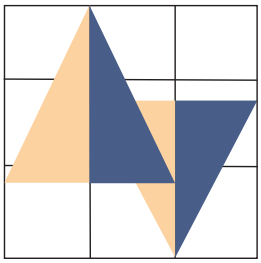

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No. 21

Gender Differences in Physiological, Psychological, and Mental Health

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Accepted by the 'editorial board'*

Gender Differences in Physiological, Psychological, and Mental Health

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April 2007

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Contents

1 Introduction

Health is the most important resource of human life. The fact of being healthy or not has an important impact on the whole life situation of an individual. Better: it influences the quality of life.

It is especially interesting for demographers to know how long the share of healthy time in life is and when and with which diseases or impairments the limited life time starts. Commonly we refer to old age when diseases, disabilities, and impairments of health appear. This is about the retirement age of people.

Health is not only important for each individual it is also very important for societies. The health status of societies is a main factor of their productivity and their ability to compete with other societies.

Therefore, it is especially important to know exactly the factors that affect health. Risk factors can be of sociodemographic, socioeconomic and behavioral nature. According to this, there is a vast amount of studies examining the influences of different risk factors on different health levels. Among other levels physiological, psychological and mental health are important.

Within decades of research the general direction of influence of known risk factors on health has been well documented. The aim of this article is to report about the different impacts of risk factors on health for men and women. This is important for understanding why women in developed countries have higher life expectancies than men and why women in general are more likely to be ill than men.

The following report concentrates on sociodemographic and socioeconomic risk factors of physiological, psychological and mental health. The first part is dedicated to physiological health. Physiological health is very important to be able to execute the tasks and activities of daily life. Results of a systematic literature review and of the applied meta-analysis of the examined risk factors are presented. This includes the description of concepts of measuring physiological health and of risk factors. Concepts of disability are activities of daily living (ADL), instrumental activities of daily living (IADL), physical performance, and mobility. Interesting factors of disability are age, marital status, education, body mass index, and smoking. Further the results are displayed and explained.

The second part is conducted to give an overview on the gender differences in psychological health. Here, the work is focused on depression. Depression is a psychological disease which can appear in episodes or chronically. Independent risk factors of depression presented in this report are age, biological factors, marital status, education, social support, and employment status.

Thereafter, the differences in risk factors causing gender differences in mental health are introduced. In this part the focus of the report is set on dementia. Gender, age, genetic factors, and other risk factors are to be presented.

2 Physiological health

Good health is an important factor of quality of life. Especially, being physically healthy is a very important point. As long as persons are physically healthy they are able to manage their course of the day independently. From the onset of disability persons are mostly dependent on the help of other people. However, the level of dependence is related to the severity of disability. The severity of disability can be determined with the help of different concepts of disability measures and different definitions. These define how many limitations must be reported to be mildly, moderately or severely disabled (Doblhammer et al. 2007).

A systematic literature review on the impact of risk factors on disability and existing gender differences has been performed. Considered resources for literature have been recommendations of experts, electronic databases, and references in existing articles. The used databases for searching for literature are: Medline, PsycINFO and SOCA (Sociological Abstracts). The search is confined to the years 1985-2005. Our systematic search logic contains the following terms: disability, impairments, limitation, decline, function, activities of daily living and/or mobility. The search was restricted to cohort and longitudinal studies. For "study" we also used the term trial, for longitudinal study also the term follow-up. To further restrict the search to our risk factors, we were looking for the terms life-style, socio-economic status, education, marital status, obesity, overweight and body mass index, and smoking (including cigarettes and tobacco). We also included the term transition, as well as demographic characteristics (age, sex or gender).

A vast number of studies have been reviewed under certain criteria. Included were studies with community-dwelling and/or institutionalized people older than 25 years. We concentrated on studies with white populations from industrialized countries. An important criteria for including articles into our review was that studies clearly distinguished the disability status at baseline and explore at least one of the following four health transitions: (1) from healthy to disabled, (2) from healthy to death, (3) from disabled to healthy, and (4) from disabled to death. Studies that look at mixed populations at baseline, i.e. healthy and disabled people together are excluded from our analysis. Further, studies that focus on disability caused by injuries, chronic conditions or surgeries have not been considered for further analysis.

We only incorporated studies that contained at least one of our risk factors age, education, marital status, smoking, and obesity. We only considered longitudinal studies with at least a one year follow-up wave. All studies that did not contain odds ratios (OR), rate ratios, relative risks (RR) or incidences as statistical measures were excluded as well.

2.1 Health indicators

> *'Disablement' refers to impacts that chronic and acute conditions have on the functioning of specific body systems and on people's abilities to act in necessary, usual, expected and personally desired ways in their society (Verbrugge and Jette 1994).*

Disability is an often used concept that can be defined and measured in many different ways. Our analysis is based on four different basic concepts of measuring disability: ADL, IADL, mobility function and physical performance. These concepts are to be described in the following:

ADL (Katz)

The concept of ADL – activities of daily living –incorporates a number of items characterizing human functions. This concept was worked out by Katz (Katz et al. 1963; Katz et al. 1970; Katz and Akpom 1976). It reflects activities which people perform habitually and universally. The index of ADL measures the functions bathing, dressing, toileting, transferring, continence, and feeding. The performance of these functions is divided into a scale ranging from A to G, where A marks the most independent grade (independent in all functions), and G the most dependent grade (dependent in all six functions).

IADL (Lawton & Brody)

IADL – instrumental activities of daily living – assess, according to Lawton and Brody (1969), everyday functional competence. The scale includes the items using the telephone, shopping, food preparation, housekeeping, doing the laundry, mode of transportation, responsibility for own medication and ability to handle finances.

Physical Performance (Nagi)

Physical Performance refers, according to Nagi (1976), to sensory-motor functioning of the organism as indicated by limitations in such activities as walking, climbing, bending, reaching, hearing, etc.

Mobility (Rosow & Breslau)

Mobility is a concept that was worked by Rosow and Breslau (1966). It measures health scale items of self-reported functional health. These items include the ability to go out to movie, church, meeting or visit, walk up and down to second floor, walk half a mile or do heavy work around the house.

Some disability measures of current studies are based on the basic concepts of disability as they are described above. Whether persons are disabled or not is either measured through self-reported limitations or through objective measurements. But often measures and definitions are modified, combined and/or further developed. As a result, a multitude of disability measures can be found in recent studies. According to this it is hard to relate these measures to a single basic disability definition. Therefore, we analyzed the obtained results by four categories of disability measures that represent the most frequently used concepts in research.

The first category is based on Katz` concept of Activities of Daily Living (ADL). This concept measures the ability to perform the six basic activities of daily living as mentioned above. In contemporary studies, an individual is already considered as disabled if a limitation in one of these items is present. In our analysis the concept of activities of daily living is used most frequently. It needs to be mentioned that being disabled in activities of daily living reflects a high level of disability.

As a second category we adapted the concept of Instrumental Activities of Daily Living (IADL) according to Lawton and Brody. This concept also measures everyday functional competence, including the eight items using the telephone, shopping, food preparation, housekeeping, doing laundry, mode of transportation, responsibility for own medication and ability to handle finances. Also here, being unable to perform one or more of these activities counts as disability. However, being disabled in IADLs is relatively rarely occurring in our analysis. It appears that IADL is a concept of measuring disability which is not as heavy as ADL disability.

Looking at the operationalization in the selected studies it turned out that in some cases Nagi's concept of physical performance and Rosow and Breslau's concept of mobility cannot be clearly distinguished. Several studies include items that are taken from the physical performance concept as well as from the mobility concept. Often the concepts of lower and upper body function are also included. For that reason, for our analysis, we created the category Mobility/Physical Performance (M/PP) which combines both concepts as a third category. This category includes items like walking several blocks or walking half a mile, climbing one flight of stairs (approximately ten) without resting or walk up and down stairs to the second floor. Items included are also lifting or carrying 10 or 25 pounds, stooping, crouching, kneeling, prolonged sitting/ standing, moving large objects or standing or being on the feet for about two ours. It is to mention, that not all studies measuring physical function/ mobility consider all of the above mentioned disability items. Rather they combine some of the items or focus more on one or another aspect of mobility or physical function. Because the concept of mobility/ physical function is used relatively flexible, it is one of the most frequent used in our analysis.

In some reviewed studies obtained from the systematic review, the underlying disability category is not clearly distinguishable. Often these studies employ a mixture of elements of the basic disability concepts. Some studies combine elements of IADL and ADL, some combine ADL, IADL and mobility, and some studies use elements of all four disability concepts. Thus, the fourth disability category we created is called Combined Disability Measure (CDM), which includes all three or four of our basic disability concepts. This measure does not indicate on which kind of disability or on which element of a certain disability the focus is more on. But since it was not practicable to create more reasonable categories that combine all the different aspects of the disability measures applied in the studies analyzed, we decided to create one category that integrates all mixed measurements.

2.2 Description of risk factors and measurement

Confounding factors of health and mortality are risk factors that have an influence on the health state. They can be classified as proximate and distal determinants. Proximate factors are risk factors that lead to a disease, whereas distal factors are causing exposures (Doblhammer et al. 2007).

Age

Age is not directly a risk factor. Moreover, it is a permanent basic and biological factor influencing health, disability and mortality. Usually it is used as control factor.

The direction of the influence of increasing age is well-known. Young persons, in general, experience better health and have lower mortality risks than older persons. With increasing age, the risk of poor health or disability increases for both sexes (House et al. 1994; Grundy and Sloggett 2003; Kaplan and Kronick 2006). Yet, increasing age has a higher effect on worsening health and functional limitation for women than for men (Sternfeld et al. 2002; Grundy and Sloggett 2003). Women have a higher life expectancy than men, but very often they spend their last years of life in poor health or with disability (Seeman et al. 1996). Males, in contrast, have a lower life expectancy (Nathanson 1977) and possibly die before they reach the state of disability. Their expected years of life in disability are lower than for women (Doblhammer and Kytir 1998; Doblhammer and Kytir 2001).

Age as a confounding factor of health and mortality can be measured as a discrete or as a continuous variable. Most studies included in our analyses measure age as continuous variable. In this case, the value gives the influence of age on health for every further year.

Education

Education is an important distal risk factor of health and mortality. Next to occupation and income it is one of the mostly used factors to depict socioeconomic status. Apart from that, education has an effect on occupation, income and ownership which further have an effect on health and health related behavior. Usually education is finished before an occupation is entered and income is earned.

Since education is often completed by the age of 35, it is assumed to be a reliable factor for which general information about the educational level of a person is derived.

Education provides individuals with knowledge. This can be used to optimize income and profession with a certain prestige. Furthermore, the attained knowledge enables people to use health relevant information and apply it on it own behavior. This influences health positively (Minicuci and Noale 2005). In the literature it is well-known that high education has a positive effect on health and mortality while

low education has a negative effect (Krokstad et al. 2002; Zimmer and House 2003; Minicuci and Noale 2005).

For Austria and Finland examinations show that low educated men compared to low educated women have a higher health and disability disadvantage (Doblhammer and Kytir 1998; Joutsenniemi et al. 2006). In contrast, there are different studies that found a higher disadvantage of low education for women than for men (Grundy and Sloggett 2003; Honjo et al. 2006)

Education is used as discrete or continuous variable. In most cases, education is used as a discrete variable and is defined by the number of years of attained education. This is possible by asking directly the number of years or by asking the highest level of education. In general low education and high education with a cut point of 8, 10 or 12 years is compared. But there are also studies distinguishing between low, medium and high education. As continuous variable the value gives the information on the influence of education if it is one year higher.

The results of our analysis are given for low versus high and medium versus high education.

Marital status

Marital status is a distal factor. For some decades it has been well-known that marriage has a protective effect on health and mortality. Married persons experience better health and lower mortality compared to non married persons (Verbrugge 1979; Helmert and Shea 1998). This applies to all ages.

It is also known that there are considerable health differences between the non married groups: single, cohabiting, divorced and widowed (Verbrugge 1979). Furthermore, there are health and mortality differentials by marital status between males and females. At middle age especially single and divorced men suffer poor health. At older age widowed and divorced men have a health disadvantage compared to the married. For women at young age, the widows suffer most poor health, whereas, at older age divorced and widowed women share the same health disadvantages (Goldman et al.; Grundy and Sloggett 2003; Joutsenniemi et al. 2006). However, opposite findings exist for Finland and the USA: it was found that the advantage of marriage is higher for males than for females. Especially never married and widowed elderly women have a significant health disadvantage (Joutsenniemi et al. 2006; Kaplan and Kronick 2006).

The better health state of married persons is often explained by two factors. The first one is that marriage has a protective effect. It offers social, economic and mental support and control of health endangering behavior. The second factor is selection. According to this, physically and psychologically healthy persons have a higher chance to enter marriage than less healthy persons (Goldman et al. 1995; Joutsenniemi et al. 2006).

Marital status can be measured in terms of being either married and unmarried or in the categories single, married, widowed and divorced. More recent studies distinguish also between cohabiting and separated persons. However, most studies included in our analysis only distinguish between being married or not. Therefore, we analyze the health of married compared to unmarried persons.

Body mass index

The body mass index is a prominent concept of measuring the relation of body height (in m²) and body weight (in kg). This measure is to determine whether a person has too much (overweight–obese) or not enough weight (underweight). Both states differ from the status normal weight and have a negative influence on health. In the further analysis the impact of overweight and obesity on health, disability and mortality is examined. Excess body fat causes health problems or worsens health independently or in association with other diseases. Frequent conditions in relation with high BMI are type 2 diabetes, hypertension, and coronary heart disease. Obesity is caused by genetic and environmental factors which for example include physical activity and behavior (Kopelman 2000).

It was found that there are differences for males and females in the level of BMI. Women are more often obese than men. In contrast, men are more often overweight (Flegal et al. 1998; Himes 2000; Kopelman 2000). There is no evidence that obesity itself has a different impact on health or disability for men and women. Jensen and Friedmann (2002) have reported that for every level of BMI women have higher rates of reported limitations than men. However, their examination did not prove that there are significant differences in the risk of disability for obese men and women. Nevertheless, it is proved that being obese endangers health (Boult et al. 1994; Mendes de Leon et al. 1997; McCurry et al. 2002; Penninx et al. 2003).

Body mass index is distinguished in the following way: persons with a BMI below 18 are considered to be underweight. A value between 18 and 24.9 reflects normal

weight. A BMI of 25-27 and 27-30 reflects light and strong overweight, respectively. People with a BMI of more than 30 are considered to be obese. In the analysis the results are given for overweight and obesity in one group versus normal weight.

Smoking

Smoking is a health factor that is based on health related behavior. It is well known that smoking has a negative influence on the health status. Besides higher mortality and ill health it causes cancer, stroke, cardiovascular, respiratory and heart disease (Ostbye et al. 2002).

Several studies found for the US population that male current smokers have a higher risk of functional limitation than female current smokers (LaCroix et al. 1993; Sternfeld et al. 2002). However, for former smokers there were no consistent findings. LaCroix found that male former smokers experienced a lower risk of mobility limitation than females. In contrast, Sternfeld et al. (2002) found that the risk was higher for males. In terms of life expectancy there is a different picture. It was found that women who smoke have a higher disabled life expectancy than men who ever smoked. Apart from that, women who ever smoked also have a higher active life expectancy than men who ever smoked (Ferrucci et al. 1999). In the USA it was found that smoking has a stronger negative effect on the health status and severe disability status for women than for men. Female smokers have a higher probability to become severely disabled and to die (Ferrucci et al. 1999).

For the Netherlands similar facts were found. Smoking increases the time of life spent with disability. This applies for both sexes, however, smoking increases the share of life with disability stronger for women than for men (Nusselder et al. 2000). Men do smoke more than women. Therefore, smoking-attributed mortality is higher for males than for females. However, smoking patterns for women have changed over time. In nations with high cigarette diffusion women do smoke more than some decades before. In those countries mortality differences between men and women have declined and are expected to decline further (Pampel 2005).

In general, nonsmokers have a better health status, are less likely to be disabled and have higher life expectancy than smokers (LaCroix et al. 1993). Differences exist between former or light smokers compared to current or heavy smokers. Cessation of smoking lowers the risk of disability and ill health especially for men (LaCroix et al. 1993). This is explained by higher smoking prevalences for men than for women. It is

supposed that the negative effects of smoking will be outbalanced after 15 years of cessation (Ostbye et al. 2002).

In the analysis of the impact of smoking on physiological health smokers are distinguished as current, former and never smokers.

2.3 Statistical meta-analysis

In the following we present the results of a meta-analysis we performed in the context of the literature review. Presented are results on two levels of the analysis: the single effect size of each study and the average effect size.

In the meta-analysis fixed and random effect models are estimated using weighted least squares. The weights are defined as the inverse of the variance of the effect sizes of the individual studies. The Cochrane Statistic Q (Cochran 1954) was used to assess heterogeneity. If a variance between the studies could be identified, the random effect model yields more reliable results which is depicted in the next section. If there is no variance between the studies both models give the same results.

From the number of studies selected for the systematic literature review only those including standard errors of the effect sizes or providing information to permit their calculation (confidence intervals, p-values) were included in the meta-analysis.

2.4 Results

Sex

The meta-analysis has been performed for the risk factor sex. The results confirm the fact that women are more likely to be disabled and are less likely to die than men. In Figure 1 the results are displayed: women have a significantly higher risk of becoming disabled than men, they have a significantly lower risk of dying healthy than men. Further, their chance of recovering from disability is significantly lower compared to men and their risk of dying disabled is lower than for men.

Age

For age as continuous variable information was available for all four health transitions. The effect sizes included in the analysis stem from studies which used the concept of ADL or CDM for measuring disability. In the case of the first health transition from healthy to disabled both concepts are included. For the second to

fourth transition effect sizes from the study conducted by Mendes de Leon et al. (1997) are included. There the activities of daily living were used as disability measure. This means that the results of all four transitions reflect severe disability.

The obtained results are clearly and statistically significant: with increasing age the risk of becoming disabled, of dying healthy, and of dying disabled increases by about 5-11% for men and women equally. The risk of recovering from disability decreases significantly between 2% and 4% for both sexes. Differences between the sexes do not appear. The results are displayed in Figure 2 and Figure 3.

Marital status

In a next step the influence of marital status on physiological health was examined. The risk of married persons in comparison to unmarried persons was estimated. Results have been obtained for the transitions from healthy to disabled and from healthy to dead (see Figure 4 and Figure 5). The meta-analysis revealed that married women have a higher risk of becoming disabled and of dying compared to non married women. However, these results are not significant. Further the estimation is based on too few effect sizes as to be sensefully interpreted. Also based on this fact no significant differences between men and women were found. Therefore, the interpretation of no existing differences has to be taken cautiously.

Education

The influence of education on health was estimated at two levels. This was possible because effect sizes are given for low and medium education compared to high education. Results are obtained for all four health transition and for both sexes.

It was found that being low educated for men means a significant increased risk of becoming disabled by 62%. For women the risk is 65% higher and significant as well. The results show that there is no difference between the sexes. For medium educated men and women the pattern is similar. They have 36% and 41% significant higher risks, respectively (see Figure 6–Figure 9).

The risk of dying healthy without getting disabled for low educated women is reduced by 26% ($p=0.073$). For medium educated women the risk is lower as well, however, not significant. In contrast, for men being low or medium educated means a significantly increased risk by 46% and 30%. It appears that the difference between low educated men and women for this health transition is significant.

The chances of recovering from disability of low educated men and women are not significantly different from high educated persons. Apart from that, for women the risk tends to be lower while for low educated men it tends to be higher than for high educated. However, there is no significant difference between men and women.

A surprising finding is that at both lower educational levels men and women have lower risks of dying disabled when compared with high educated individuals. However, this result is only border significant for low educated men, but not statistically significant for women. No difference exists between the sexes.

The impact of education on the health transitions of both sexes follows similar patterns with the exception of dying healthy. There, low educated women have a lower risk to die healthy than high educated women. While the opposite is true for males. One possible explanation is health selection that operates differently between the two sexes.

Among low educated women the majority becomes disabled and only the fittest remain healthy. Among high educated women a much smaller proportion becomes disabled and the remaining healthy ones are possibly less fit than the low educated women.

Body Mass Index

Only three studies that distinguished between men and women can be used for estimating the mean effect of a high BMI on the risk of becoming disabled.

In the studies of Wannamethee et al. (2005) and LaCroix et al. (1993) disability is defined as limitation in mobility or physical performance. Launer et al. (1994) did not use a common concept for measuring disability. They used items that are combined in the mixed category.

The estimated mean sizes point to an increased risk of becoming disabled for persons who are overweight or obese. For women the risk is 50% higher and for men it is 35% higher. The difference between men and women is not statistically significant (see Figure 10 and Figure 11).

Smoking

For the risk factor smoking mean effect sizes have been estimated for current versus never/non smokers, current versus former smokers, and for former versus never/non

smokers. However, results were only obtained for the health transition from healthy to disabled.

It was found that comparing current and never/non smokers reveals the highest difference. Female current smokers have a by 9% increased risk of becoming disabled. For current male smokers the difference is much higher. Their risk of becoming disabled is 25% higher than for never or non smokers. However, the difference between men and women is not significant.

Comparing current and former smokers does not show significant results. It is not possible to determine whether this can be explained by the fact that quitting smoking cancels the negative effect of smoking or, which is more likely, by the fact that there are only one or two effect sizes included in the analysis.

For the last possibility of comparing groups of smokers, namely former and never/non smokers, the estimation shows that female former smokers experience a significantly higher risk of becoming disabled than never or non smokers. On the other hand, males do not show any differences. The difference between men and women is not significant.

All results obtained from the meta-analysis for the above described risk factors and health transitions are displayed in Table 1.

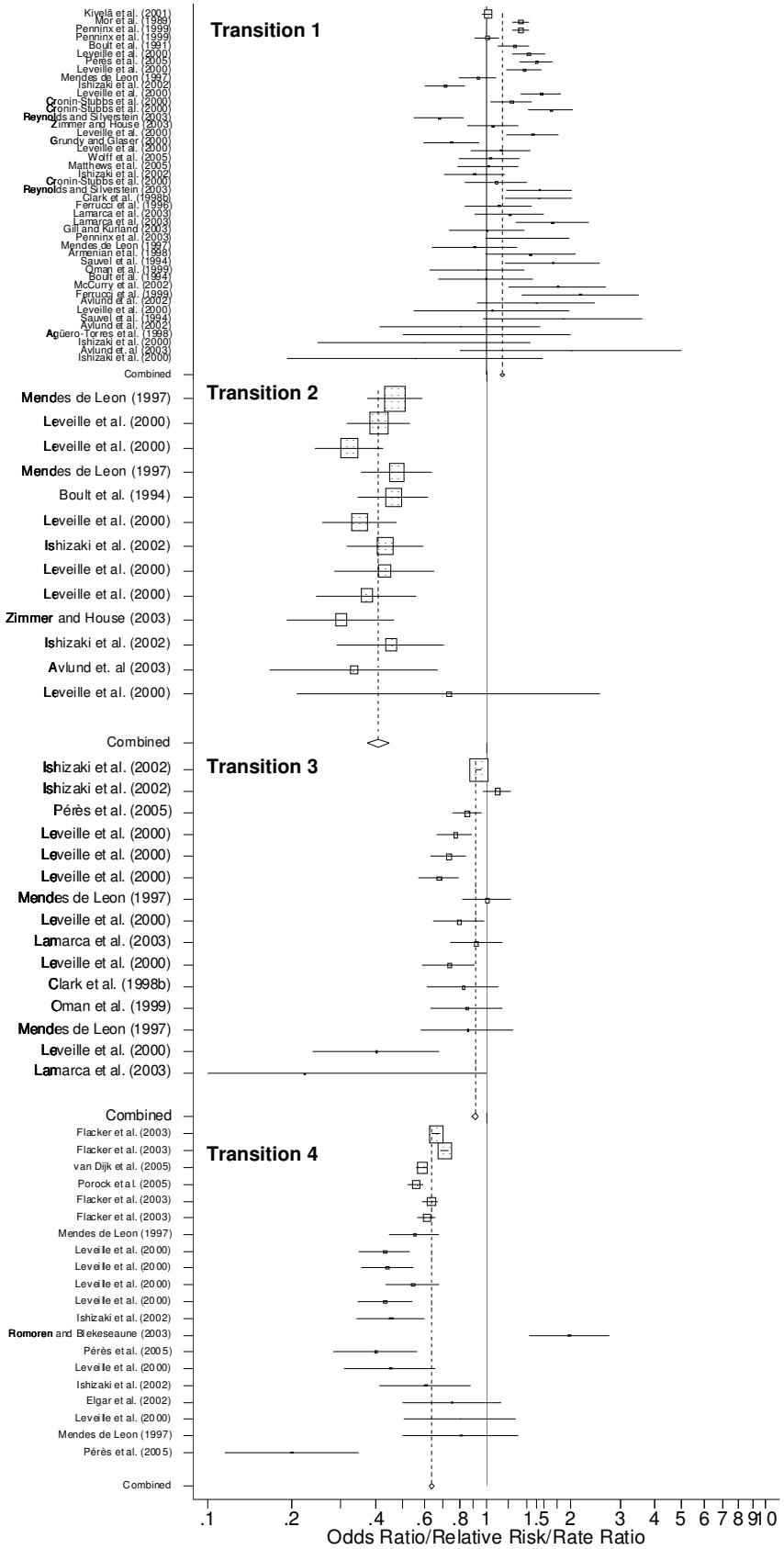

Figure 1: Health transitions 1-4 for the risk factor sex (reference group: males).

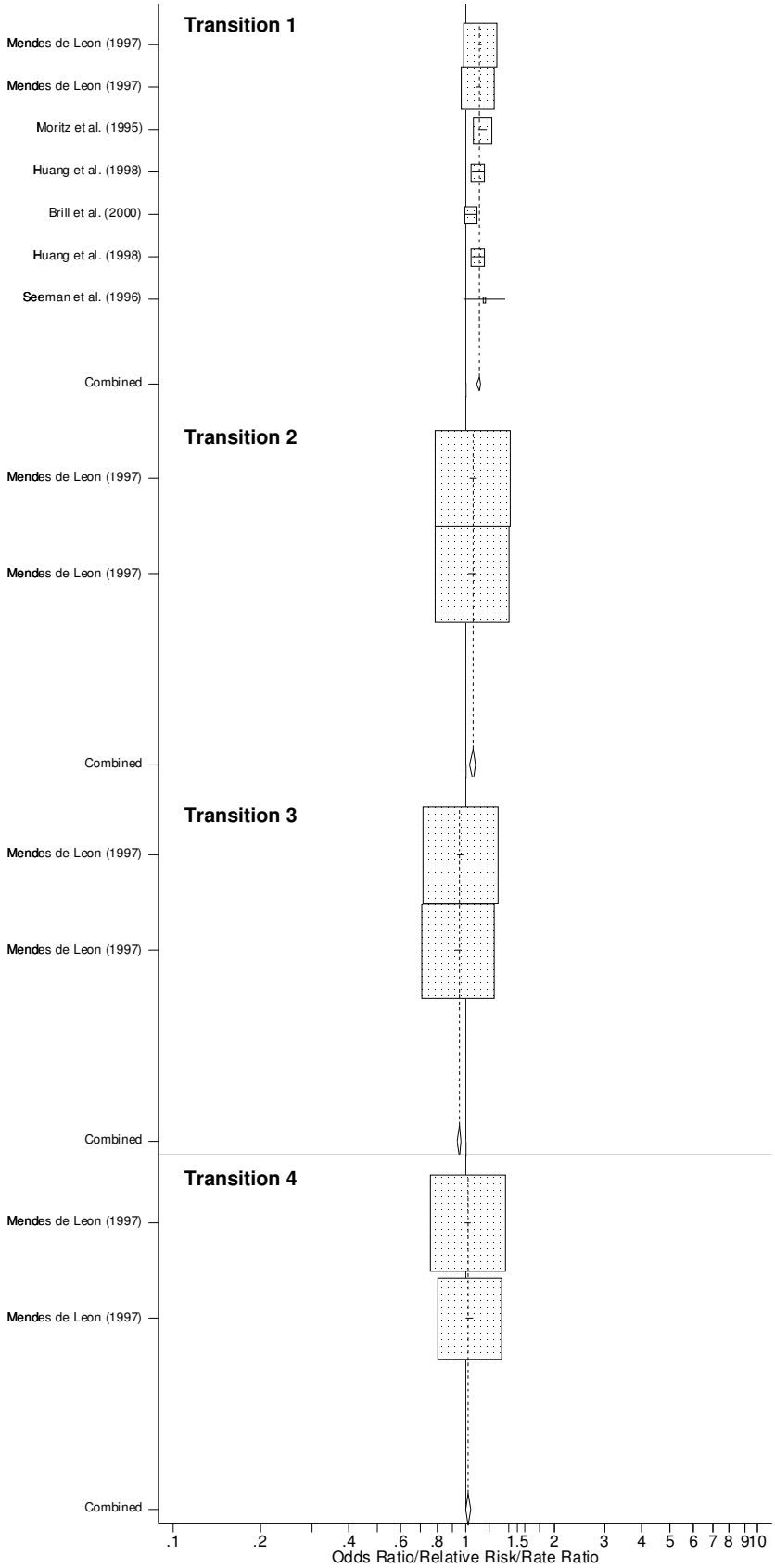

Figure 2: Health transitions 1-4 for the risk factor age with continuous measure, females.

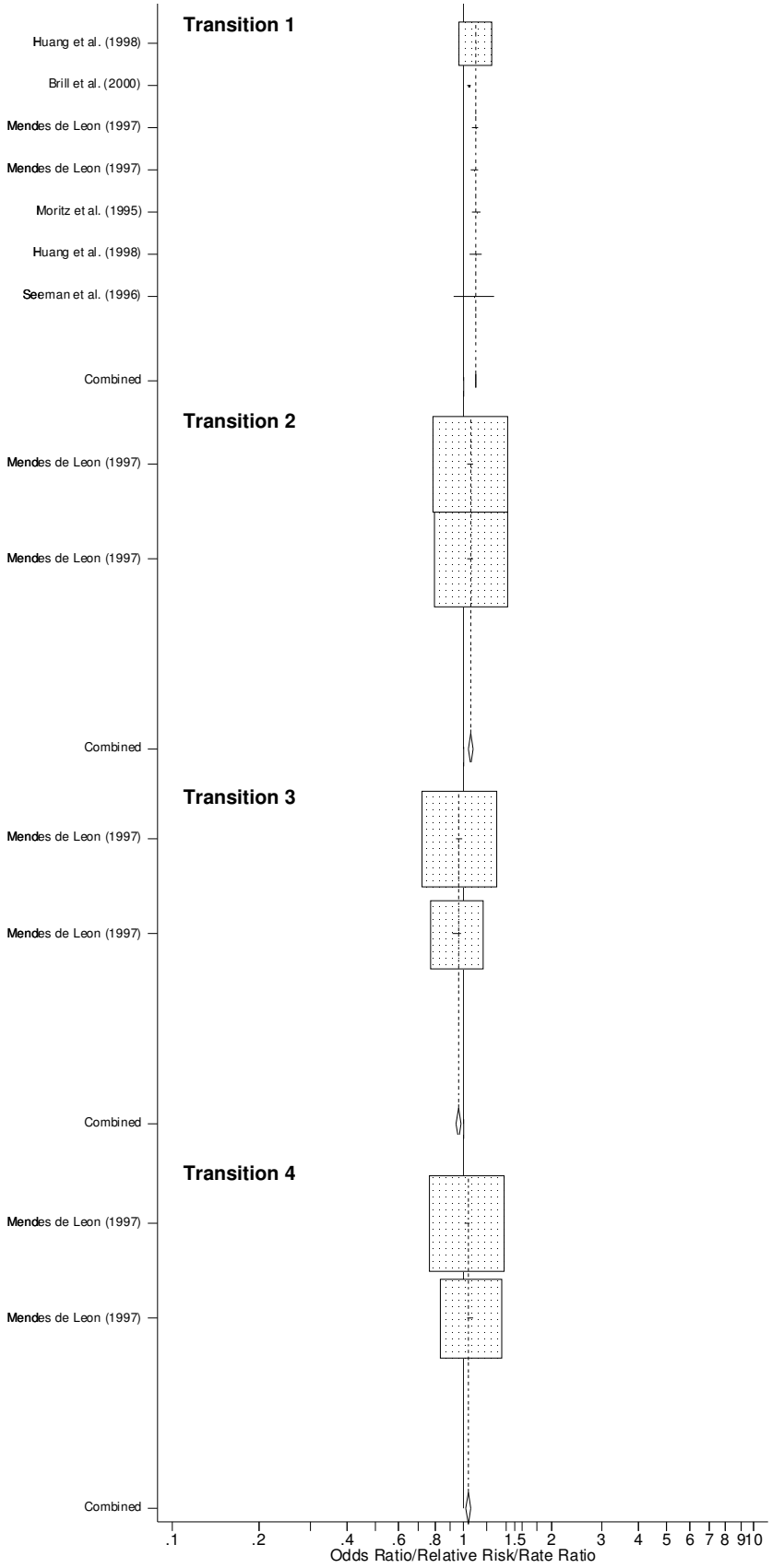

Figure 3: Health transitions 1-4 for the risk factor age with continuous measure, males.

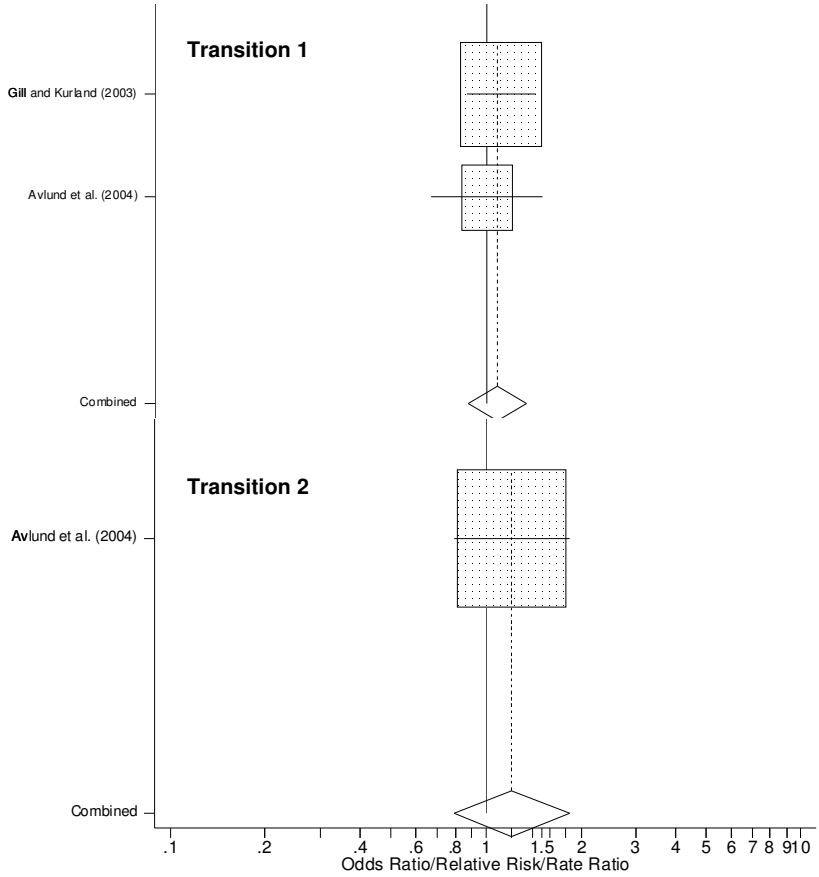

Figure 4: Transitions from healthy to disabled and from healthy to death for risk factor marital status (reference group: unmarried), females.

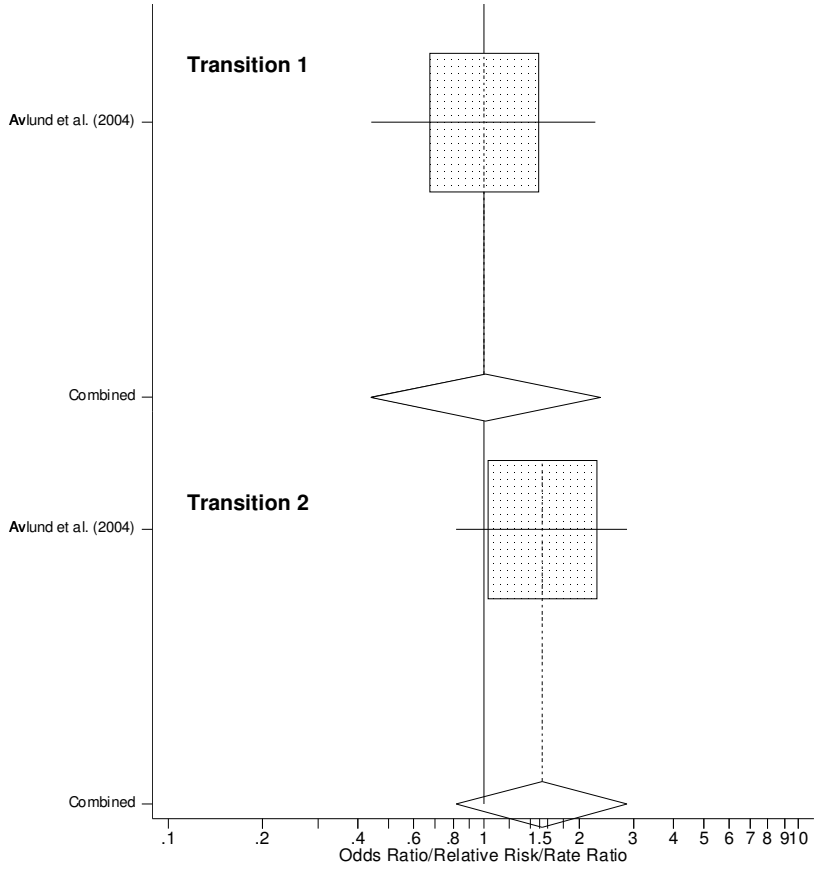

Figure 5: Transitions from healthy to disabled and from healthy to death for risk factor marital status (reference group: unmarried), males.

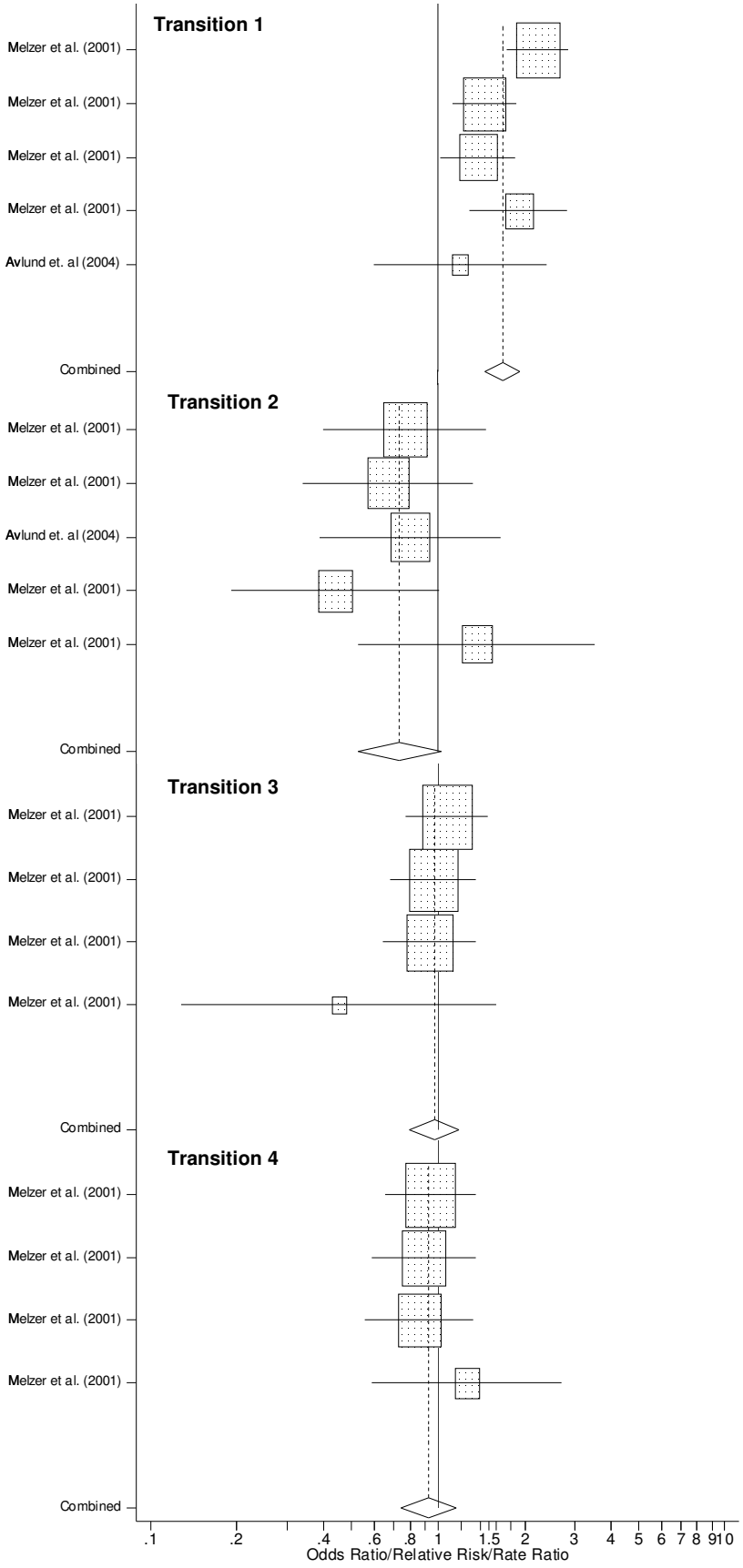

Figure 6: Health transitions 1-4 for the risk factor education (low vs. high education), females.

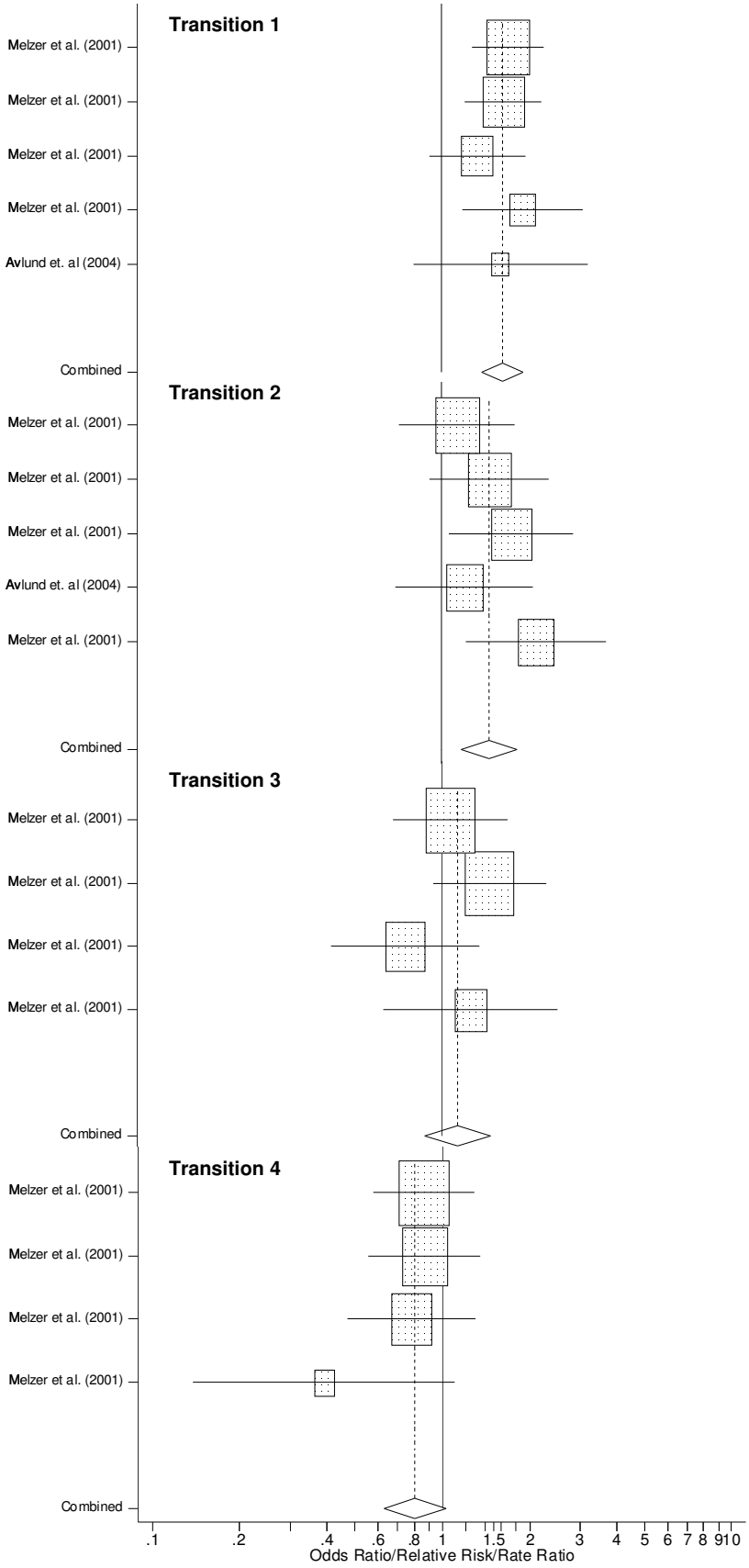

Figure 7: Health transitions 1-4 for the risk factor education (low vs. high education), males.

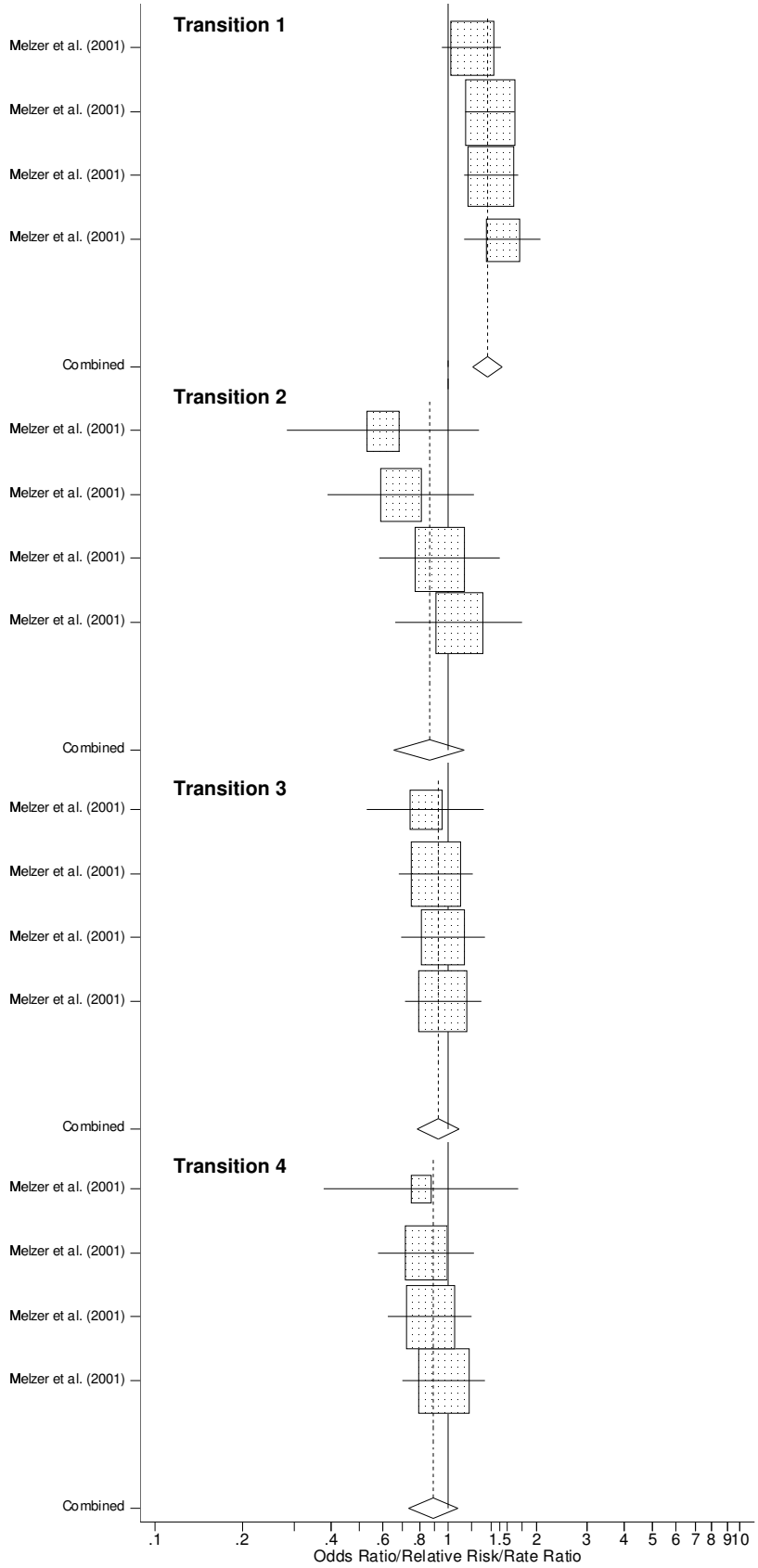

Figure 8: Health transitions 1-4 for the risk factor education (medium vs. high education), females.

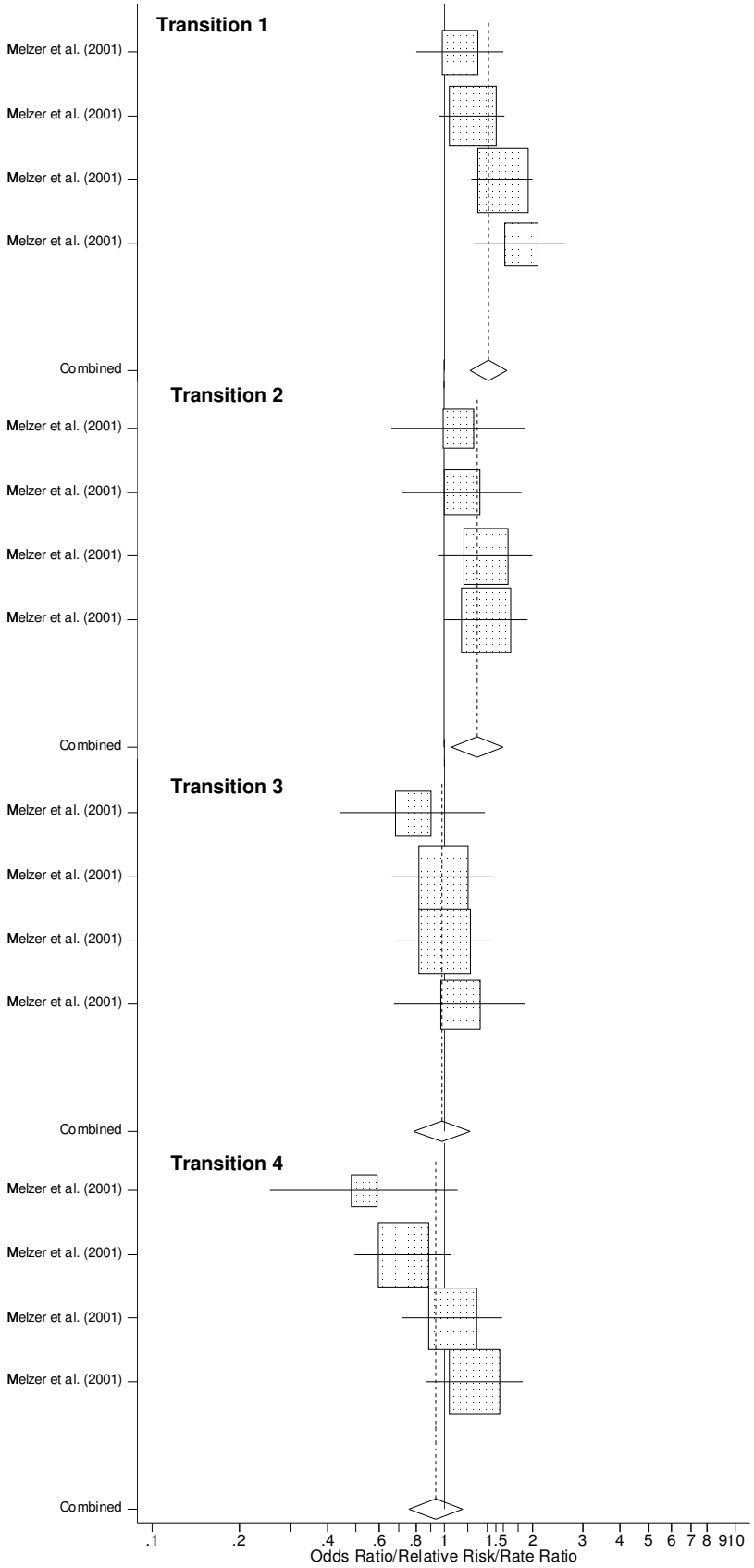

Figure 9: Health transitions 1-4 for the risk factor education (medium vs. high education), males.

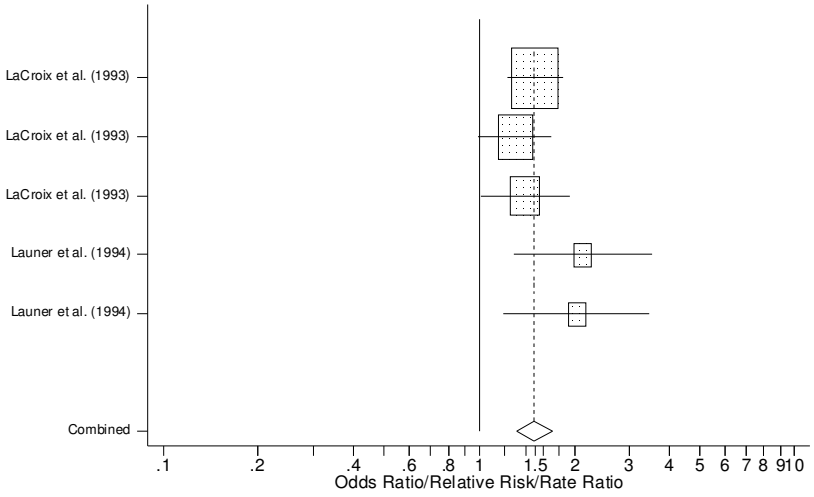

Figure 10: Health transition from healthy to disabled for the risk factor body mass index (overweight/obese vs. normal weight), females.

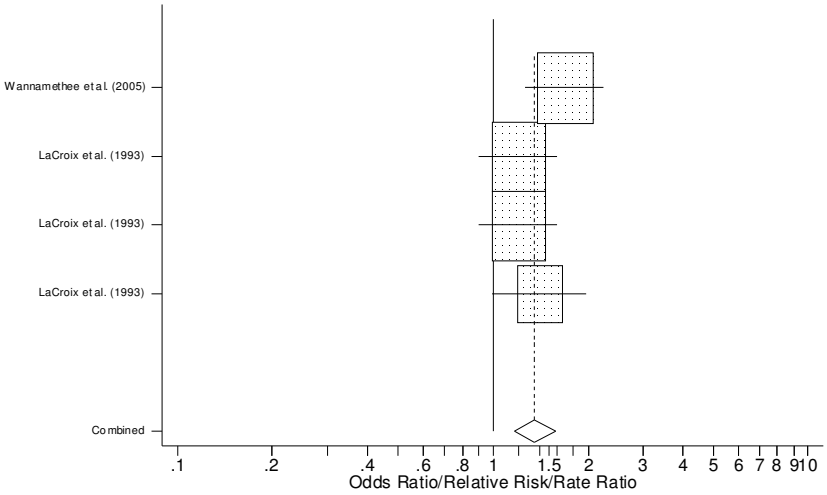

Figure 11: Health transition from healthy to disabled for the risk factor body mass index (overweight/obese vs. normal weight), males.

Table 1: Statistical meta-analysis: Estimated mean effect of age, marital status, education, body mass index, and smoking on health transitions 1-4 by sex.

risk factor	risk groups	risk groups	sex	number of effect sizes	Random effects model			
					estimated mean	CI_low	CI_up	
sex	female vs. male	1	female	44	**1.180**	**1.095**	**1.271**	***
		2	female	13	**0.410**	**0.373**	**0.449**	***
		3	female	15	**0.766**	**0.674**	**0.870**	***
		4	female	20	**0.579**	**0.536**	**0.627**	***
age	continuous	1	female	7	1.106	1.086	1.127	***
			male	7	1.089	1.067	1.112	***
		2	female	2	1.055	1.034	1.076	***
			male	2	1.060	1.042	1.078	***
		3	female	2	0.950	0.931	0.970	***
			male	2	0.963	0.943	0.984	***
		4	female	2	1.024	1.005	1.043	**
			male	2	1.044	1.015	1.074	**
marital status	married vs. unmarried	1	female	2	1.079	0.871	1.336	n.s.
			male	1	1.000	0.442	2.261	n.s.
		2	female	1	1.210	0.796	1.840	n.s.
			male	1	1.533	0.820	2.867	n.s.
education	low vs. high	1	female	5	1.655	1.320	2.076	***
			male	5	1.622	1.374	1.914	***
		2	**female**	**5**	**0.737**	**0.528**	**1.029**	*
			male	**5**	**1.466**	**1.170**	**1.836**	***
		3	female	4	0.971	0.797	1.183	n.s.
			male	4	1.130	0.858	1.489	n.s.
		4	female	4	0.927	0.743	1.157	n.s.
			male	4	0.806	0.627	1.035	*
education	medium vs. high	1	female	4	1.368	1.221	1.532	***
			male	4	1.415	1.167	1.717	***
		2	female	4	0.863	0.655	1.137	n.s.
			male	4	1.301	1.062	1.592	**
		3	female	4	0.927	0.787	1.093	n.s.
			male	4	0.982	0.783	1.231	n.s.
		4	female	4	0.892	0.736	1.080	n.s.
			male	4	0.904	0.645	1.268	n.s.
BMI	overweight vs. normal	1	male	1	1.144	0.866	1.511	n.s.
		3	male	1	0.643	0.402	1.030	*
	overweight/obese vs. normal	1	female	5	1.500	1.297	1.734	***
			male	4	1.356	1.150	1.599	***
		3	male	1	0.951	0.645	1.403	n.s.
smoking	current vs. never/non	1	female	6	1.099	0.924	1.306	n.s.
			male	6	1.254	1.127	1.396	***
		3	male	1	0.979	0.630	1.522	n.s.
	current vs. former	1	female	1	1.180	0.522	2.668	n.s.
			male	2	1.071	0.746	1.538	n.s.
	former vs. never/non	1	female	3	1.190	1.017	1.392	**
			male	5	0.992	0.882	1.115	n.s.
		3	male	2	1.045	0.785	1.392	n.s.

*…p?0.1; ** …p?0.05; *** …p?0.001; n.s. … not significant; **bold** indicates a significant difference between males and females

3 Psychological health

> *"Depression is an unpleasant emotion that people generally wish to avoid. Feelings of depression are a common type of distress. Depression correlates with other types of distress such as anger and anxiety, and with clinical diagnoses of depression, […]"(Ross and Mirowsky 2006:1404).*

An often confirmed finding in epidemiology is the preponderance of women in depression compared to men (Wenzel et al. 2005; Altemus 2006; Joutsenniemi et al. 2006; Pilar Matud et al. 2006; Maier et al. 1999; Piccinelli and Wilkinson 2000; Kuehner 2003; Heun and Hein 2005; Inaba et al. 2005).

3.1 Measurement of psychological health indicators

ICD-10

The ICD-10 uses symptoms like fatigue, pain, sad mood, irritability, lack of interest, lack of motivation, further loss of self-confidence, feelings of guilt, lack of concentration, being restless, disturbance of sleep, lack of appetite, and thoughts of suicide. According to the number of reported symptoms the ICD-10 distinguishes between light, moderate, and severe depressive episodes. Persons are considered to be lightly depressed with at least two of the first six mentioned items and two further items mentioned thereafter.

DSM-IV

Diagnostic and Statistical Manual of Mental Disorder fourth edition is a system for categorizing mental disorders. According to this, symptoms for determining depression are: depressed mood, reduced level of interest or pleasure in most or all activities, loss or gain of weight, possibly influenced by more or less appetite, sleeping disorder, agitated or slowed down behavior, fatigue or decreased energy, feelings of worthlessness or guilt, diminished ability to concentrate, and thoughts of death (American Psychiatric Association 2000).

EURO-D scale

The EURO-D scale is a very new scale, developed to compare symptoms of depression in 14 European centers, with good reliability and validity. The following symptoms of depression are included: depression, pessimism, wishing death, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment, and tearfulness. It is a continuous measure of symptoms of depression with higher scores indicating higher levels of depression (Prince et al. 1999).

Table 2: Items of the CESD-Scale

I was bothered by things that usually do not bother me
I did not feel like eating; my appetite was poor
I felt that I could not shake off the blues even with help from my family or friends
I felt that I was just as good as other people
I had trouble keeping my mind on what I was doing
I felt depressed (blue or down)
I felt that everything I did was an effort
I felt hopeful about the future
I thought my life had been a failure
I felt fearful
My sleep was restless
I was happy
I talked less than usual
I felt lonely
People were unfriendly
I enjoyed life
I had crying spells
I felt sad
I felt that people disliked my
I could not get “going”

CES-D

The CES-D – Center for Epidemiological Studies’ Depression Scale – is a self-report scale for measuring depressive symptoms in community surveys. According to this scale twenty items are used (see Table 2) (Radloff 1977). A modified version of this scale does also exist with only seven items (Ross and Mirowsky 1984; Ross and

Mirowsky 2006). Patients are asked to rate how often symptoms appear per week. When items are rated with 0 the symptoms appeared less than 1 day, 1 – 1-2 days, 2 – 3-4 days, 3 – 5-7 days. Scores range between 0–60 with higher values indicating higher severity of depression. A person is considered clearly depressive with 16 and more points (Shinar et al. 1986).

DRS

The DRS – Depression Rating Scale – is a scale used in the Minimum Data Set (MDS) which was constructed for the Resident Assessment Instrument (RAI). The MDS items concerning depression are summarized in the DRS. These are: the negative statements (passive suicidal ideation), permanent anger and irritability with self or others, expressions of what appear to be unrealistic fears, repetitive health complaints, repetitive anxious complaints/concerns (non-health-related), sad, pained, worried facial expressions, crying, tearfulness. It is built on the basis of seven items which can be scored from 0-2, with 0 indicating no symptom, 1 indicating that the symptom appears at least once in the last 30 days and up to 5 days a week, and 2 indicating that the symptoms appear daily or almost daily. At a cut point of 3 it can be spoken of a high level of depression.

GDS

GDS – Geratric Depression Scale – according to Yesavage et al. (1983) is a 30 item scale in origin. In contemporary research often modified GDS are used which are shortened to 4 or 15 items. They were judged to be highly sensitive. Patients are ask to answer questions concerning the emotions over the last week with yes or no. The 15 item scale consists of the items displayed in Table 3. According to this short scale a person is considered depressive with a score of at least 5 (Sheikh and Yesavage 1986).

BSI

According to BSI – Brief Symptom Inventory – this depression is measured with six items. The six items are: thoughts of ending the life, feelings of worthlessness, feeling lonely, feeling blue, feeling no interest in things, feeling hopeless about the future. Persons are asked to indicate at a five-point-scale how strong they suffered from problems in the past week. With 1 indicating “no problem at all” and 5 “extremely

problems". Higher scores are indicating higher intensity of depressive symptoms (Derogatis 1993).

Table 3: Items of the GDS

Are you basically satisfied with your life?
Have you dropped many of your activities and interests?
Do you feel that your life is empty?
Do you often get bored?
Are you in good spirits most of the time?
Are you afraid that something bad is going to happen to you?
Do you feel happy most of the time?
Do you often feel helpless?
Do you prefer to stay at home, rather than going out and doing new things?
Do you feel you have more problems with memory than most?
Do you think it is wonderful to be alive now?
Do you feel full of energy?
Do you feel that your situations is hopeless?
Do you think that most people are better off than you are?

3.2 Description of risk factors and measurement

Age

As already mentioned, age is a basic and biological factor of every individual which cannot be changed or stopped as long as we live. Time is running and age is increasing.

It is known that health, especially functional health, is getting poor with increasing age. Therefore, the question arises whether age has an impact on psychological health as well. Roberts et al. (1997) pointed out that there is no clear answer to this question. This disagreement in science is caused by different ways of measuring and defining criteria of depression, by different sample studies and methods used (Roberts et al. 1997, p.1384). It is argued that there are events influencing health like dementia, disability, physical illness, bereavement, loss of independence and security, and suicide at old age and therefore, it is imaginable that the prevalence of depression also increases with age.

Nevertheless, the question is how the independent influence of age on depression is. Roberts et al. (1997) conclude that a small number of studies found that age-related effects on depression are caused by other risk factors like physiological health and disability (Roberts et al. 1997, p.1385). For cohorts of the Alameda County Study of a 60+ old U.S. population controlled for age and other psychosocial factors they did not reveal significant age effects on depression. In contrast, Prince et al. (1999) compared the effect of age for 14 European centers with the harmonized 12-item depression symptom scale EURO-D. They found that the EURO-D scale scores increased with age. Further, for a Finnish older population it was found that age is an independent predictor of depression for men and somehow stronger for women. However, with no significant difference between the sexes (Kivela et al. 1999).

Biological factors

With biological factors a large variety of risk factors is summarized. These are for example genetic, hormonal and disease factors which are more relevant in medical studies. It should only be mentioned that the degree of genetic liability to depression is similar in both sexes. There is no evidence of a relation between the higher frequency of women reporting depression and genes located on the X-chromosomes. However, a possible explanation of gender differences might be that genetic factors may have an indirect influence on developing depression of men or women (Piccinelli and Wilkinson 2000).

Education

Ross and Mirowsky (2006) have summarized clearly the meaning of the risk factor education. It is a necessary resource that helps to generate other resources. It is part of a person and cannot be taken away. Education precedes and influences employment, work, earnings, and income. Hence, the achieved welfare due to a certain level of education protects psychological well-being. Since women have less socioeconomic resources than men they are more dependent on education for their well-being (Ross and Mirowsky 2006).

The results of this study support the hypothesis that “the beneficial effect of education on depression is greater for women than for men” (Ross and Mirowsky 2006, p. 1400). However, at a very high level of education for persons with PhD/professional education the opposite is true, see Figure 12. According to this

hypothesis women have, due to lower socioeconomic resources (e.g. power, authority, and earnings), less resources. Benefiting from education they are able to substitute the absence of resources to maintain their well-being and to avoid depression.

Marital status

Marital status has an important impact on psychological health. It is a well-known fact that married persons have a strong health advantage. According to this depression is more common among non married persons (including single, divorced, and widowed persons), especially among widowed (Prince et al. 1999).

But also being married may have a different impact on developing depression for men and women. It is argued that women overtake more social roles and are more exposed to demands in marriage than men. One study showed that among married persons women do suffer more from depression than men due to chronic strains that arise from marital role differences (Wu and DeMaris 1996). For example, keeping house and taking care for children might reduce the likelihood of being

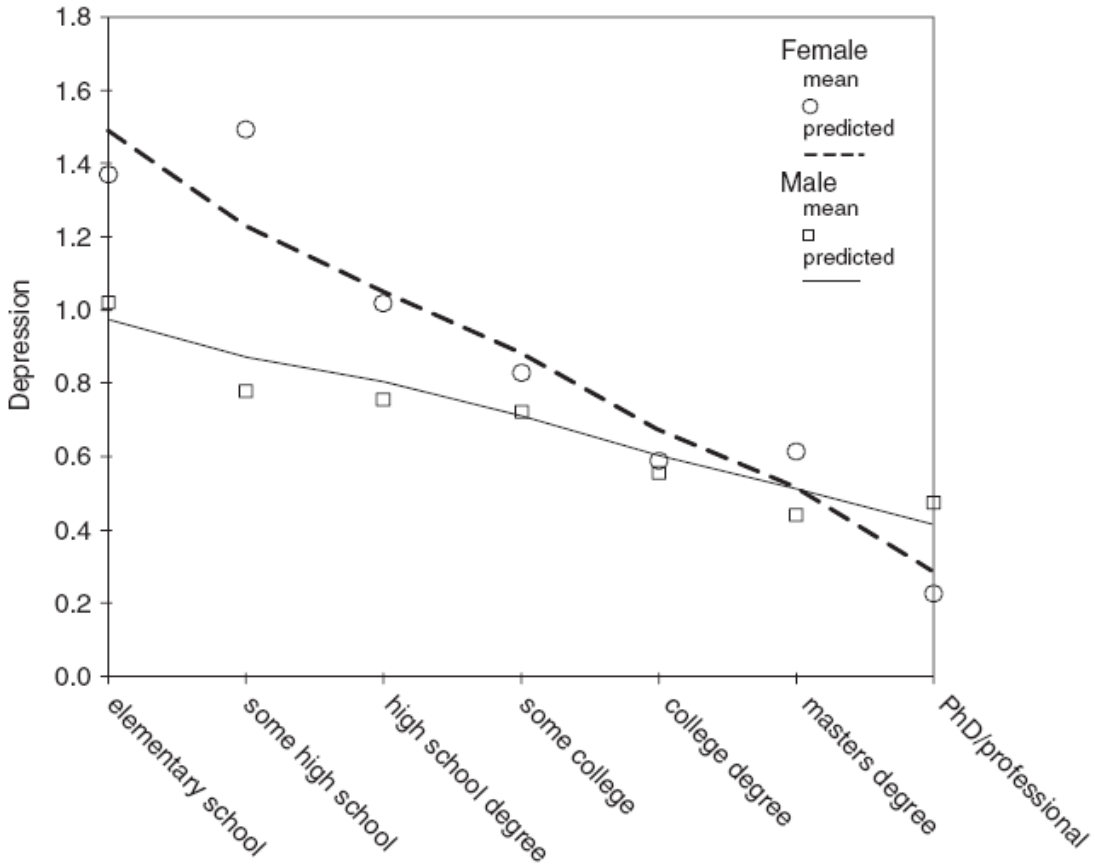

Figure 12: Mean and predicted levels of depression by sex and education, adjusting for age and race.

Source: Ross and Mirowsky 2006, p.1406

employed and earning money and contributes to dissatisfaction. On the other hand, these are additional demands next to being employed and put more stress on women (compare Piccinelli and Wilkinson 2000). The effect of marital status on psychological health for men and women has often been examined. However, there is no consensus about who suffers more from depression due to not being married. For example one study shows that widowhood implicates higher disadvantage for men (Umberson et al. 1992). Further, an examination of a Viennese population aged 18-67 years revealed that in general married persons have a health advantage meaning a lower risk of depression than for non married persons. The difference in the risk of depression between never married and married persons is higher for men than for women (Gutiérrez-Lobos et al. 2000). For widowhood a different pattern was found: widowed men have a higher risk of depression than married, but widowed women have a lower risk than married women. In a review of studies it was found that no differences exist between the non married groups for men and women (Gutiérrez-Lobos et al. 2000).

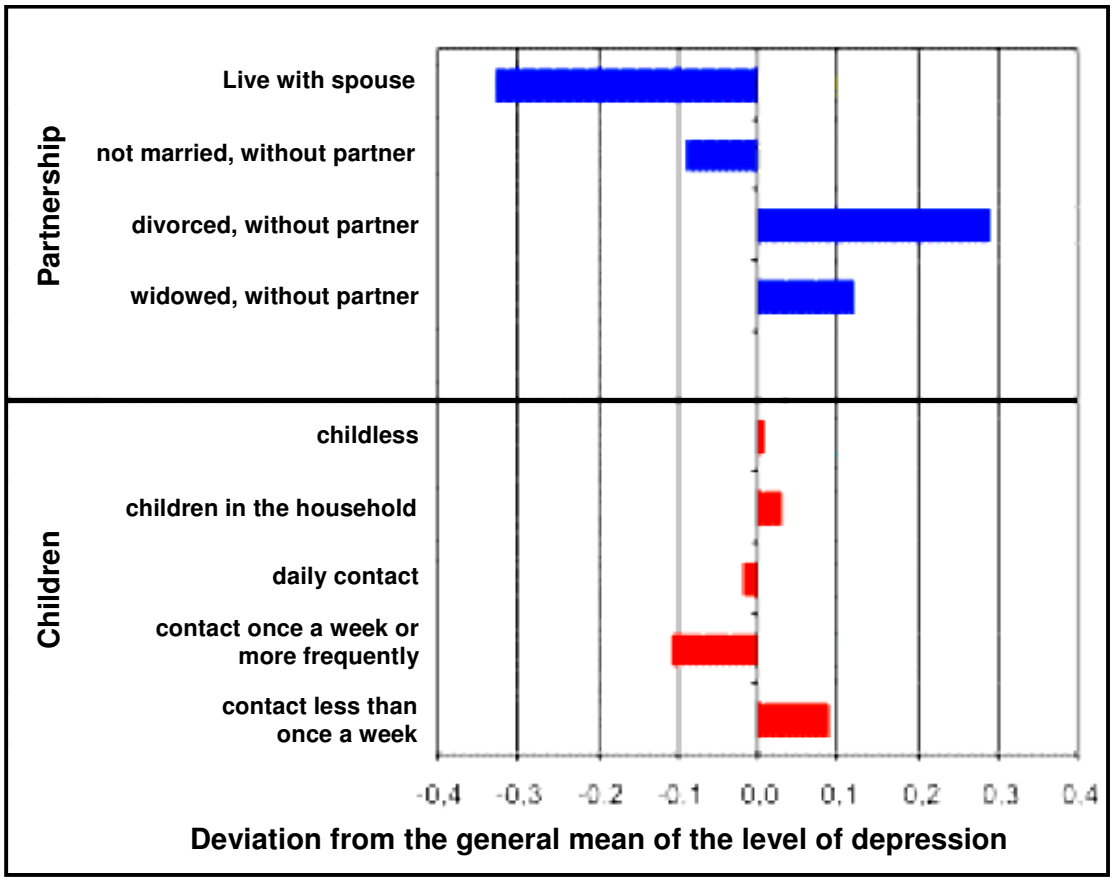

Figure 13: Impact of the contact to a partner or with children on the level of depression.
Source: Buber and Engelhardt (2006b)

In a study of SHARE data it was found that the presence of a partner obviously is a more important factor than the contact to children (Buber and Engelhardt 2006a), see Figure 13.

Social support

Social support covers support from the own partner or family (e.g. children, relatives), from friends and neighbors in the form of perceived concern, perceived help, or number of contacts. Frequent social contacts point to an integration into society (Buber and Engelhardt 2006a). A number of studies have examined the effect of social support on psychological health. Results indicate that social support prevents from developing mental disorders (Kendler et al. 2005; Buber and Engelhardt 2006a; Dalgard et al. 2006; Greenglass et al. 2006).

Evidence for the impact of children on mental health (reflecting depression) has been described for a population aged 60+ and being unemployed based on the SHARE data set. Mental disorder was measured with help of the EURO-D scale. The analysis revealed that children have a protective impact on psychological health. Being childless as well as having fewer contacts to children has a negative impact on psychological health. However, it is argued that the frequency of contacts does not inform about the quality of contact and of the relationship between parents and children since no information exist in the SHARE data. Apart from that, the frequency of contacts points to an integration into the family (Buber and Engelhardt 2006a)

In their review Piccinelli and Wilkinson (2000) point out that there is no clear direction of findings for the different meaning of social support for men's and women's psychological health. For example Umberson et al. (1992) already found that social support from children lowers depression scores for men as well as for women. A recent study of twin pairs revealed that social relationships are more protective against depression for women than for men (Kendler et al. 2005). In a study of five European populations (Finland, England, Ireland, Spain, and Norway) aged 18-63 years evidence is given that among people without social support women are most likely to develop depression. However, the authors point out that the difference in social support does not explain the gender difference in depression (Dalgard et al. 2006)

Employment status

Being employed has financial advantage. It secures earnings which are needed for daily life. Therefore, it has a calming effect on emotional well-being. Concerning this fact from older studies it is known that being in paid employment lowers the likelihood of being depressive. It was observed that women without employment have an increased risk of developing depression. The impact was found to be there for men and women, however, with a stronger effect for women (Anthony and Petronis 1991). This fact was confirmed in a recent study of a Viennese population aged 18-67 years. Not being employed implies a higher risk of depression for women than for men (Gutiérrez-Lobos et al. 2000). In a study based on the Catalonian Health Survey results revealed significantly higher negative impact of unemployment on mental health for men (compared to employed men) than for women. It is mentioned that this difference is not explained by the value that men and women assign to a paid job, moreover, it is the different role men and women have according to family responsibilities (Artazcoz et al. 2004).

Piccinelli and Wilkinson (2000) performed critical review on gender differences in drepression. Apart from social support their research is concentrated on different risk factors than our review. A short overview over these risk factors is given in Table 4.

Childhood familial environment and adverse experiences	Females are at greater risk of sexual abuse and seem to be more sensitive to the effect of adverse experiences in childhood
Prior depression and anxiety disorders	Females are at increased risk of depression and anxiety disorders at earlier ages
Social roles and cultural norms	Role limitation with associated lack of choice, role overload and competing social roles contribute to females' increased risk of depressive illness
Adverse life events	Females do not experience higher rates of adverse life events but may differ in the quality of experience associated with them, possibly due to their distinctive social circumstances
Vulnerability and coping style	No consistent gender differences in personality attributes and coping styles compatible with a depressive image
Social support	No contribution to females' increased risk of depressive illness
Genetic factors	No direct contribution to females' increased risk of depressive illness
Gonadal hormones	Partial effect, although smaller than that of environmental variables
Adrenal axis and thyroid axis	Contrasting findings for adrenal axis. Limited role for thyroid axis
Neurotransmitter systems	Uncertainty about their effects

Table 4: Risk factors explaining gender differences in depression

Source: Piccinelli and Wilkinson (2000), p. 487

4 Mental health

Mental and behavioral disorders represent 4 of the 10 leading causes of disability worldwide and are estimated to account for 12% of the global burden of disease (World Health Organization, 2001). European and Northern American studies show that about one fourth of the population above age 65 is suffering from a mental health problem. About 6% to 10% account for severe dementia and severe functional psychoses (Bickel, 2003; Hendrie, 1998).

The number of sufferers from dementia in the beginning of the 21st century is estimated to about 25 million people worldwide. 46% of them live in Asia, 30% in Europe and 12% in North America (Wimo et al., 2003). A lower number is provided by Eurostat (2003), who estimate for the year 2000 that 4,624 million Europeans (EU25) between ages 30 and 99 suffered from different types of dementia (12.3 per 1000 inhabitants). Due to their higher mean age more women are affected, 2.9 million compared with 1.7 million men. In the year 2006 the number provided by the 'European Community Concerted Action on the Epidemiology and Prevention of Dementia group' (EURODEM) (Alzheimer Europe, 2006) already rose to 5.37 million people.

It is very difficult to quantify dementia. Different definitions and measurement methodologies lead to diverging results. First of all it combines different kinds of diseases. Secondly, it is difficult to differentiate the disease in its early state from the normal cognitive changes that occur in older ages (Fratiglioni and Rocca, 2001; Schaie, 2004). A rising awareness might have further influenced the number of affected cases, because the disease is earlier and more often diagnosed. Cross-cultural differences and within-culture changes over time additionally aggravate a consistent understanding of the disease. Recently, more attention is paid to the topic which is reflected in a higher number of journals, programs and initiatives dealing with the topic, and a rising number of studies analyzing the epidemiology of dementia, the prevalence and incidence of dementing illnesses, and the risk factors of the disease (Fratiglioni et al., 1999; Larson et al., 1992).

Definitions from the DSM-III, DSM-IV and the 'International Classification of Diseases and Related Health Problems' (ICD) are among the most widely accepted

formal definitions of dementia today (American Psychiatric Association, 1987, 1994). All definitions have in common that a change in the brain occurs which leads to memory impairment and a change in personality. The disease hampers the daily living of the person. This is also an indicator for differentiation to normal aging: the age-related decline does not usually cause significant impairment of function, is slower, and people can compensate this decline (Larson et al., 1992). The condition usually worsens. Sometimes 3 levels of severity are distinguished. The relation of the mild, moderate and severe dementia is 3:4:3 (Bickel, 2004). The affected persons can suffer from changes in cognitive perception, emotional control, social behavior, motivation, in their personality, they can get depression, sleep disorders, angst, hallucinations, aggressions, constraints in daily living. The gradually deteriorating health state leads to complete dependence and the initial need for help turns into full-time care need. People with dementia have a higher institutionalization rate and a higher risk for other diseases such as hip fracture, urinary incontinence, blood pressure (Skoog, 2004). Dementia causes a higher mortality rate (Bickel, 2004; Dewey and Saz, 2001; Kliegel et al., 2004; Kokmen et al., 1996; Wilson et al., 2003), which might be higher in Vascular Dementia (VaD) than Alzheimer's Disease (AD) (Dewey and Saz, 2001) and also being male, older and having more severe dementia especially affects survival negatively (Bickel, 2004; Heyman et al., 1997). The average disease time from the beginning until death is estimated to last about 4.7 to 8.1 years for AD and about 1 year less for VaD. (Weyerer, 2005). In industrialized countries dementia is the fourth most common cause of death after heart diseases, malignant growth and cerebrovascular diseases (Bickel, 2003). The term dementia combines disease patterns with different causes: degenerative dementia (e.g. Alzheimer's Disease (AD)), vascular dementia (VaD) (e.g. multi-infarct dementia), nutritive-toxic or metabolically caused dementia (e.g. caused by alcohol), dementia caused by infections or transmission e.g. AIDS-dementia), dementia caused by head injury (European Community, 2005; Weyerer, 2005). The most frequent form today is AD, a neurodegenerative disorder which slowly and progressively destroys brain cells. The disease accounts for about 50-75% of all dementias (Bickel, 2004; Breteler et al., 1992; European Community, 2005; Eurostat, 2003; Weyerer, 2005). VaD is the second most common form of dementia and accounts for about one forth of all cases. However, numbers vary: 25-50% (European Community, 2005), 15-20% (Weyerer, 2005), 20-30% (Skoog, 2004). Other forms such as fronto-temporal degeneration,

Parkinson's disease and Lewy body disease or mixed forms of degenerative-vascular dementia are often grouped together into 'other dementias'.

4.1 Determinants of Dementia

Because dementia has become more important in the last decades only few factors are well established yet. For AD only three risk factors are approved: age, family history and Down's syndrome (Jorm, 1995). The rising awareness, however, has led to a much higher attention towards this topic and much more research, in order to find out about underlying mechanisms and possible treatment or prevention. In the newer literature several risk factors are discussed. Some are confirmed in replicate studies, some are disproved. The following table 1 shows the consistency of risk factors.

Table 5: Risk Factors for Alzheimer's Disease

Risk Factor	Highly Consistent	Somewhat Consistent	In-consistent	Interactive	Insufficient Data
Age	x				
Family History	x				
ApoE4		x		x	
Education		x			
Depression		x			
Estrogen-repl.[1]		x			
NSAIDS[2]		x			
Gender			x	x	
Head Injury			x	x	
Smoking			x	x	
Hypothyroidism			x		
Diabetes			x		
Aluminium			x		
Life Styles					x
Environ. exp.[3]					x
Zinc					x
Antioxidants					x

[1] Estrogen-replacement therapy
[2] Nonsteroidal anti-inflammatory agents
[3] Environmental exposures

Source: Hendrie, 1998; Bundesministerium für Familie, Senioren, Frauen und Jugend, 2002

Table 6: Protective Factors for Dementia

Protective Factor	Highly Consistent	Somewhat Consistent	In-consistent	Insufficient Data
ApoE2, Apoe3	x			
Education		x		
Estrogen-repl.[1]		x		
NSAIDS[2]		x		
Antioxidants			x	
Social Contact				x
Antihypertensiva				x

[1] Estrogen-replacement therapy
[2] Nonsteroidal anti-inflammatory agents

Source: Hendrie, 1998; Bundesministerium für Familie, Senioren, Frauen und Jugend, 2002

Gender

The literature shows no definite results whether a gender difference exists in the incidence or prevalence of dementia (Bickel, 2004; Mortimer, 1983). Some studies find a higher incidence or prevalence for women (Aevarsson and Skoog (1996); Ebly et al. (1994); Manton et al. (2005); Ravaglia et al. (2005)), others do not find differences (Cooper et al. (1992); Edland et al. (2002); Hall et al. (2005); Hofman et al. (1991); Kokmen et al. (1993, 1989); Kukull et al. (2002); Wernicke and Reischies (1994)). Only few studies find higher rates for severe dementia for males (Nilsson, 1984) (the results are for people between ages 70-79 and were not significant). The following table shall provide an overview over existing dementia studies that control for gender.

Table 7: Gender Differences in the occurrence of dementia

	Rates	Type	N	Remarks
Gender Differences, Higher Rates for Females				
Nitrini 2004	incidence	Dem, AD		above age 85
Fratiglioni 2000	incidence	Dem, AD	meta	8 studies, Europe
Bickel 1994	incidence	Dem, AD	458	tendency
Ott 1998	incidence	Dem	7,046	
Miech 2002	incidence	AD	3,308	above age 85
Kawas 2000	incidence	AD	1,236	not sign.
Launer 1999	incidence	AD	meta	4 studies
Gao 1998	incidence	AD	meta	12 studies
Jorm 1998	incidence	AD	meta	23 studies, tendency
Aevarsson 1996	incidence	AD, VaD	347	ages 85-88, n. s.
Ravaglia 2005	incidence	AD, VaD	937	not sign.
Manton 2005	prevalence	Dem, AD	42,000	sign.
Lobo 2000	prevalence	Dem, AD	meta	11 studies, Europe
von Strauss 1999	prevalence	Dem, AD	1,848	77+
Lopes 2002	prevalence	Dem	meta	38 studies
Fichter 1995	prevalence	Dem	1,692	75+, tendency
Engedal 1993	prevalence	Dem	1,029	75+
Ebly 1994	prevalence	Dem	1,835	85+, sign.
		AD		not sign.
Cooper 1992	prevalence	AD	3,737	no sig. given
Kokmen 1989	prevalence	AD	12,000	sign.
Jorm 1987	prevalence	AD	meta	27 studies
Gender Differences, Higher Rates for Males				
Nilsson 1984	incidence	Dem	385	ages 70-79, not sign.
Fichter 1996	incidence	Dem	402	85+, tendency
Jorm 1998	incidence	VaD	meta	23 studies, tendency
Rocca 1991	prevalence	VaD	meta	5 studies, Europe
Jorm 1987	prevalence	VaD	meta	27 studies, tendency
No Gender Differences				
Edland 2002	incidence	Dem, AD	14,439	
Kukull 2002	incidence	Dem, AD	2,356	
Bachman 1993	incidence	Dem, AD	2,391	
Hall 2005	incidence	Dem	488	
Riedel-Heller 2001	incidence	Dem	1,692	75+
Jorm 1998	incidence	Dem	meta	23 studies
Kokmen 1993	incidence	Dem	12,000	
Fratiglioni 2000	incidence	VaD	meta	8 studies, Europe
Fichter 1995	prevalence	Dem	402	85+
Wernicke 1994	prevalence	Dem	156	70+
Cooper 1992	prevalence	Dem	3,737	
Hofman 1991	prevalence	Dem	meta	8 studies, Europe
Kokmen 1989	prevalence	Dem	12,000	
Jorm 1987	prevalence	Dem	meta	27 studies
Ebly 1994	prevalence	VaD	1,835	above age 85
Lobo 2000	prevalence	VaD	meta	11 studies, Europe
von Strauss 1999	prevalence	VaD	1,848	77+

For dementia in general study results do not provide a clear answer if a gender difference exists in the incidence and prevalence of dementia. However, from the table one can see that there is clear tendency for dementia subgroups. Women seem to

have a higher risk to develop AD. Nearly all studies in the table in the first section 'Higher Rates for Women' find it for AD. Men, on the other hand, seem to have a higher risk to develop VaD or at least the same risk as women. The two studies that find higher rates for males also for dementia are not significant. These results are shown even within one study. Ebly et al. (1994) finds higher prevalence rates for women for dementia. The higher rates are still seen for AD, although not significant, but for VaD there is no gender difference anymore.

Age and Genetic Factors

All studies agree on the fact that age is the biggest risk factor for developing a dementia (Bickel, 2003, 2004; Fichter et al., 1995; Fratiglioni et al., 1999; Hatada et al., 1999; Kokmen et al., 1996; Mortimer, 1983; Nitrini et al., 2004; Ravaglia et al., 2005; Ritchie et al., 1992; Rocca and Kokmen, 1999; Weyerer, 2005). Before age 65 it is negligible, very few people suffer from presenile dementia. However, after age 65 the increase of prevalence and incidence is steep. The prevalence seems to double every five years from about 2% for ages 65 to 69 to 8% to 13% for ages 80 to 84 and 25% to 42% for ages 90+. The incidence rate of dementia rises from about 0.5% for people aged 60 to 69 to about 1% for people aged 70 to 79 and to 3% for people above age 80. After age 85 findings differ substantially and are as high as 5% to 10%. AD seems to be the driving force of the strong increase with age, VaD often is found to have a much slower increase with age.

However, at oldest ages it is difficult to distinguish between AD and VaD and the classification by etiology becomes a matter of attribution (Fratiglioni, 2001).

After age genetic influences are another clear risk factor of dementia and AD. However, the impact of genes in connection with the frequency of dementia is not quite clear, yet. Theories differ to what extent contributions from genes and environment contribute to the development (Karmiloff-Smith, 1998). Many studies have shown a correlation between genetic factors and dementia. Especially twin studies have confirmed this correlation. However, they also showed that the influence was overestimated before (Bickel, 2004) and that most patients develop the disease without an accumulation of events within the family.

The association between apolipoprotein E (Apo E) and Alzheimer's disease is the object of many studies. They find an increased risk for developing AD for people with ApoEe4, e. g. (Kukull et al., 2002; Miech et al., 2002; Nitrini et al., 2004; Palumbo et

al., 1997). In Europe in about 20-24% of the population at least one ApoEe4 is common and therefore a significantly higher risk to get the disease (Staehelin, 2004).

Table 1 shows that education, depression, estrogen-replacement therapy and the use of nonsteroidal anti-inflammatory agents are somewhat consistent risk factors for dementia. Higher education shows a lower occurrence of dementia in most (Bickel, 2004; Kukull et al., 2002; Launer et al., 1999; Nitrini et al., 2004; Ravaglia et al., 2005; Manton et al. 2005), but not all studies (Kokmen et al.,1996). With regard to the education expansion that started in many countries after the Second World War it could give reason for hope. However, it could simply be that people with higher education are better or longer able to cope with the different scales which measure dementia (McDowell, 2004). Some studies show that a history of depression increases the risk to develop a dementia (McDougall, 2006; Devanand et al., 1996). There is some evidence that the use of estrogen-replacement therapy in postmenopausal women and the use of nonsteroidal anti-inflammatory agents may reduce the onset of AD (Henderson et al., 1994; Breitner et al., 1993), however, not all studies support these findings (Stewart et al., 1997).

Other Risk Factors

Many other minor risk factors have been looked at, which cannot be addressed here in detail. The results are often inconsistent. Too few studies and contradicting results make them unreliable. The table lists head injury, smoking, hypothyroidism, diabetes, aluminium, life styles, environmental exposures (Skoog, 2004), zinc and antioxidants. Furthermore urban/rural differences, regional differences (Fratiglioni et al., 2000, Hofman et al., 1991), racial differences (Jorm, 1991; Jorm and Jolley, 1998; Reed, 2004) and social factors might have an impact. Also earlier or accompanying illnesses could increase the risk of developing a dementia, such as stroke (especially for VaD) (Desmond et al., 2002; Ivan et al., 2004; Zhu et al., 2000; Knopman et al., 2002; Rocca and Kokmen, 1999), Parkinson (Lonneke et al., 2005), diabetes mellitus, alcohol abuse, lipometabolic disorder, down's syndrome, head injury (Breitner, 1993), depression (Kokmen et al., 1996), atrial fibrillation, coronary heart disease, hypertension (Skoog, 2004) and also smoking (Launer et al., 1999; Breitner, 1993) and obesity (Skoog, 2004). Also the results from the nun study (Snowdon, 2001) indicate that the lifestyle might have an impact on the dementia risk. Although Jorm et al. (1987) and Corrada et al. (1995) both noted that studies which included the

institutionalized population did not report higher rates than those with only private households, most studies find a correlation, e. g. (Ebly et al., 1994; Engedal and Haugen, 1993). On the other hand, some studies did not find a correlation between dementia and some risk factors, e. g. Kokmen et al. (1996) found in a review of studies of dementia in Rochester, Minnesota that general medical conditions, previous head injury, thyroid disease, exposure to therapeutic radiation, anesthesia, and blood transfusion were no risk factors for AD. Also socio-demographic factors such as education, occupation, marital status, and type of dwelling were not significantly different among patients with AD and their age- and gender-matched control subjects. Launer et al. (1999) could not confirm a correlation between AD and depression and head trauma, respectively. For a more detailed description of other risk factors see also (Hendrie et al., 2006).

Discussion of the Risk Factors

Within the context of the aging of the populations all over the world dementing illnesses come to the foreground of societal, political and medical interest. The increase of people suffering from this disease during the next years will be especially high in the developed countries which predominates the problem in these regions. Despite an increasing awareness of the disease and more research going on there is still a rather rudimentary knowledge of the risk factors for dementing illnesses (Jorm, 1995). Only age and family history are confirmed risk factors, some factors such as gender (for subtypes of dementia), ApoE4, education, depression, estrogen-replacement therapy and nonsteroidal anti-inflammatory agents are likely risk factors. Gender does not show clear results for general dementia, however, there might be a higher risk for women to develop AD and for men to develop VaD. In general a moderate lifestyle with healthy nutrition and physical and mental activity seem to have a protective effect.

Recent progresses in understanding the illness and detecting some strategies give hope. Table 2 shows protective and possibly protective factors and the list might be prolonged with more research going on. ”In spite of what has seemed to be an endless search for cause and cure, those involved are now cautiously optimistic that a useful outcome will be achieved within the next decade. It is postulated that successful inroads will have been made towards eliminating the devastating effects of AD - not cure, but prevention” (Lefroy, 2000). Also other studies conclude with an optimistic

prospect that it might be possible to delay the onset of the disease (Breteler, 1992; Jorm, 1995 and Lautenschlager, 2002).

5 Conclusion

This review has been performed to display the impact of different risk factors for men and women on their physiological, psychological and mental health. Several sociodemographic, socioeconomic and behavioral factors have been examined for the three fields of health with a special focus on sex differences.

Concerning physiological health a systematic review has been performed. The results of the studies included in the review have been analyzed with the method of meta-analysis. This was necessary to obtain a mean value over all effect sizes included to estimate the effect of the considered risk factors for men and women on the health transitions of physiological health which are: from health to disabled, from healthy to dead, from disabled to healthy, and from disabled to dead. The following risk factors have been examined for men and women separately: age, education, marital status, body mass index, and smoking.

Concerning the impact of age no differences between men and women have been found. Age has the same effect on health for men and for women. Also for marital status no gender differences have been found. However, results were only available for the transitions from healthy to disabled and from healthy to dead. The question remains open whether there are differences for recovering from disability of for dying disabled.

The analysis of the impact of education on physiological health revealed differences for men and women for the transition from healthy to dead. It appears that being low educated seems to have a protective effect for women but not for men. However, for the remaining health transitions no significant differences for men and women exist.

Regarding body mass index/obesity no evidence exists to determine sex differences. This is due to a lack of studies examining the effect of body mass index on the health of men and women separately and for the four health transitions. Also for the risk factor smoking not enough information are available. We only were able to compare the influence of smoking on the transition from healthy to disabled. No differences between the sexes can be found.

Concerning psychological health literature has been reviewed to get information on gender differences in becoming depressive under the impact of the risk factors age,

biological factors, education, marital status, social support, and employment status. For age no gender differences were found in previous research. Also for biological factors no clear indication is given. It is assumed that genetic factors might have an indirect influence on the development of depression for men and women.

Evidence was found that being married holds a higher risk of becoming depressive for women than for men which is explained with their social role in marriage. However, there is no consensus about who suffers more from being not disabled.

Also no clear direction of a different impact of social support on men's and women's health was found. However, it is clear that a lack of social support has a negative effect on emotional well-being.

For employment status there are studies with results indicating that unemployment has a higher negative impact on men's than on women's health. On the other hand there are studies with opposite findings.

Concerning mental health the focus of our work is set on dementia. It can be concluded that there is no evidence for gender differences in general. When looking at subgroups of dementia women show a higher risk of developing Alzheimer's Disease and men are more likely to develop Vascular Dementia. It was found that with increasing age especially after age 65 the incidence or prevalence of dementia increases. Therefore, age is very important factor of mental health.

In this review risk factors have been presented. Mostly, results were reported that have controlled for further confounding factors. Apart from that it would be more interesting to get to know about gender differences in interaction effects of risk factors. For example, for men behavioral factors act differently than for women. This is also true for a number of social and sociodemographic factors. Social role patterns act differently for both sexes. They may have different impacts on further confounding factors. Therefore, a goal of scientific work should be to examine the influence of combinations of risk factors. However, this work is possibly limited by lack of information and too small sample sizes.

Further research is required concerning gender differences in the influence of risk factors. This review has confirmed that in general gender differences in health exist. However, the patterns of gender differences in risk factors are not well-established.

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