigue. (Table 2)

Types of diagnoses in groups with different numbers of symptoms

Regardless of the number of symptoms, the most common diseases were fractures, circular problems and urinary incontinence. In the group with no symptoms, diabetes was also common. In the two groups with symptoms of varying numbers, cancer was also common. (Table 3)

Marital status, education and housing in the study group

As is shown in Table 4, with descriptive data for the study group as a whole, the most common marital statuses were married and widowed; among the men it was most common to be married (67%), and among the women it was most common to be widowed (54%). Half of the study group had similar schooling, but a higher proportion of the men were educated compared to the women; among the men, 29% had 13 or more years of education, whereas the corresponding figure for women was 14%.

Drop-outs

The life satisfaction of the drop-outs did not differ significantly from the study group. However, it should be noted that there were only nine individuals who had data on life satisfaction in the group of drop-outs. The drop-outs had significantly more diseases ($p = 0.002$) and more symptoms ($p = 0.000$) than the study group. The drop-outs had an average of two diseases (q1-q3 = 1-3) and nine symptoms (q1-q3 = 6-14) in comparison with the study group with an average of six symptoms (q1-q3 = 3-10).

Discussion

Three different models were tested in this study in relation to life satisfaction. The different models have advantages as well as disadvantages, and depending on the focus of the study, the choice of model might vary.

If the purpose of a study is to specifically examine the processes and mechanisms relating to the life of multimorbid people, and that this knowledge, in turn, might serve as a basis for future interventions, the first model should be useful because it can distinguish the healthy from the sick but also between those with single morbidity and those who are co-/multimorbid. The healthy group can act as a reference group in different studies and the single morbid group can be used to clarify the nuances between them and the multimorbid, in other words – what it means to have only one diagnosis compared to having several.

The first model can also distinguish between multimorbid people with few or a lot of symptoms. These two groups are important to distinguish because one group, the multimorbid persons with few symptoms, can be seen as a salutogenic group that we can learn from and this strength based knowledge could be beneficiary to the other group, the multimorbid persons with a lot of symptoms - a group that experiences great suffering. This design can, in other words, specify different levels of morbidity, "how to have it", but also "how to cope with it"; how the symptoms can have an impact on life satisfaction of multimorbid people as well as in comparison with persons who are healthy or single morbid.

For an examination of the differences in life satisfaction of individuals with a lot of symptoms regardless of them being single morbid or co-/multimorbid, the second model can be suitable. This model has been explored in relation to mortality in an earlier study (Steij Stålbrand, et al., 2007). However, this design does not distinguish between the healthy and the sick which can be a detriment to conclusions on the symptoms relevant to life satisfaction. With the exception of these observations the second model does not add more than what is presented in the first.

The third model has much in common with the first, except that it merely distinguishes the number of diagnoses that are important for the life satisfaction of persons with few symptoms. In addition, significant differences between multimorbid persons with few symptoms and healthy persons with several symptoms appear.

It is particularly important to gain more knowledge of the group with no morbidity in the form of diseases but still perceived morbidity in the form of symptoms, as this is a risk group that could benefit greatly from any knowledge that would make their life satisfaction remain unchanged, or at least not deteriorate. This group might represent persons who often seek medical attention at different care units but who are hard to treat, for various reasons not described in this article. However, since there were few people in these groups, the statistical power is too low to draw any far-reaching conclusions in this study on the importance of these links. More studies are needed to examine whether this connection is repeated.

To conclude, the use of the first model is advocated for the purposes of this study. The design is simple and easy to grasp and the model has the greatest capacity to explain variations in life satisfaction of people with different levels of morbidity in combination with few or several symptoms.

This study has its starting point in earlier studies that have shown that different definitions of multimorbidity create varying results in different studies, making comparisons difficult. Previous studies have, for example, studied quality of life, physical functioning, mortality, and public health needs in relation to their own specific definition of multimorbidity (Gijsen, et al., 2001). However, different purposes and research questions might require different definitions, considering research, treatment, care, prevention, aetiology, diagnosis or prognosis and in that aspect we need to explore, explicitly differentiate and make the most of already existing concepts, but also to form new ones that can render useful insights and clinical practice (Yancik, et al., 2007). In other words: we need both uniform definitions as well as different concepts, but they all have to be explicit to the person who uses it in e.g. research so that the most appropriate definition is chosen.

Overall, the results of this study showed how life satisfaction decreased as the number of diseases and symptoms increased, and more specifically and notably as the symptoms got more. The results also showed that a combination of the number of diseases and experienced symptoms gives a better understanding of the impact on life satisfaction compared to an analysis of number of diseases and number of symptoms separately. When studying only symptoms in this study the increasing number of symptoms didn’t exhibit a consistent change of life satisfaction, and the increasing number of diseases didn’t discriminate changes of life satisfaction.

Type of morbidity

Constructing and describing morbidity based on quantity over quality can be provocative. However, by focusing only on quantity, the complex concept of life satisfaction can be visualized in a more accessible way. Thus, in order to examine whether it is still possible to ignore the type of medical condition and the quality in it, descriptive analysis of how morbidity looked like in the data sample were made. These analyses were based on either the number of diseases or the number of symptoms, but not in combination.

It turned out that the type of disease was similar regardless of the number of symptoms. For example, impaired hearing was the most common symptom among people with one or no diseases, but falls to 5th place for persons with two diseases, and was not even in the top 5 of most common symptoms among those with the most diagnoses. Could the reason for this be that hearing becomes less important as morbidity increases?

The type of symptoms, however, varied more, as well as the life satisfaction. Experienced symptoms can be regarded as a measurement of discomfort and suffering and is in fact what the person responds to, not the actual labels of the diagnosis or the symptom, but the experience of malaise.

Symptoms can either be part of a clear nosological definition or remain subclinical. Also, many symptoms can be common and non-detectable for a number of diagnoses, e.g. pain or fatigue. Moreover, the prevalence of self-reported symptoms is dynamic and may reflect the current community approach to what is a symptom and what is not, sickness or not, ill health or not. Thus, if solely the number of diseases is estimated, it is easy to draw the wrong conclusions regarding the relationship to life satisfaction, since it is clearly the symptoms that are crucial for the life satisfaction of the person. Diseases should be supplemented with symptoms since the assessments of diseases are designed labels and does not say anything about how the individuals actually experience their health.

Differences between men and women

The study also revealed that there were differences between men and women regarding life satisfaction, with the women having significantly lower life satisfaction than the men. This suggests that sex is an important aspect that should be taken into account, possibly in the form of a sex-specific design when studying morbidity in relation to life satisfaction. The aspect is however not covered in this study, partly because there was a possible lack of statistical power, but mostly because the primary aim of this study was to explore implications of morbidity on life satisfaction, not to explore the role of sex in morbidity and life satisfaction. Even so, the study group was described on the basis of education and marital status in order to still give an idea of whether sex differences existed. These two factors could contribute to the explanation of the differences in life satisfaction. Being a widow most often affects life negatively, as well as having a lower level of education, which can both have an impact on the financial situation, which in turn may be important in order to allow for a life that promotes life satisfaction.

Strengths, weaknesses and future studies

One weakness of this analysis is that the constructs are restricted to morbidity in terms of diseases and symptoms. Further studies should take into account other factors relevant to life satisfaction, e.g. functional performance, social network, coping, health attitudes, locus of control, personality and age. Previous studies have shown that older people's life satisfaction is connected with factors such as loneliness, financial factors, anxiety, physical activity, education, housing, but also depression and health, but these factors are not within the scope of this study (Borg, Hallberg, & Blomqvist, 2006; Demura & Sato, 2003; Inal, Subasi, Ay, & Hayran, 2007; Subasi & Hayran, 2005).

Another weakness of this analysis is the low participation rate which could give bias in the results. This bias may have greater impact and importance when high age groups are being investigated. For example, a part of the sample of persons, probably with multiple health problems, had to be excluded due to poor cognition and therefore missing data needed to classify them for analyses. We can therefore assume that the remaining sample of persons represents a rather healthy selection of 80-year-olds as they have managed to go through four hours of tests.

On the other hand, the loss is assessed in this study to be of minor importance, because heterogeneity in the morbidity and experience of illness is still represented in the material as well as the variation in the outcome variable life satisfaction. In addition, we assume that the loss in a theoretical study such as this one is less important than e.g. for a study focusing on the prevalence of a specific disease.

One limitation in this analysis is that symptoms and diseases regarding cognition are missing in the material. In previous longitudinal epidemiological population studies prevalence of 3-19% of Mild Cognitive Impairment (MCI) among persons older than 65 years is reported (Gauthier, et al., 2006) and there is no reason to believe that this material would differ.

Some index data are also missing meaning that the diseases covered in this study are not comprehensive. In particular, no information on dementia, infections, immunological diseases, gastrointestinal diagnoses and lung disease were gathered. The study was originally planned on the basis of current and previous population studies, e.g. H70 (Rinder, et al., 1975), and the choice of detailed diseases reflects the studies from this point in time. As for the specific index data: Lund 80 + started in 1988 and the National Inpatient Registry began to register in 1987. The registers lacked information on past diagnoses, which limited data.

Finally, more studies that may form the basis for exploring different definitions on morbidity are needed, both empirically and theoretically based, to clarify different relationships with e.g. quality of life (Fortin, et al., 2004), but also life satisfaction as it covers the entire life span, not just current conditions. Current psychological factors and, of course, personal health influence how people respond to retrospective evaluations and this complex relation needs to be further explored.

Conclusion

In this study, 296 80-year-olds, born 1908 and 1913, were studied to investigate the relevancy of amount of diseases and symptoms for life satisfaction. It turned out that the symptoms have a stronger relation to life satisfaction than the diseases in isolation have, and a combination of these two variables is important in order to get a more nuanced picture of morbidity related to life satisfaction. This can not be achieved to the same extent by simply focusing on the number of diagnoses or symptoms separately. This knowledge is valuable because it can ultimately provide a theoretical basis, which is likely to lead to more successful interventions in order to maintain or increase the life satisfaction of the, many times multimorbid, older men and women.

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Table 1. Significant differences of life satisfaction (median and quartiles) tested separately in three different models based on varying combinations of number of diseases and number of symptoms (comparisons in pairs in respectively model).

Three separate combinations of number of diseases and number of symptoms				
Model 1: Healthy, single disease and co-/multimorbidity				
	Few symptoms	***n***	**Several symptoms**	***n***
Zero disease	15 (13-16)^{a*,b*,c***}	58	15 (9-17)	25
One disease	14 (12-15)^{a*,d**}	48	13 (11-15)^{b*,e*}	37
Two or more diseases	15 (13-17)^{e*,f***}	44	12 (10-14)^{c***,d**,f***}	84
Model 2: Co-/multimorbidity versus others				
	Few symptoms	***n***	**Several symptoms**	***n***
Zero or one disease	14,5 (13-16)^{g***}	106	13,5 (11-16)^{h*,i*}	62
Two or more diseases	15 (13-17)^{h*,j***}	44	12 (10-14)^{g***,i*,j***}	84
Model 3: Healthy, single disease, two and three or more diseases				
	Few symptoms	***n***	**Several symptoms**	***n***
Zero disease	15 (13-16)^{x*,y*,k***,l***}	58	15 (9-17)^{m*}	25
One disease	14 (12-15)^{x*,n**,o**,p*}	48	13 (11-15)^{y*,q**}	37
Two diseases	14 (13-16)^{r**,s*,t*}	26	12 (10-14)^{k***,n**,r**,u***}	40
Three or more diseases	16 (14-17)^{m*,o**,q**,s*,u***,v***}	18	12,5 (9,50-14)^{l***,p*,t*,v***}	44

Note. Identical letters denote pairwise comparisons. Lowercase letters with * denote p<.05, ** denote p<.01 and *** denote p<.001. 0-6 symptoms = Few symptoms, 7-22 symptoms = Several symptoms.

Table 2. Descriptives of common symptoms in groups with varying number of diseases.

Number of Diseases	**Five most common symptoms** (%)
Zero disease (*n* = 83)	Impaired hearing (40)
No. of symptoms: Median (q_1-q_3): 4 (2-7)	Sleeping disturbance (39)
Life satisfaction: Median (q_1-q_3): 15 (13-17)	Eye problems (38)
	Leg pain (36)
	Easy to cry (30)
	Other symptoms ≤29%
One disease (*n* = 85)	Impaired hearing (49)
No. of symptoms: Median (q_1-q_3): 6 (3-9)	Backache (46)
Life satisfaction: Median (q_1-q_3): 14 (12-15)	Leg pain (42)
	Joint pain (41)
	Eye problems (41)
	Other symptoms 4-36%
Two diseases (*n* = 66)	General fatigue (53)
No. of symptoms: Median (q_1-q_3): 8 (4-11)	Backache (50)
Life satisfaction: Median (q_1-q_3): 13 (11-15)	Leg pain (48)
	Joint pain (47)
	Impaired hearing (39)
	Other symptoms 8-36%
Two or more diseases (*n* = 128)	General fatigue (54)
No. of symptoms: Median (q_1-q_3): 8 (5-12)	Leg pain (52)
Life satisfaction: Median (q_1-q_3): 13 (11-15)	Joint pain (50)
	Backache (48)
	Eye problems (40)
	Other symptoms 9-38%
Three or more diseases (*n* = 62)	Leg pain (56)
No. of symptoms: Median (q_1-q_3): 9 (6-12)	General fatigue (55)
Life satisfaction: Median (q_1-q_3): 13 (10-16)	Joint pain (53)
	Backache (47)
	Eye problems (45)
	Other symptoms 10-44%

Table 3. Descriptives of common diseases in groups with varying number of symptoms

Number of Symptoms	**Five most common diseases** (%)
Zero symptom (*n* = 11)	Angina pectoris (18)
No. of diseases: median (q_1-q_3): 0 (0-1)	Diabetes (9)
Life satisfaction: Median (q_1-q_3): 14 (12-16)	Hypertension (9)
	Urinary incontinence (9)
	Non-hip fracture (9)
	Other diagnoses 0%
Zero to six symptoms (*n* = 150)	Hypertension (22)
No. of diseases: median (q_1-q_3): 1 (0-2)	Non-hip fracture (16)
Life satisfaction: Median (q_1-q_3): 15 (13-16)	Angina pectoris (13)
	Urinary incontinence (13)
	Cancer (9)
	Other diagnoses 2-7%
Seven to twenty-two symptoms (*n* = 146)	Non-hip fracture (29)
No. of diseases: median (q_1-q_3): 2 (1-3)	Hypertension (27)
Life satisfaction: Median (q_1-q_3): 13 (10-15)	Urinary incontinence (25)
	Angina pectoris (22)
	Cancer (19)
	Other diagnoses 4-16%

Table 4. Description of study group (born 1908 and 1913, 80 years old)

	n (%)
Sex	
Men	106 (36)
Women	190 (64)
Marital status	
Single	41 (14)
Married	106 (37)
Divorced	18 (6)
Widowed	123 (43)
Education	
≤7 years	128 (46)
8-9 years	54 (19)
10-12 years	44 (16)
≥13 years	54 (19)

	Min-Max	**Median** (quartiles)
Number of Diseases	0-7	1 (0-2)
Number of Symptoms	0-22	6 (3-10)
Life satisfaction (possible range 0-20)	3-20	14 (11-16)

Note. Eight individuals in the study group were missing information regarding marital status and 16 individuals lacked information regarding education.

Study III

The relation between personality and life satisfaction in four groups of elders

Ingela Steij Stålbrand and Sölve Elmståhl

Study III

The relation between personality and life satisfaction in four groups of elders

Abstract

The aim of this study was to explore the role of personality in relation to life satisfaction in four groups of individuals in a population 60-93 years of age. Therefore, the whole spectrum from healthy to ill is represented in this study.

In this study 2109 participants were recruited from the county Skåne: Gott Åldrande i Skåne – GÅS (Good Ageing in Skåne) which is part of the Swedish National study on Ageing and Care (SNAC) – an ongoing population based, multicentre and cohort study.

Structural equation modelling and univariate ANOVA were used to examine the relationships between personality and life satisfaction in four groups with diverse burdens of illness and health experiences.

The personality traits of neuroticism, extraversion and openness showed to have relation to life satisfaction in different ways, in different groups. Especially the personality trait of extraversion showed to be important in relation to a higher life satisfaction with standardized estimates ranging from 0.69 – 0.88 in a structural model that fitted the data fairly well: $\chi^2(392)$ was 1696.5, $p < 0.001$, RMSEA = 0.04 and CFI = 0.83.

In conclusion, personality is an important factor to consider when life satisfaction is outcome in studies including older, often multimorbid, populations. More longitudinal studies are needed to explore interactions between personality and life satisfaction in groups with different health experiences in order to identify and aid persons at risk of a lower life satisfaction.

Keywords: personality, multimorbidity, symptoms, life satisfaction, elders

Increasing age is associated with deteriorating health. Physiological changes, chronic diseases and other health problems are more common in the old age than earlier in life. Being ill also increases vulnerability to incur more morbidity, which in turn affects both mortality and quality of life (Landi, et al., 2010). Within geriatric medicine, it is apparent that the health of older people is affected by the accumulation of biological dysfunctions in multiple systems. Each one of the dysfunctions can contribute to the clinical picture, including those whose severity has not yet reached the diagnostic threshold for the standard definition of a disease.

There are a multitude of biological and psychosocial factors that are related to many different diseases, involving several different organ systems. However, the most well-known and disease-specific risk factors only explain and predict a small percentage of all the multiorgan syndromes and diseases (Friedman & Booth-Kewley, 1987). Thus, older people tend to have not only one single disease or medical condition but the predominating disease pattern is rather multimorbidity (Fratiglioni & von Strauss, 2006; Landi, et al., 2010). Multimorbidity means, in general terms, that a person has several concurrent diseases or medical conditions. Multimorbidity is already the most common pattern of disease in the elderly and is expected to increase further. This is because new and better diagnostics and therapies have developed, with the result that more and more people survive the medical conditions that previously led to death. However, the prevalence varies greatly according to existing studies depending on definitions of morbidity used, the time span used, type of data and the target group being studied which shows the complexity of the research (Crimmins, 2004). Prevalence ranges in different studies from 25% to 98% but generally at least 50% over age 60 is considered to have multiple diagnoses and the presence of multimorbidity increases sharply with age (Fratiglioni, 2010; Landi, et al., 2010; van den Akker, Buntinx, Metsemakers, Roos, & Knottnerus, 1998). Since there is, for most multimorbid individuals with chronic diseases, no hope for a medical cure, more knowledge of life satisfaction and quality of life is needed in order to make the living years as satisfying as possible (Norris, et al., 2008).

There is currently no good general explanation as to why some people seem to be more prone to be sick and others do not. Some may have illness after illness, while others are almost never sick or feel unwell (van den Akker, Vos, & Knottnerus, 2006). The concept of vulnerability is a main concept that may be operationalized and used to discriminate individuals at risk of death but also for identification of the most vulnerable elder individuals. The syndrome of frailty is a central concept of vulnerability in geriatric medicine. Overall, the syndrome includes weakness, decreased endurance and slowed performance (Borges & Menezes, 2011; Gallucci, Ongaro, Amici, & Regini, 2009). Frailty can be defined as an accumulation of health deficits, such as symptoms or diagnoses but frailty may also be assessed by different functional tests as a reflection of decreased physical reserve that precedes illness. Usually only physical markers are used to identify frailty and only occasionally other factors than just the physical have been taken into account (Borges & Menezes, 2011). Thus, the concept of frailty does not include psychological factors such as personality.

To be carrier of a disease or several does not automatically mean that the individual experiences illness. Also, even if various risk factors, biological or life style related, are found and identified, it has proven very difficult to get people to change their behaviour in order to avoid diseases or to get well (Syme, 1996). This may indicate that there are stable underlying factors, such as personality, that have an impact on the individuals' subjective well-being and behaviour. A disease-prone personality refers to a psychological concept of vulnerability that has its origin in personality instead of physical factors representing the geriatric concept of frailty. Although there are a multitude of studies regarding personality types that have relation to specific diseases, such as Type A-personality or cancer-personality (Friedman & Booth-Kewley, 1987; Smith & MacKenzie, 2006), the research of *general* disease-prone personality has been very scarce in the last decades. Personality has been shown to be associated with life satisfaction (Berg, Björk Hassing, Thorvaldsson, & Johansson, 2011). The Big Five model (FFM) – a well established model of personality – consists of five broad domains: Openness (O), Conscientiousness (C), Extraversion (E), Agreeableness (A) and Neuroticism (N) (McCrae & Costa, 1987). Both N and E have been shown to have complex relationships with mortality and morbidity (Kämpfe & Mitte, 2010), as well as a strong correlation with life satisfaction (Costa & McCrae, 1980; DeNeve & Cooper, 1998). A high degree of neuroticism has a negative relationship with life satisfaction and high levels of extraversion have shown a positive relation (Kämpfe & Mitte, 2010). The results regarding O are more complex; openness has shown to be a "double-edged sword" as it may predispose individuals to feel both the good and the bad in a more profound way (DeNeve & Cooper, 1998). However, most of the studies regarding personality and life satisfaction were performed on individuals younger than

80 years, making the results inappropriate to generalize to older people (Berg, Hoffman, Hassing, McClearn, & Johansson, 2009).

Numerous articles have been written separately about the concepts of life satisfaction, personality, vulnerability and experience of illness. However, the concepts have not been combined and investigated to any great extent in relation to the whole range of different general health experiences, nor in non clinical elder populations (Friedman & Booth-Kewley, 1987; Thomas, 1988; van den Akker, Buntinx, Metsemakers, & Knottnerus, 2000).

The aim of this study was to explore personality in relation to life satisfaction in four groups of older individuals, and the whole spectrum from healthy to ill is represented. For the same reasons the number of diagnoses would give a simplified picture of ill-health, one cannot simply use only the number of symptoms (Tooth, Hockey, Byles, & Dobson, 2008). Simply counting the number of diagnoses or symptoms in separate is insufficient for representing an individual's morbidity burden, but a combination might do. Therefore, in this study, the lifetime number of diagnoses will be combined with number of symptoms. As already concluded, it is extremely common for older people to be affected by the simultaneous biological pathological processes in several body systems (Yancik, et al., 2007). Moreover, these processes accumulate over a lifetime, and many concurrent or consecutive biological processes might have an impact on reserve capacity which suggests that it is important to take the entire life cycle into account. In this study, in order to consider the whole lifespan, a sum of the number of unique diagnoses over a lifetime was calculated for each individual. These sums were thereafter combined with the sums of reported symptoms in order to classify four groups of older individuals with varying degrees of health-experience (described in more detail in the method part, see also Figure 1). These groupings of individuals, with different health experiences, have been used and explored in two earlier studies (Steij Stålbrand, Svensson, Elmståhl, & Horstmann; Steij Stålbrand, et al., 2007). The groups are important to investigate in order to explore what characterizes them, how they differ and what they have in common so that identification of individuals at risk can be made, prognosis can be predicted and knowledge of factors of change for the positive can be expanded. The aim of this study was to investigate these four groups in order to see if the relation between life satisfaction and personality differed in the groups and if so, in what way.

Method

Design and participants

The Swedish National study on Ageing and Care (SNAC) is an ongoing population based, multicentre, cohort study, which started enrolment of participants in 2001 (Lagergren, et al., 2004). The study has four participating centres: Skåne, Blekinge, Nordanstig and the district of Kungsholmen in Stockholm. The participants in this study were recruited from the county of Skåne: Gott Åldrande i Skåne – GÅS (Good Ageing in Skåne) (Ekström & Elmståhl, 2006). The county of Skåne is one of the largest county councils in Sweden. Approximately 13% of the Swedish population lives in this region. The GÅS study includes a random sample of men and women from nine age cohorts: 60, 66, 72, 78, 81, 84, 87, 90 and 93 years from five municipalities covering both urban and rural areas using The Municipality Registry.

The participants were recruited between February 2001 and July 2004 (baseline). Originally 5370 men and women were invited by letter. Of them 2931 finally accepted the invitation and the participation rate was 60%. Lost participants were 2439, of which 1962 denied participating, 67 did not answer, 281 died during sampling period, 11 moved, and 118 reported sick or difficulties in speaking Swedish.

In this study, 2109 persons were included in the explorative analyses. Exclusion of 822 individuals was due to incomplete data concerning diagnoses, symptoms, personality and life satisfaction.

Settings and data collection procedures

The examination was mainly performed at the research outpatient clinic but for disabled participants house calls were also offered at their own homes or sheltered livings. Data collection included clinical and psychological assessments, questionnaires and physical assessments. All staff in the study had extensive training and they were monitored by the research leaders. A physician performed the medical assessment according to a predefined research protocol scheme. The standardized questions and tests regarding cognitive functioning and interviews about life events and coping were performed by psychologists or behaviourists specially trained in psychology.
A registered nurse performed functional assessments. The self-administered part comprised of questionnaires about life satisfaction, personality, health attitudes and health experience in the form of a symptoms checklist.

There were experienced medical and office staff assisting in case the participant should feel any doubt in how to answer the questionnaires. Help to complete questions was also offered to participants with writing and visual impairment. Proxy information was retrieved from relatives if the participants had cognitive decline that hindered them from answering. Before information was retrieved from medical records the participants gave informed consent. All together, the whole examination took about 4-6 hours to complete but the participants had the choice to divide the examinations over several occasions if they were unable to complete them on a single occasion.

Brief description of the four "health style" groups in the studies

In this study there is an underlying reasoning behind different combinations of "low and high" number of diagnoses and symptoms that reflect various "health styles". The four groups can be described conceptually as follows:

Group 1: The individuals in this group have few diseases and few symptoms. They are basically the healthiest; do not have diagnoses nor any symptoms to any great extent.

Group 2: They have very few or none diseases but still report several symptoms.

Group 3: They have several diagnoses but still report few symptoms.

Group 4: Individuals in this group have several diagnoses and also report much discomfort in the form of symptoms.

Healthy group: Low disease / low symptom	**Risk group:** Low disease / high symptom
Salutogenic group: High disease / low symptom	**Unhealthy group:** High disease / high symptom

Outcome measures and instruments

Life satisfaction was measured with Life Satisfaction Index A (LSIA), which is a self-rating instrument that covers general feelings of psychological well-being among older persons, originally used in order to identify "successful" ageing (Neugarten, Havighurst, & Tobin, 1961). Life satisfaction is multidimensional in character, and, according to Neugarten et al., consists of five components: *zest* (vs. apathy); *resolution and fortitude*; *congruence* between desired and achieved goals in life; *self-concept* and *mood tone*. The instrument of LSIA includes 20 items that consist of statements reflecting psychological well-being in old age, for example: "As I look back on my life, I am fairly well satisfied" and "I expect some interesting and pleasant things to happen to me in the future". To each statement the person could agree or disagree. Negative items were reversed-coded. The sum of the scores ranges from 0 to 20, with higher scores reflecting higher levels of life satisfaction. The instrument has been extensively used and is well validated and tested for reliability and has shown satisfying properties (McDowell, 2006; Shmotkin, 1991). In a meta analysis of 34 different studies using LSI instruments the average reliability was 0.79 with a range between 0.42-0.98 (Wallace & Wheeler, 2002). The alpha internal consistency in this study was 0.66.

To measure *subjective experienced health* the Gothenburg Quality of Life Instrument was used (GQL) (Tibblin, Tibblin, Peciva, Kullman, & Svärdsudd, 1990). The GQL was originally constructed to assess the quality of life of middle-aged men and it consists of two instruments: *a well-being section* – a questionnaire covering social, physical and mental well-being concepts, and *a symptom section* – a questionnaire covering the 30 most common symptoms. This last mentioned questionnaire, in the form of a checklist, was used in the GÅS study (but not the well-being section) in order to visualize symptoms the person might have experienced within the last three months. The checklist originally contains 30 items: exhaustion, sleeping disturbance, general fatigue, depression, being close to tears, irritability, nervousness, impaired concentration, difficulty relaxing, restlessness, difficulty in passing urine, anorexia, nausea, diarrhoea, constipation, abdominal pain, pain in the joints, backache, pain in the legs, feeling cold, sweating, loss of weight, overweight, coughing, chest pain, breathlessness, dizziness, headache, impaired hearing and eye problems. In the GÅS study the following symptoms were added: difficulty to speak/express myself, difficulty swallowing, impaired memory ability, urinary incontinence, fecal incontinence and slow-healing ulcers. The GQL instrument has shown acceptable reliability and validity (Sullivan, et al., 1993). Chronbachs alpha for the GQL symptoms section was 0.88 in this study.

Previous and present diagnoses. The *number of unique diagnoses under a lifetime* was counted. Diagnoses were classified according to the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10). Data was gathered trough an extensive medical assessment, including data of medical history and medical records; therefore, data from both historic and present time is represented. ICD is an international standard classification and categorization of diseases, health related conditions and external causes of disease and injury, devised and published by the World Health Organization (WHO). The Swedish version of the 10th revision of the classification (ICD-10) is published by the Swedish National Board of Health and Welfare (2002). The classification comprises 21 chapters representing different organ systems, categories of diseases, health problems, contact with the health care delivery system, and in addition, reasons for death. The total number of ICD-10 codes are about 14,500, but in this study they were summarized into 65 groups of diagnoses. The grouping has been done within the chapters that already exist in the classification, and in addition an ageing perspective and life satisfaction as outcome variable has been taken into account. For example, fractures were defined in separate groups, e.g. hip fractures were categorized separately because they are very common among the elderly but also because they can have profound consequences for the person who falls. Also, benign neoplasms were categorized separately as they are presumed to have different consequences for the individual than malignant neoplasms. Based on this classification the number of diagnoses was counted. The data was cleared of diagnoses reported twice (the same occasion), so that only the unique diagnoses were added to obtain the total number of diagnoses per person.

Personality was measured with a modified version of the NEO Five-factor Inventory (NEO-FFI) (Costa & McCrae, 1989; Costa & McCrae, 1992), a short form of the NEO-PI-R. The inventory comprises 60 self-descriptive statements in which participants rate the extent to which a statement agrees with their personality. Item scores range on a scale from strongly disagree (0) to strongly agree (4). In the present study only three of the five broad domains of the original instrument were included: Neuroticism, Extraversion and Openness, leaving out Conscientiousness and

Agreeableness. Chronbachs alpha for internal consistency was 0.82 (N), 0.78 (E) and 0.64 (O) in this study.

Activities of daily life (ADL) were measured by means of the ADL staircase (Hulter-Åsberg & Sonn, 1989) which is an extended version of the ADL index developed by Katz (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963). Functional status, in the framework of physical dependency, includes data on personal ADL (P-ADL) and instrumental ADL (I-ADL). P-ADL includes bathing, dressing, using the toilet, transferring from bed, continence and feeding oneself, and I-ADL includes cleaning, shopping, transportation and preparing meals. Performance in each activity can be graded as independent, partly dependent or dependent. In this study, the number of activities of each individual were categorized as dependent (Hulter-Åsberg & Sonn, 1989) in each section of the staircase and were calculated, resulting in a sum where zero means independent in all activities and ten means dependent in all activities. Chronbachs alpha in this study was 0.73.

Health locus of control (HLC) measures to what extent individuals attribute their health to themselves (internal), to powerful others such as doctors (external) or to chance, fate or luck (chance). In this study, it was measured by the Multidimensional Health Locus of Control (MHLC) Scales, Form A (Wallston, Wallston, & DeVellis, 1978). The concept of locus of control has its origin in Rotter's social learning theory, which proposes observation and imitation of other people's behaviour as fundamental for future behaviour and expectations (Rotter, 1954). In the MHLC the three dimensions are measured by three scales: Internal health locus of control (IHLC), Powerful others health locus of control (PHLC) and Chance health locus of control (CHLC). Every scale has six items: self-descriptive statements in which participants rate the extent to which each statement describes their view, for example worded as "When I get sick I am to blame" or "If I take care of myself, I can avoid illness". Item scores ranges on a scale from strongly agree (1) to strongly disagree (5). Low scores on a scale thus meant that the internal, external or chance control was pronounced for the person. The alpha internal consistency was in this study 0.82.

Both ADL and HLC were measured only for descriptive purposes but were not included in the structural equation modelling.

Statistical analysis

Structural equation modelling was conducted with AMOS (Byrne, 2001) to investigate the relationships between personality and life satisfaction in the different groups. To measure model fit, the following indices were used: The model fit index (CFI), which tests the proportionate improvement in fit by comparing the hypothesized model with the independent model. The value of the CFI should approximate 0.95 for a good fitting model (Hu & Bentler, 1999). The root-mean-square error of approximation (RMSEA) represents closeness of fit, and values approximating 0.06 represent close fit of the model (Hu & Bentler, 1999). For between-groups-analysis of life satisfaction, age, ADL and HLC univariate ANOVA was performed. P-values below 5% were considered statistically significant. For multiple comparisons Bonferroni post-hoc test was used. Only two-sided tests were used. The univariate analyses were carried out using PASW Statistics 18.

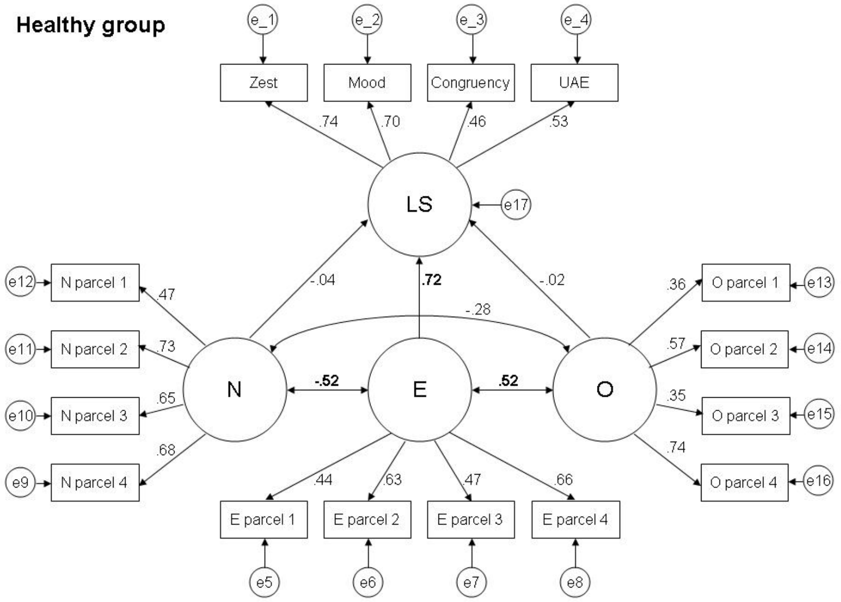
Ethical approval

The GÅS study was approved by the regional research ethics committee at Lund University 2001, Registration no. LU 744-00. The participants provided a written consent to participate in the study and to allow retrieving information from the National Patient Register medical records.

Results

The complete structural model fitted the data fairly well. The $\chi^2(392)$ was 1696.5, $p < 0.001$, RMSEA = 0.04 and CFI = 0.83. Using Bollen-Stine bootstrap, to check for non normal distributions, it was found that the model almost fitted the data ($p = 0.005$). The most important hypothesis in the present study was that the models of the four groups differed, suggesting that there were interactions between group type and personality. It was found that the measurement weights generally did not differ among the groups, delta $\chi^2(36)$ was 52.39, $p > 0.01$, the latent variables loaded about the same in all four groups. There were rather large differences in measurement intercepts, delta $\chi^2(48)$ was 637.10, $p < 0.001$, suggesting differences between the groups on the level of the observed variables. Structural weights were not different, $\chi^2(9)$ was 17.28, $p > 0.01$, in other words the coefficients from personality to life satisfaction were about the same in all groups. Also the structural covariances and the measurement residuals varied significantly between groups, suggesting firstly that the correlation between the personality factors varied among groups, and secondly that the latent variables did not explain the same amount of variance in the observed variables. The last two hypotheses were not of interest in this study.

As shown in Figures 2-5 below, in the *healthy group* it is the trait of extraversion that has the strongest relation to life satisfaction. *The risk groups'* life satisfaction has relation to all the three traits: extraversion has less influence here than in the healthy group, neuroticism and openness become more significant, but these latter two have a negative relationship with life satisfaction. Also for *the salutogenic group* all three personality traits have importance for life satisfaction. In this group, extraversion has the strongest impact on life satisfaction compared to the other three groups; neuroticism has no strong correlation with life satisfaction, and openness also has its strongest influence compared with the other groups. The relationship between openness and life satisfaction is, however, negative. For the *unhealthy group* extraversion has its weakest link with life satisfaction and neuroticism the strongest, compared with the other three groups. The internal relationship between N and O are also the weakest compared to the other three groups.


Healthy group
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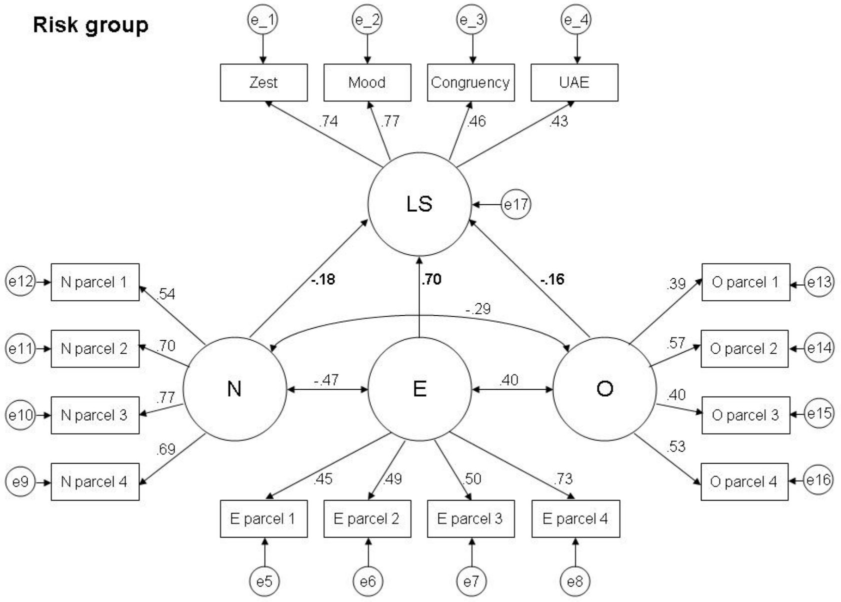
Risk group
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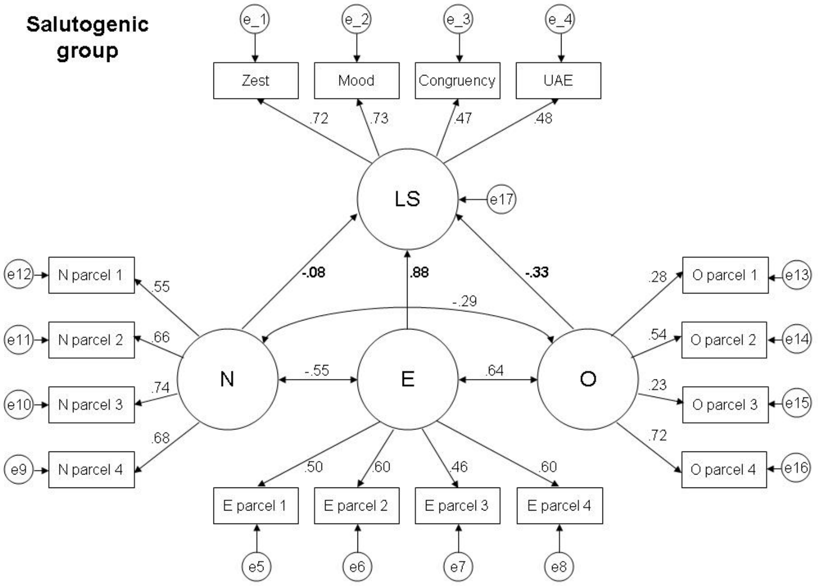
Salutogenic group
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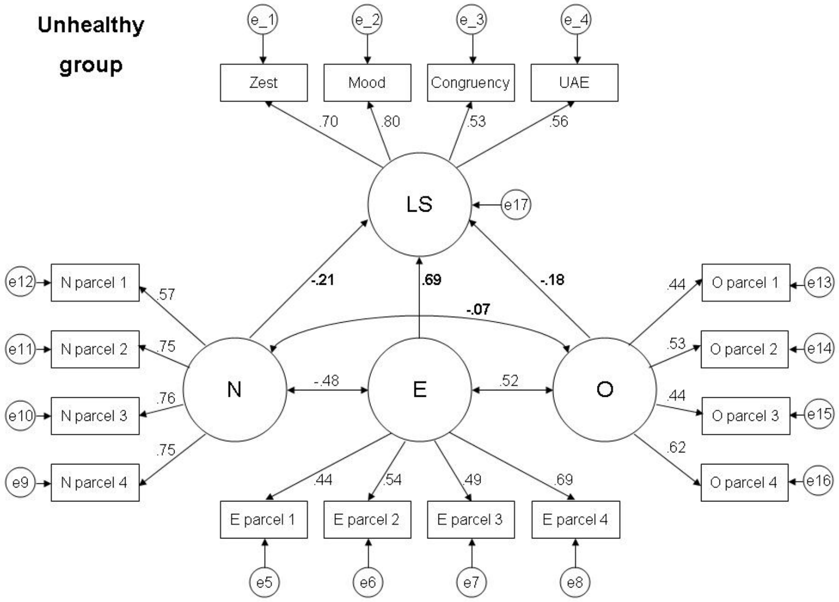
Unhealthy group
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In addition to the structural equation modelling of relations between personality domains and life satisfaction, also age, ADL and HLC were added and explored by univariate ANOVA. As shown in Table 1, there were significant differences in life satisfaction between the groups F(3, 2108) = 124.43, $p < 0.001$. The healthy and salutogenic group reported significantly higher life satisfaction than both the risk and unhealthy group. Also, there were significant differences in age between the groups F(3, 2108) = 3.47, $p = 0.015$. The largest proportion of the youngest was in the unhealthy group. The risk group had the largest share of the oldest. Regarding ADL, there were significant differences F(3, 2108) = 27.38, $p < 0.001$. Both the healthy and salutogenic group were more independent than the other two groups. The HLC differed significantly in two of three of the dimensions: internal F(3, 2104) = 8.68, $p < 0.001$ and chance F(3, 2102) = 9.57, $p < 0.001$. The healthy and salutogenic groups both had higher internal locus of control as well as less attribution to chance, fate or luck. The risk group also differed significantly by having the strongest pronunciation of chance locus of control of all the four groups.

Table 1. Descriptives of the four groups.

Groups	**Healthy**	**Risk**	**Saluto**	**Unhealthy**
n	649	353	425	682
Sex				
Men	329	145	206	257
Women	320	208	219	425
Age				
Mean age	71	72	72	70
60 *(percent)*	53.6	47.0	54.1	59.7
70	21.,7	24.6	17.2	16.9
80	20.3	22.7	25.2	19.5
90	4.3	5.7	3.5	4.0
Number of diagnoses	Max 6	Max 6	4-15	4-17
Mean	2.5	2.9	6.5	7.1
Median	2	3	6	7
SD	2.0	1.4	2.1	2.3
Number of symptoms	Max 11	9-31	Max 11	9-36
Mean	5.1	14.7	6.0	16.2
Median	5	14	6	15
SD	2.7	4.1	2.8	4.8
Life satisfaction				
Mean	13.1	9.6	12.8	9.6
Median	14	10	13	10
SD	3.7	4.1	3.6	4.4
ADL				
Mean	0.3	0.6	0.4	0.7
Median	0	0	0	0
SD	0.6	1.3	1.0	1.3
Locus of Control				
Internal				
Mean	16.0	16.2	16.0	17.0
Median	16	16	16	17
SD	4.0	3.6	3.9	4.0
Powerful others				
Mean	16.9	16.2	16.5	16.3
Median	17.0	16.0	17.0	16.0
SD	4.7	4.2	4.7	4.3
Chance				
Mean	19.4	17.8	19.5	18.6
Median	19.0	17.0	19.0	18.0
SD	5.4	4.6	5.5	5.2

Discussion

This study focused on personality in relation to life satisfaction in four groups reflecting different health experiences. The three personality traits of neuroticism (N), extraversion (E) and openness (O) showed to have different relation to life satisfaction in the four groups. First, extraversion showed to be a trait that may buffer for the experience of illness. In both the healthy and salutogenic groups E was most strongly pronounced in relation to a higher life satisfaction. In the other two groups (the risk and unhealthy groups), N had stronger relation to life satisfaction and then in a negative way. E was still the strongest trait but the relation to life satisfaction got weaker as the trait of N got stronger. O showed, in accordance with earlier studies (DeNeve & Cooper, 1998), to be the two-edged sword: To someone burdened by illness, being curious and open to new experiences then becomes a negative trait, while it is a more positive trait when healthy. This is especially pronounced in the salutogenic group suggesting that O will make the person aware of what they are no longer able to do, and that awareness will be as "banging the head against the wall". The person wants to but can't. Overall, the results is in accordance with previous studies that have shown personality to be a robust predictor of behaviour, especially when behaviour is aggregated across different situations and over time as well as quality of personal relationships, adaptations to the challenges of life such as a deterioration in health, happiness and mortality (McAdams & Olson, 2010).

An individual can be regarded as being at the positive end of the continuum of psychological wellbeing – to have high life satisfaction – to the extent that he (1) takes pleasure in activities that constitute normal life; (2) considers life meaningful and accepts how life has been; (3) feels successful in achieving major goals; (4) holds a positive image of self; and (5) maintains positive, optimistic attitudes and mood. Personality traits can be either prohibitive or promotive in order to reach these five points. It may be that being extraverted makes it easier to experience activities, hold a positive image of self as an outgoing and social being, which may also promote a positive mood. Neuroticism on the other hand may hinder the feeling of a meaningful life, a positive self-image or an optimistic attitude, as worrying and anxiety takes over the individual's mind and behaviour. Since all individuals have these personality traits, it may in the end be the balance between them that matters the most. The influence of promotive and prohibitive factors may be facilitated by, for example the experience of independence or health attitudes that are based on earlier experiences of success or defeat.

A common goal for the ageing population is to prolong active life, free from major disabilities. Loss of independence is a major cause of impaired quality of life for older people (Balducci, Colloca, Cesari, & Gambassi, 2010). The result showed that the two groups with the highest life satisfaction as well as strongest extraversion (the healthy and salutogenic groups) also were more independent than the other two groups (the risk and the unhealthy groups). One may wonder if the personality trait of extraversion helps those in the healthy and salutogenic groups to ask for help as ordinary general strategy and that they are more independent because they perceive themselves as that. Individuals in the groups with more pronounced neuroticism – the risk and unhealthy groups – might be more prone to worry by an increasingly impaired health in addition to experienced dependence. In other words: it becomes a downward spiral where the worrying reinforces the negative aspects of being dependent, which in turn increases the level of concern.

Also, there were differences between the groups regarding health locus of control, especially internal and chance. The healthy and salutogenic groups had higher internal locus of control than the other two groups. Also regarding locus of control it may be difficult to determine what is cause and what is effect. It may be easier to be outgoing, social and independent if you feel well. On the other hand, maybe just the fact that a person is outgoing and open makes it easier for that person to seek help and information in order to both promote and maintain good health as well as to receive support in different forms. However, both regarding independence and locus of control, more, especially longitudinal, studies are needed to explore their complex relation to personality in groups with different burdens of health and illness.

Strengths and weaknesses in the study

Population based studies, as well as studies on the mechanisms that explain why some people are more vulnerable and prone to illness than others, are scarce (Norris, et al., 2008; Syme, 1996; Tooth, et al., 2008). However, this study, exploring data from Good Ageing in Skåne has the advantage of being population-, non-clinical based as well as including a wide age span. Also in two earlier studies (regarding mortality and life satisfaction) the four groups, reflecting health experience, have been the basis for exploring relations between personality and life satisfaction (Steij Stålbrand, et al.;

Steij Stålbrand, et al., 2007). The results showed that the risk group and unhealthy group had a significant lower life satisfaction and a higher dependence which could be interpreted as higher vulnerability in accordance with Landi et al. (2010). However, the differences could not be shown structurally, suggesting that the way the group classification was done – dichotomizations based on simple numbers of diagnoses and symptoms – might be too indistinct to reflect health experience, which was also concluded by Tooth et al. (2008). Further investigations are needed in order to manage analyzing the complex issue of morbidity and health experience in relation to life satisfaction and personality and interactions even in a structural way.

Conclusion and implications

We have never had as much knowledge about disease-specific causes, risk factors and medical technology as we have now, at the same time as there have never been so many men and women that cannot be cured because they live with several, often chronic medical conditions. Despite this paradox, we focus almost all our attention on the incidence and prevalence of diseases and deaths related to specific diseases rather than to expand the focus to include also the concepts of quality of life and life satisfaction and how to maintain life satisfaction. Personality has shown to be an important factor to consider when life satisfaction is outcome in studies including older, often multimorbid, populations or when planning intervention in order to increase well-being in cases when there is no cure. An expansion of our healthcare treatments is also needed to take symptoms into more account than just established diagnoses as the experience of symptoms may be a source to experiencing lower life satisfaction and dependence. Finally, we need to incorporate a perspective of strengths to complement risk perspectives. In short: we need to make the healthcare more holistic as well as more individualistic.

Future studies

Personality and vulnerability in the elders with specific diseases are rather well examined. However, when facing an ageing world, with individuals' burden with concurrent health problems (either in the form of manifest ill-health or in the experience of illness), we need to explore general factors for vulnerability. For example, to compare individuals who are considered frail according to the geriatric definition with those who are defined as having a disease-prone personality would be highly intriguing. Are they the same persons?

We also need to study further those individuals who feel rather well in spite of explicitly defined diseases, as they may have some answers that can aid us when planning future interventions, health care and direction. Therefore, we need to increase the age spans and not exclusively focus on those who are already elderly, frail and critically ill (Fortin, Lapointe, Hudon, & Vanasse, 2005; Gijsen, et al., 2001).

In order to maintain and promote life satisfaction and experience of health we need not only mitigation of damage already causing discomfort, but we need also to strengthen the factors that may act as buffering factors, for example personality. However, since personality is generally regarded as rather stable , we also need to explore what may render change and how big or small that change can be to still have a significant impact on, for example, life satisfaction.

Acknowledgements

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Appendix I

Table 1

	Frequency	% of total	Top ten
Certain infections and parasitic diseases	192	6,5	
Neoplasms			
Airway	16	0,5	
Breast	79	2,7	
Urogenital	135	4,6	
Leukemia	17	0,6	
In situ neoplasms	35	1,2	
Benign neoplasms	110	3,8	
Malignant and other forms of neoplasms	267	9,1	
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	37	1,3	
Endocrine, nutritional and metabolic diseases			
Diabetes	233	7,9	
Thyroid	287	9,8	
Malnutrition	14	0,4	
Obesity	3	0,1	
Others	411	14	
Mental and behavioural disorders			
Dementia	1047	35,7	3
Schizophrenia and psychosis	19	0,6	
Depression and mania	540	18,4	10
Others	66	2,2	
Diseases of the nervous system			
Central nervous system – Episodic and migrains *(mostly sleep difficulties and migrains)*	1290	44	1
Peripheral nervous system - Polyneuropathies	72	2,5	
Others – systemic diagnoses	51	1,7	
Diseases of the eye and adnexa			
Cataracts	757	25,8	7
Glaucoma	157	5,4	
Macula degeneration	299	10,2	
Others	42	1,4	
Diseases of the ear and mastoid process			
Loss of hearing	13	0,4	
Others	50	1,7	

Diseases of the circulatory system			
Hypertension	852	29	4
Heart	1180	40,2	2
Brain	369	12,6	
Others	289	9,9	
Diseases of the respiratory system			
Infections and pneumonias	122	4,2	
Others (including chronic)	321	11	
Diseases of the digestive system			
Stomach	159	5,4	
Intestine	428	14,6	
Others	574	19,6	9
Diseases of the skin and subcutaneous tissue	96	3,3	
Diseases of the musculoskeletal system and connective tissue			
Arhtrosis	832	28,4	5
Osteoporosis	210	7,2	
Others	480	16,4	
Diseases of the genitourinary system			
Kidney	20	0,7	
Others	504	17,2	
Pregnancy, childbirth and the puerperium	21	0,7	
Certain conditions originating in the perinatal period	2	0,1	
Congenital malformations, deformations and chromosomal abnormalities	28	1,0	
Symptoms, signs and abnormal clinical and laboratory finding, not elsewhere classified			
Circulatory and respiratory symptoms	14	0,5	
Stomach symptoms	3	0,1	
Skin symptoms	1	0,0	
Symptoms from nerves and muscles	2	0,1	
Symptoms from urinary organs	4	0,1	
Emotional, behavioural and cognitive symptoms	9	0,3	
Symptoms of speech and voice			
Other symptoms	9	0,3	

Injury, poisoning and certain other consequences of external causes			
Fracture: Head, neck and thorax	106	3,6	
Fracture: Back/pelvis	50	1,7	
Fracture: Upper arm/shoulder, forearm and hand	645	22,0	8
Fracture: Hip	182	6,2	
Fracture: Lower leg, ankle, foot	278	9,5	
Other fractures	8	0,3	
Dislocations	29	1,0	
Superficial injuries and wounds	7	0,2	
Crushing injuries	2	0,1	
Others *(mostly traumas to the head when falling)*	812	27,7	6
External causes of morbidity and mortality	5	0,2	
Factors influencing health status and contact with health services	115	3,9	

Appendix II

ICD-10 in Study III

ICD 10, Division in Good Ageing in Skåne, Study III

Certain infectious and parasitic diseases

A00-B99		Infections and parasites

Neoplasms

C00-C14	Lip, oral cavity and pharynx	Airways
C30-C39	Respiratory and intrathoracic organs	
C50	Breast	Breast
C51-C68	Female genital organs, Male genital organs, Urinary tract	Urogenitala
C81-C96	Malignant neoplasms, stated or presumed to be primary, of lymphoid, haematopoietic and related tissue,	Leukaemia
D00-D09	In situ neoplasms	In situ neoplasms
D10-D36	Benign neoplasms	Benign neoplasms
C15-C26	Digestive organs	Malignant and other forms of neoplasms
C40-C49	Bone and articular cartilage, Skin, Mesothelial and soft tissue	
C69-C80	Eye, brain and other parts of central nervous system, Thyroid and other endocrine glands, Malignant neoplasms of ill-defined, secondary and unspecified sites	
C97	Malignant neoplasms of independent (primary) multiple sites	
D37-D48	Neoplasms of uncertain or unknown behaviour	

Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism

D50-D89		Blood, blood-forming organs and immune mechanism

Endocrine, nutritional and metabolic diseases

E10-E14	Diabetes mellitus	Diabetes
E00-E07	Disorders of thyroid gland	Thyroid
E40-E46	Malnutrition	Malnutrition
E50-E64	Other nutritional deficiencies	
E65-E68	Obesity and other hyperalimentation	Obesity
E15-E16	Other disorders of glucose regulation and pancreatic internal secretion	Others
E20-E35	Disorders of other endocrine glands	
E70-E90	Metabolic disorders	

Mental and behavioural disorders

F00-F03	Dementia in Alzheimer's disease, Vascular dementia, Dementia in other diseases classified elsewhere, Unspecified dementia	Dementia
F20-F29	Schizophrenia, schizotypal and delusional disorders	Schizophrenia and psychosis
F30-F39	Mood [affective] disorders	Depression and mania
F04-F19	Organic amnesic syndrome, not induced by alcohol and other psychoactive substances, Delirium, not induced by alcohol and other psychoactive substances, Other mental disorders due to brain damage and dysfunction and to physical disease, Personality and behavioural disorders due to brain disease, damage and dysfunction, Unspecified	Others

	organic or symptomatic mental disorder, Mental and behavioural disorders due to psychoactive substance use	
F40-F99	Neurotic, stress-related and somatoform disorders, Behavioural syndromes associated with physiological disturbances and physical factors, Disorders of adult personality and behaviour, Mental retardation, Disorders of psychological development, Behavioural and emotional disorders with onset usually occurring in childhood and adolescence, Unspecified mental disorder	
Diseases of the nervous system		
G40-G47	Episodic and paroxysmal disorders	Central nervous system - Episodic and migrains
G50-G99	Nerve, nerve root and plexus disorders, Polyneuropathies and other disorders of the peripheral nervous system, Diseases of myoneural junction and muscle, Cerebral palsy and other paralytic syndromes, Other disorders of the nervous system	Peripheral nervous system - Polyneuropathies
G00-G37	Inflammatory diseases of the central nervous system, Systemic atrophies primarily affecting the central nervous system, Extrapyramidal and movement disorders, Other degenerative diseases of the nervous system, Demyelinating diseases of the central nervous system	Others – Systemic diagnoses
Diseases of the eye and adnexa		
H25-H28	Disorders of lens	Cataracts
H40-H42	Glaucoma	Glaucoma
H30-H36	Disorders of choroid and retina	Maculadegeneration

H00-H22	Disorders of eyelid, lacrimal system and orbit, Disorders of conjunctiva, Disorders of sclera, cornea, iris and ciliary body	Others
H43-H59	Disorders of vitreous body and globe, Disorders of optic nerve and visual pathways, Disorders of ocular muscles, binocular movement, accommodation and refraction, Visual disturbances and blindness, Other disorders of eye and adnexa	

Diseases of the ear and mastoid process

H90-H95	Other disorders of ear	Loss of hearing
H60-H83	Diseases of external ear, Diseases of middle ear and mastoid, Diseases of inner ear	Others

Diseases of the circulatory system

I10-I15	Hypertensive diseases	Hypertension
I00-I09	Acute rheumatic fever, Chronic rheumatic heart diseases	Heart
I20-I25	Ischaemic heart diseases	
I30-I52	Other forms of heart disease	
I60-I69	Cerebrovascular diseases	Brain
I26-I28	Pulmonary heart disease and diseases of pulmonary circulation	Others
I70-I99	Diseases of arteries, arterioles and capillaries, Diseases of veins, lymphatic vessels and lymph nodes, not elsewhere classified, Other and unspecified disorders of the circulatory system	

Diseases of the respiratory system

J00-J39	Acute upper respiratory infections, Influenza and pneumonia, Other acute lower respiratory infections, Other diseases of upper respiratory tract	Infections and pneumonias
J40-J99	Chronic lower respiratory diseases, Lung diseases due to external agents, Other respiratory diseases principally affecting the interstitium, Suppurative and necrotic conditions of lower respiratory tract, Other diseases of pleura, Other diseases of the respiratory system	Others (including chronic)

Diseases of the digestive system

K20-K31	Diseases of oesophagus, stomach and duodenum	Stomach
K35-K38	Diseases of appendix	Intestine
K50-K63	Noninfective enteritis and colitis, Other diseases of intestines	
K00-K14	Diseases of oral cavity, salivary glands and jaws	Others
K40-K46	Hernia	
K65-K93	Diseases of peritoneum, Diseases of liver, Disorders of gallbladder, biliary tract and pancreas, Other diseases of the digestive system	

Diseases of the skin and subcutaneous tissue

L00-L99		Skin

Diseases of the musculoskeletal system and connective tissue

M15-M19	Arthrosis	Arthrosis
M80-M82	Osteoporosis with pathological fracture, Osteoporosis without pathological fracture, Osteoporosis in diseases classified elsewhere	Osteoporosis

M00-M14	Infectious arthropathies, Inflammatory polyarthropathies	Others
M20-M79	Other joint disorders, Systemic connective tissue disorders, Dorsopathies, Soft tissue disorders	
M83-M99	Adult osteomalacia, Disorders of continuity of bone, Other disorders of bone density and structure, Other osteopathies, Chondropathies, Other disorders of the musculoskeletal system and connective tissue	

Diseases of the genitourinary system

N00-N19	Glomerular diseases, Renal tubulo-interstitial diseases, Renal failure	Kidney
N20-N99	Urolithiasis, Other disorders of kidney and ureter, Other diseases of urinary system, Diseases of male genital organs, Disorders of breast, Inflammatory diseases of female pelvic organs, Noninflammatory disorders of female genital tract, Other disorders of genitourinary tract	Others

Pregnancy, childbirth and the puerperium

O00-O99		Pregnancy

Certain conditions originating in the perinatal period

P00-P96		Perinatal

Congenital malformations, deformations and chromosomal abnormalities

Q00-Q99		Mal- and deformations and abnormalities

Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified

R00-R09	Symptoms and signs involving the circulatory and respiratory systems	Circulatory and respiratory symptoms
R10-R19	Symptoms and signs involving the digestive system and abdomen	Stomach symptoms
R20-R23	Symptoms and signs involving the skin and subcutaneous tissue	Skin symptoms
R25-R29	Symptoms and signs involving the nervous and musculoskeletal systems	Symptoms from nerves and muscles
R30-R39	Symptoms and signs involving the urinary system	Symptoms from nerves and muscles
R40-R46	Symptoms and signs involving cognition, perception, emotional state and behaviour	Emotional, behavioural and cognitive symptoms
R47-R49	Symptoms and signs involving speech and voice	Symptoms of speech and voice
R50-R99	General symptoms and signs, Abnormal findings on examination of blood, without diagnosis, Abnormal findings on examination of urine, without diagnosis, Abnormal findings on examination of other body fluids, substances and tissues, without diagnosis, Abnormal findings on diagnostic imaging and in function studies, without diagnosis, Ill-defined and unknown causes of mortality	Other symptoms

Injury, poisoning and certain other consequences of external causes

S02 S12 S22	Fracture of skull and facial bones Fracture of neck Fracture of rib(s), sternum and thoracic spine	Fracture: Head, neck and thorax
S32	Fracture of lumbar spine and pelvis	Fracture: Back and pelvis

S42	Fracture of shoulder and upper arm	Fracture: Upper arm/shoulder, forearm and hand
S52	Fracture of forearm	
S62	Fracture at wrist and hand level	
S72	Fracture of femur	Fracture: Hip
S82	Fracture of lower leg, including ankle	Fracture: Lower leg, ankle and foot
S92	Fracture of foot, except ankle	
T02	Fractures involving multiple body regions	Other fractures
T08	Fracture of spine, level unspecified	
T10	Fracture of upper limb, level unspecified	
T12	Fracture of lower limb, level unspecified	
T14.2	Fracture of unspecified body region	
S03	Dislocation, sprain and strain of joints and ligaments of head	Dislocations
S13	Dislocation, sprain and strain of joints and ligaments at neck level	
S23	Dislocation, sprain and strain of joints and ligaments of thorax	
S33	Dislocation, sprain and strain of joints and ligaments of lumbar spine and pelvis	
S43	Dislocation, sprain and strain of joints and ligaments of shoulder girdle	
S53	Dislocation, sprain and strain of joints and ligaments of elbow	
S63	Dislocation, sprain and strain of joints and ligaments at wrist and hand level	
S73	Dislocation, sprain and strain of joint and ligaments of hip	
S83	Dislocation, sprain and strain of joints and ligaments of knee	
S93	Dislocation, sprain and strain of joints and ligaments at ankle and foot level	
T03	Dislocations, sprains and strains involving multiple body regions	
T09.2	Dislocation, sprain and strain of unspecified joint and ligament of trunk	
T11.2	Dislocation, sprain and strain of unspecified joint and ligament of upper limb, level unspecified	
T13.2	Dislocation, sprain and strain of unspecified joint and ligament of lower limb, level unspecified	
T14.3	Dislocation, sprain and strain of unspecified body region	

S00-S01	Superficial injury of head, Open wound of head	Superficial injuries and wounds
S10-S11	Superficial injury of neck, Open wound of neck	
S20-S21	Superficial injury of thorax, Open wound of thorax	
S30-S31	Superficial injury of abdomen, lower back and pelvis, Open wound of abdomen, lower back and pelvis	
S40-S41	Superficial injury of shoulder and upper arm, Open wound of shoulder and upper arm	
S50-S51	Superficial injury of forearm, Open wound of forearm	
S60-S61	Superficial injury of wrist and hand, Open wound of wrist and hand	
S70-S71	Superficial injury of hip and thigh, Open wound of hip and thigh	
S80-S81	Superficial injury of lower leg, Open wound of lower leg	
S90-S91	Superficial injury of ankle and foot, Open wound of ankle and foot	
T00-T01	Superficial injuries involving multiple body regions, Open wounds involving multiple body regions	
T09.0-T09.1	Superficial injury of trunk, level unspecified, Open wound of trunk, level unspecified	
T11.0-T11.1	Superficial injury of upper limb, level unspecified, Open wound of upper limb, level unspecified	
T13.0-T13.1	Superficial injury of lower limb, level unspecified, Open wound of lower limb, level unspecified	
T14.0-T14.1	Superficial injury of unspecified body region, Open wound of unspecified body region	
S07	Crushing injury of head	Crushing injuries
S17	Crushing injury of neck	
S28	Crushing injury of thorax and traumatic amputation of part of thorax	
S38	Crushing injury and traumatic amputation of part of abdomen, lower back and pelvis	
S47	Crushing injury of shoulder and upper arm	
S57	Crushing injury of forearm	
S67	Crushing injury of wrist and hand	

S77	Crushing injury of hip and thigh	
S87	Crushing injury of lower leg	
S97	Crushing injury of ankle and foot	
T04	Crushing injuries involving multiple body regions	
S04-S06	Injury of cranial nerves, Injury of eye and orbit, Intracranial injury	Others
S08-S09	Traumatic amputation of part of head, Other and unspecified injuries of head	
S14-S16	Injury of nerves and spinal cord at neck level, Injury of blood vessels at neck level, Injury of muscle and tendon at neck level	
S18-S19	Traumatic amputation at neck level, Other and unspecified injuries of neck	
S24-S27	Injury of nerves and spinal cord at thorax level, Injury of blood vessels of thorax, Injury of heart, Injury of other and unspecified intrathoracic organs	
S29	Other and unspecified injuries of thorax	
S34-S37	Injury of nerves and lumbar spinal cord at abdomen, lower back and pelvis level, Injury of blood vessels at abdomen, lower back and pelvis level, Injury of intra-abdominal organs, Injury of urinary and pelvic organs	
S39	Other and unspecified injuries of abdomen, lower back and pelvis	
S44-S46	Injury of nerves at shoulder and upper arm level, Injury of blood vessels at shoulder and upper arm level, Injury of muscle and tendon at shoulder and upper arm level	
S48-S49	Traumatic amputation of shoulder and upper arm, Other and unspecified injuries of shoulder and upper arm	
S54-S56	Injury of nerves at forearm level, Injury of blood vessels at forearm level, Injury of muscle and tendon at forearm level	
S58-S59	Traumatic amputation of forearm, Other and unspecified injuries of forearm	
S64-S66	Injury of nerves at wrist and hand level, Injury of blood vessels at wrist and hand level, Injury of muscle and tendon at wrist and hand level	
S68-S69	Traumatic amputation of wrist and hand, Other and unspecified injuries of wrist and hand	
S74-S76	Injury of nerves at hip and thigh level, Injury of blood vessels at hip and thigh level, Injury of muscle and tendon at hip and thigh level	
S78-S79	Traumatic amputation of hip and thigh, Other and specified injuries of hip	

	and thigh
S84-S86	Injury of nerves at lower leg level, Injury of blood vessels at lower leg level, Injury of muscle and tendon at lower leg level
S88-S89	Traumatic amputation of lower leg, Other and unspecified injuries of lower leg
S94-S96	Injury of nerves at ankle and foot level, Injury of blood vessels at ankle and foot level, Injury of muscle and tendon at ankle and foot level
S98-S99	Traumatic amputation of ankle and foot, Other and unspecified injuries of ankle and foot
T05-T07	Traumatic amputations involving multiple body regions, Other injuries involving multiple body regions, not elsewhere classified, Unspecified multiple injuries
T09.3-T09.9	Injury of spinal cord, level unspecified, Injury of unspecified nerve, spinal nerve root and plexus of trunk, Injury of unspecified muscle and tendon of trunk, Traumatic amputation of trunk, level unspecified, Other specified injuries of trunk, level unspecified, Unspecified injury of trunk, level unspecified
T11.3-T11.9	Injury of unspecified nerve of upper limb, level unspecified, Injury of unspecified blood vessel of upper limb, level unspecified, Injury of unspecified muscle and tendon of upper limb, level unspecified, Traumatic amputation of upper limb, level unspecified, Other specified injuries of upper limb, level unspecified, Unspecified injury of upper limb, level unspecified
T13.3-T13.9	Injury of unspecified nerve of lower limb, level unspecified, Injury of unspecified blood vessel of lower limb, level unspecified, Injury of unspecified muscle and tendon of lower limb, level unspecified, Traumatic amputation of lower limb, level unspecified, Other specified injuries of lower limb, level unspecified, Unspecified injury of lower limb, level unspecified
T14.4-T14.9	Injury of nerve(s) of unspecified body region, Injury of blood vessel(s) of unspecified body region, Injury of muscles and tendons of unspecified body region, Crushing injury and traumatic amputation of unspecified body region,

	Other injuries of unspecified body region, Injury, unspecified
T15-T19	Effects of foreign body entering through natural orifice
T20-T32	Burns and corrosions
T33-T35	Frostbite
T36-T50	Poisoning by drugs, medicaments and biological substances
T51-T65	Toxic effects of substances chiefly nonmedicinal as to source
T66-T78	Other and unspecified effects of external causes
T79	Certain early complications of trauma
T80-T88	Complications of surgical and medical care, not elsewhere classified
T90-T98	Sequelae of injuries, of poisoning and of other consequences of external causes

External causes of morbidity and mortality

V01-Y98		External causes

Factors influencing health status and contact with health services

Z00-Z99		Other diagnoses