Epidemiological studies of sexuality in old age

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“Sexuality is a fundamental need, natural as eating and sleeping. It is certain that we changes with advancing age, both mentally and physically, but sexuality does not disappear at a certain age. Having the opportunity to live out one’s sexuality can be seen as realization of own human potential. Sexuality is closely connected to love and connectedness. Being able to give and receive love is an individual ability which is not age related”

Åke Rundgren,
MD, PhD in Geriatrics [1]

ABSTRACT

Aim: The overall aim of this thesis was to improve knowledge about sexuality in an older population and to try to understand the context and factors, affecting sexuality in general population. It is based on three studies of general populations in Gothenburg. The multidisciplinary H70 studies (longitudinal gerontological and geriatric studies) were used for paper I and III. The 95+ study for paper II and the Prospective Population Study of Women were used for paper IV.

Methods: H70 studies started in 1971-72 with the aim of studying health and health related factors in a population of 70-year-olds. 70-year-olds were also examined in 1976-77, 1992-93, and 2000-2001. Total n=1 506 eligible for examination. The study on 97-year-olds comprises those born between July 1, 1901 and December 31, 1909. Eligible for the study was n=911, among those n=591 participated (response rate 64.9%). Study IV is part of the Prospective Population Study of Women. In 1968–69, a representative systematically selected sample of 710 women aged 38 years (born 1930), 46 years (born 1922), and 50 years (born 1918). All studies included physical and psychiatric examinations. Individuals with dementia were excluded in the analysis of sexuality. All studies are based on representative population living in Gothenburg, systematically obtained from the Swedish Population Register.

Results: *Paper I and III* In the time period 1971-2 and 2000-1, sexual activity in men increased from 47% to 66%, and in women 12% to 34%. Sexual activity was related to positive attitude toward sexuality, having a very happy relationship, having a physically and mentally healthy partner, being married or cohabiting. *Paper II* Almost half of the sample had a positive attitude towards sexuality and considered it to be normal for people at their own age to have sexual interest and needs. 88% of the men and 82% of the women considered questions on sexuality in a health survey to be positive and natural. *Paper IV* Sexuality in middle-aged and older women is dependent on a number of basic conditions, such as general well-being, physical and mental health and quality of the relationship or life situation.

Conclusion: Quantity and quality of sexual experiences among 70 year olds improved over a 30 year study period. It is important to have a multifactorial, a multidisciplinary approach in the exploration of mid- and late life sexuality. A great majority find it natural to include questions on sexuality in health examinations why health professionals should not hesitate to ask about sexual concerns despite age.

Keywords: Old people sexuality, Midlife Women, Sexual concerns in human senescence, Cross-sectional, General Population.
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SAMMANFATTNING PÅ SVENSKA

Det övergripande syftet med den avhandlingen är att öka kunskapen om sexualitet hos äldre och att försöka förstå sammanhang och faktorer som påverkar sexualiteten hos den äldre allmänheten. Den är baserad på tre studier av allmän population i Göteborg. Den multidisciplinära H70 studien (longitudinell gerontologisk och geriatrisk studie) användes för artikel I och III, 95+ studien för artikel II och den prospectiva populationsstudien av kvinnor (PPSW) användes för artikel IV.

Metod: H70 studien startade 1971-2 med syfte att studera hälsa och hälsorelaterade faktorer i en befolkning på 70 år. 70-åringar var också undersökta 1976-7, 1992-3 och 2000-1. Totalt 1 506 blev utvalda till undersökning. Studien av 97-åringar består av dem som var födda mellan första juli 1901 och sista december 1909. Möjliga att nå för studien var 911 personer, av dessa deltog 591, (svarsfrekvens 65 %). Studie IV är en del av Kvinnostudien (PPSW). 1968-9 inbjöds kvinnor i medelåldern att delta i en hälsoundersökning. Av dessa blev ett representativt antal, systematiskt utvalda för psykiatrisk undersökning. 710 kvinnor, födda 1918, 1922 och 1930. Alla studier inkluderade fysiologisk och psykiatrisk undersökning. Personer med demensdiagnos var exkluderade från studien av sexualitet.

Resultat: *Artikel I och III*, under tidsperioden 1971-2 till 2000-1 ökade andelen män som var sexuellt aktiva från 47 % till 66 %, och hos kvinnorna var ökningen från 12 % till 34 %. Sexuell aktivitet var relaterad till en positiv attityd till sexualitet, ett mycket lyckligt förhållande, en fysisk och psykiskt frisk partner och att ha en fast partner. *Artikel II.* Nästan hälften av alla hade en positiv attityd till sexualitet och ansåg att det var normalt för personer i deras egen ålder att ha sexuella intressen och behov. 88 % av männen och 82 % av kvinnorna ansåg frågor om sexualitet i en hälsoundersökning vara naturligt. *Artikel IV.* Sexualitet bland medelålders och äldre kvinnor var beroende av ett antal grundläggande förhållanden, så som allmänt välmående, fysisk och psykisk hälsa och kvaliteten på relationen till partner eller livssituationen.

Konklusion: Kvantitet och kvalitet på sexualiteten bland 70-åringar förbättrades över den 30 åriga studieperioden. Det är viktigt att ha en multifaktoriell och en multidisciplinärt synsätt vid utforskandet av sexualitet i medelåldern och äldre. En stor majoritet av de äldre anser det vara naturligt med frågor kring sexualitet i en hälsoundersökning, varför läkare och sjuksköterskor inte ska tveka att fråga om sexuella problem, oavsett ålder.

LIST OF PAPERS

This thesis is based on the following studies, referred to in the text by their Roman numerals.

I. Nils Beckman, Margda Waern, Deborah Gustafson, Ingmar Skoog. Secular trends in self reported sexual activity and satisfaction in Swedish 70 year olds: cross sectional survey of four populations, 1971-2001.
BMJ, 2008. 337: p. a279.

II. Nils Beckman, Margda Waern, Svante Östling, Valter Sundh, Ingmar Skoog. Sexuality in 97-year-olds; a population-based cross-sectional study in Gothenburg, Sweden.
In manuscript

III. Nils Beckman, Margda Waern, Svante Östling, Valter Sundh, Ingmar Skoog. Determinants of sexual activity in four birth cohorts of Swedish 70-year-olds examined 1971-2001.
J Sex Med, 2014. 11(2): p. 401-10.

IV. Nils Beckman, Margda Waern, Svante Östling, Valter Sundh, Hanna Falk, Tore Hällström, Ingmar Skoog. Childhood and midlife factors in relation to sexuality in mid- and late life. A population-based study of women followed over 24-32 years.
In manuscript

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ABBREVIATIONS

ADL	Activities for Daily Living
BMI	Body Mass Index
CI	Confidence Interval
CAMDEX	Cambridge Mental Disorders of the Elderly Examination
CPRS	Comprehensive Psychiatric Rating Scale
DSM III-R	Diagnostic and Statistical Manual of Mental Disorder, Third Edition, Revised
DSM IV	Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition
EPI	Eysenck Personality Inventory
FSD	Female Sexual Dysfunction
GBS	Gottfries-Bråne-Steen Scale
HRQL	Health Related Quality of Life
MD	Major Depression
OR	Odds Ratio
PEF	Peak Expiratory Flow
PPSW	Prospective Population Study of Women
SAS	Statistic Analysis System
SBP	Systolic Blood Pressure

1 INTRODUCTION

Sexuality has historically been surrounded by regulations, condemnations and taboos, based on philosophical and religious ideas. In early Christianity there were very definite beliefs about, and rules for sexuality and sexual behaviour. One of the most important Church Fathers and philosopher in Latin Christianity, Saint Augustine (354-430 AD) stated that the Christian ideal was the celibacy. For those who could not achieve this, reproduction within the marriage was the purpose of sexuality. In the mid 13th Century Tomas of Aquino declared: God has given Humans, sexual feelings in the purpose of reproduction, which was the natural, good and rational sexuality, to live out one's sexual desire just for pleasure was irrational, unnatural and a sin [2]. The real origin of this attitudes toward sexuality is believed to be much older, beliefs were expressed in the various dualistic philosophies such as Zoroastrianism, which arose in the eastern region of the ancient Persian Empire (6000-1200 BC, (the sources of time epoch are diverse)), which separated matter from spirit, body from soul, women from men, pleasure from reproduction, and sex from God, as evil from good. The philosophy is assumed to have influenced early Judaism and ancient Greece [3]. Aristotle believed that sexual activity should end for women at menopause and for men between 45 and 55 years [4]. In medieval thought, sexuality was primarily for reproduction, and should cease when procreation was no longer possible. Before the 20th century, individuals did not live beyond the reproductive years, and sexuality in old people was not an issue [5]. Unfortunately, the attitude towards older people's sexuality has survived until modern time. Cultural attitudes that revere reproduction and youthful good looks may contribute to the expectation that older people are, or ought to be, asexual [6].

Human senescence has been delayed by a decade, and people are reaching old age in better health [7] and attitudes to sexuality have changed dramatically in Western societies during the 20th century. This may have had impact on sexuality, which is important for well-being, self-esteem, and maintenance of good relationships and quality of life [6, 8]. During that time changing patterns of sexual behaviour were reported in adolescence and young adulthood, such as earlier age of first sexual intercourse [9-11]. Since the late 1940s several population-based studies on sexual behaviour have been performed. Among those most known are Kinsey Reports on Sexual Behviour in the Human Male 1948 [12] and Sexual Behaviour in Human Female 1953 [13], Masters & Jonson, Human Sexual Responce in the 1960s. [14]. And the Swedish study, Sex i Sverige 1996 [10]. Although they were large population studies there was just a small number of old people included. However there are other studies showing that older people both have desire and are sexually active, as the Duke studies in the 1960s [15-19], the multidisciplinary longitudinal gerontological and geriatric H70 studies in the 1970s [20] and The Consumers Union Report 1984 [21], Bretschneider & McCoy 1988 [22] and the Janus Report [23]. All these studies include older people but many of them are primarily based on selected groups.

1.1 Prevalence of sexuality

The knowledge of sexual behaviour in older people has improved. Recent data from the US National Social life, Health and Aging Project (NSHAP) indicate that more than half of people aged 57-85 years and about one third of those aged 75-85 are sexually active and that physical health is significantly

correlated with sexual activity and many aspects of sexual function, independent of age [24].

Knowledge about sexual behaviour in older people is still limited and even less is known about secular trends in sexual behaviour in this age group. Older participants in surveys on sexual behaviour developed their views during the early part of the 20th century and could be expected to have different views from those born later. Negative attitudes towards sexuality learned at young age may seriously impair the ability to enjoy sex in later life [6]. The Duke longitudinal studies, carried out in the 1950s and 1960s, suggested secular trends in sexual activity among elderly people on the basis of a relatively small number of participants [15-18]. We examined secular trends in sexual behaviour (intercourse, age of sexual debut, sexual satisfaction, and some sexual dysfunctions) and attitudes toward sexuality in later life among four samples representative of the general population and found that sexual activity among married 70-year-olds increased from 52% to 68% in men, and from 38% to 56% in women, from 1971–1972 to 2000–2001 [25]. In the later-born cohort, 66% of all men and 34% of all women were sexually active [25]. These figures are remarkably similar to a recent large U.S. study [26], but higher than in a study on older, Chinese men [27]. The one year prevalence of sexual intercourse in the two earliest birth cohorts was similar to that among septuagenarians reported from studies in the 1950s and 1980s [15, 19, 28]. In the two younger birth cohorts the prevalence is similar to a European study in 2001-2 [29] and a US study in 2005-6 [24]. Whether or not older couples continue to be sexually active seems to a large extent to be determined by men [30]. In agreement with previous reports self reported sexual activity was more common in men, regardless of marital status [15, 16, 18, 24, 28, 29, 31-33]. Differences between the sexes in self reported sexual behaviour, however, decreased from 1971 to 2001 among the

70-year-olds in our study [25]. Overall, men reported an earlier age of sexual debut and a higher proportion of premarital sex than women in the 1970s, but this sex difference diminished among those in later born samples. Recent studies on adolescents report that women experience first sexual intercourse at a younger age than men [9-11]. Finally, whereas 70 year old men in the 1970s more often reported positive attitudes to sexuality than women, there were no sex differences in attitudes in 2000-1 [25].

Most of these data are derived from younger old people aged 60-80 years and most of them show that sexual desire and activity remain into old age. The Kinsey studies [12, 13] included more than 10 000 subjects, but only 8 were above age 80. Masters & Jonson [14] included only 15 men above age 80; information on the number of women in this age group was lacking. The Duke Study on sexuality included 260 community volunteers who were 60 years and older at study inception [15-18]; 118 were above age 78.

The longitudinal H70-study in Gothenburg, Sweden, which started in the 1970s, was one of the first studies in an elderly general population which included questions on sexuality [20]. As part of that study, 85-year-olds without dementia (n=321) were examined in the mid 1980s. Among married individuals, sexual feelings were reported in 46 % of the men and 24 % of the women, and sexual intercourse in 23 % of the men and in 10 % of the women [34]. Consumers Union Report [21], Love, Sex, and Aging included men and women aged 50 to 93 years, n=689 age 71-80 years and 79 above 80. They found that some men and women in their eighties continued to engage in and enjoy a wide range of sexual activities. In 1988, Bretschneider et al [22] reported, in a study on 202 healthy 80-102 year olds, that 62 % of the men and 30 % of the women above age 80 were involved in sexual intercourse, at least sometimes. However, the study was based on white upper middle class

people living in residential homes, and 42 % answered that living in a retirement home increased their chances for engaging in sexual activity. Diokno et.al [28] reported on a subsample, from a large study on incontinence, who answered questions on sexuality, 296 men and 448 women age 60 and older that sexual activity decreased with age in both sexes. Among those married and aged 80 years or more (14 men and 4 women), four men and one woman were engaged in sexual activity. In the study of Lindau et.al [24] that focused on 75-85 year olds (308 men and 513 women) sexual activity was reported by 38.5% of the men and 16.7% of the women. In a recent study on sexual behaviour on 14-94 year-olds (n=2 936 men and n=2 929 women) they found that vaginal sex progressively declined among older age groups, masturbation was common throughout the lifespan, and more common than partner related sexual activities in adolescence and after age 70 years. [35]. A German community survey [36] with a representative sample of men and women aged 18-93 years (n=2 341) found that sexual desire declined with advancing age; overall, men reported more frequent and stronger sexual desire than women. For both men and women, sexual activity in older participants was mostly an issue of the presence of a partnership. Some studies included nonagenarians, but gave no information on the frequency of sexual activity after age 90 years.

In our study of 97-year-olds we found that current sexual desire was more common in men (27%) than in women (5%). Only one man and no woman were sexually active. One fourth of the men and one in seven women reported to miss their sexual activity. Sexual dreams at night were reported by 7% of the men and 4% of the women. Sexual thoughts were reported by one third of the men and almost one fifth of the women. Almost half of the sample had a positive attitude towards sexuality and considered it to be

normal for people at their own age to have sexual interest and needs. Among all responders, 88% of the men and 82% of the women considered questions on sexuality in a health survey to be positive and natural.

1.2 Determinants for sexual activity

Most studies show that sexual desire and activity can remain into old age [24, 25]. The proportion sexually active has increased among older adults during the 20th century [24, 25]. At the same time, most studies show that sexual activity declines with increasing age [28, 37, 38]. Although there is a decline in sexual activity with increasing age, this is not necessarily due to ageing per se, although the aging process affects the physiology of male and female sexual response and function [39]. In addition, a number of medical conditions that become more prevalent with age, play a significant role in the pathogenesis of sexual disorders in the elderly [39]. In middle aged women we found that sexual desire and activity was related to a large number of factors pertaining to childhood adversities, and midlife family-social situation, health, sexuality and personality, however only few of the factors measured in midlife had impact on old age sexuality. Women's sexuality in midlife is relatively well explored in relation to medical conditions and menopausal related problems. In a literature review on menopausal sexuality, it was suggested that lower oestrogen levels diminished sexual responsiveness and sexual desire [40]. Others report that most aspects of female sexuality are not affected by age, menopausal functioning or hormone levels [41]. Factors suggested to affect midlife sexuality are health status and current medications, social status, cultural attitudes, and dissatisfaction with partner relationship [40]. Hällström [42] reported that sexual desire and

capacity for orgasm decreased from pre- to postmenopausal time. The relation seemed to exist primarily with biological, not chronological age.

In old age, a large number of factors, such as gender, marital status, physical and mental health, previous sexual experience, attitudes towards sexuality, life satisfaction, psychosocial, cultural and economic factors as well as social and interpersonal relations are known to have impact on sexuality [20, 25, 26, 28, 31, 32, 43-55].

It is well known that marital status is a major determinant for sexual activity in old age [18, 22, 25, 28, 31, 32, 45-47, 50, 55-58], especially in women. Among married/cohabiting persons, we found that all partner related factors studied were important in both men and women [43]. In a Chinese study, there were similar findings among married, middle-aged women but not among men [59]. Several studies report that both men and women disclose that the reason for ceasing sexual intercourse in old age most often is male related [17, 19, 25]. This might be an expression of the fact that men in these generations in general take initiative to intercourse [15, 16, 19, 21, 53]. The length of the relationship might also be of importance. A French study [60] reported that individuals living in new relations, including those aged over 70 years, had more frequent sexual intercourse.

Many physical and mental disorders and their treatments have negative impact on sexual activity [61-66]. A German community study on aging men reported that sexual and partnership satisfactions were compromised in men who were dissatisfied with their health [58]. In a national Danish population study, factors related to seldom having sexual desire included psychological and physical distress in both genders [67]. Decreased sexual activity and desire is part of the symptoms of depression. Several studies have reported on

a negative association between depression and sexuality [43, 68, 69]. Diabetes mellitus and coronary heart disease have often been reported in other studies [49, 58, 59]. In a US study, women with diagnosed diabetes were less likely than men with diagnosed diabetes to be sexually active and prevalence of orgasm was similarly elevated among men with diagnosed and undiagnosed diabetes compared with that for other men, but erectile difficulties were elevated only among men with diagnosed diabetes [70]. These disorders and lifetime smoking may influence the vascular system and thus affect the sexual organs. We found that coronary heart disease, diabetes mellitus, a sum score of physical disorders, and lifetime smoking were associated with less sexual activity, with no difference in associations between men and women, but the associations are less strong than in many clinical studies [43]. A Chinese population study found that physical health condition was not related to sexual activity [51]. Thus, many older people in the population remain sexually active despite having physical disorders. In 70-year-olds we found that self-reported good health and interviewer-rated good mental health were associated to higher sexual activity.

Strong sexual desire at age 20–30 years in the 1970s and sexual debut before age 20 among not married/cohabiting were related to higher sexual activity. It has consistently been reported that previous sexual experience is important for sexual behaviour in old age [22, 31, 53, 56, 71], including higher sexual desire in young adulthood [31, 50], higher frequency of intercourse in young adulthood and midlife in men [28, 35, 46, 51, 56, 71], and higher satisfaction with intercourse in young adulthood among women [20]. Sexual desire and sexual activity in midlife women were associated to higher desire and activity in late life. Sexuality in younger ages may reflect a lifelong higher desire, a positive feedback from the earlier experience or personality factors.

2 AIM

The overall aim of this thesis was to improve knowledge about sexuality in an older population and try to understand the context and factors affecting sexuality in general population.

- *Paper I*
  To study secular trends in self-reported sexual behaviour in four birth cohorts of 70-year-olds over a time period of 30 years.
- *Paper II*
  To study the prevalence of sexual activity, sexual feelings and attitudes toward sexuality in 97-year-olds without dementia.
- *Paper III*
  To investigate determinants of sexual activity in four birth cohorts of non-demented 70-year-olds examined 1971-1977 and 1992-2001
- *Paper IV*
  To explore associations between self-reported childhood adversities, sexual behaviour, social factors, mental and physical health in midlife and sexuality in mid- and late life.

3 SAMPLES AND METHODS

This thesis is based on three studies of general populations in Gothenburg. The multidisciplinary H70 studies (longitudinal gerontological and geriatric studies) were used for paper I and III. The 95+ study for paper II and the Prospective Population Study of Women were used for paper IV.

3.1 Paper I and III

H70 studies started in 1971-72 with the aim of studying health and health related factors in a population of 70-year-olds from Gothenburg, Sweden. The population was representative of 70-year-olds living in Gothenburg and included both people living in their own homes and those living in institutions. Representative population samples of 70-year-olds living in Gothenburg were also examined in 1976-77, 1992-93, and 2000-2001. Table 1 shows characteristics according to the Swedish population register. Table 2 lists the self-reported characteristics of the 70-year-olds by sample.

Birth cohort I: All 70-year-olds living in Gothenburg and born between July 1st, 1901 and June 30th, 1902 on dates ending with 2, 5 or 8 were invited to a health examination in 1971-72. The individuals were numbered consecutively (1, 2, 3, 4, 5, 1, 2, etc.) and those with numbers 1 and 2 (n=460) were invited to take part in a psychiatric examination. Out of these, 392 (85.2%) persons participated (166 men and 226 women)[20].

Table 1 Characteristics of 70-year-olds from Gothenburg, Sweden, participating or not in four cross sectional samples surveyed in 1971-2, 1976-7, 1992-3 and 2000-1
Values are numbers (percentages)

	Year of examination							
	1971 -72		**1976 – 76**		**1992**		**2000**	
Variable	**Participants (n=392)**	**Non-participants (n=68)**	**Participants (n=404)**	**Non-participants (n=109)**	**Participants (n=249)**	**Non-participants (n=132)**	**Participants (n=500)**	**Non-participants (n=267)**
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Women	226 (58)	41 (60)	227 (56)	72 (61)	249 (100)	132 (100)	271 (54)	127 (48)
Marital status								
Married	225 (58)	34 (50)	230 (57)	62 (57)	135 (54)	56 (42) *	299 (60)	139 (52) *
Widowed	93 (24)	17 (25)	101 (25)	24 (22)	64 (26)	34 (26)	73 (15)	38 (14)
Divorced	16 (4)	3 (4)	31 (8)	10 (9)	35 (14)	28 (21.2)	99 (20)	50 (19)
Never married	58 (15)	14 (21)	42 (10)	13 (12)	15 (6)	14 (11)	29 (6)	40 (15) ***
3-year mortality	27 (7)	6 (9)	25 (6)	8 (7)	7 (3)	5 (4)	8 (2)	12 (5)

*=P<0.05, **P<0.01, ***P<0.001. (Fisher's exact test) for difference in proportions within birth cohorts between participants and non-participants.
±From Swedish population register

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Table 2. Self reported characteristics of four samples of 70-year-olds from Gothenburg, Sweden, examined in 1971-2, 1976-7, 1992-3 and 2000-1. Values are numbers (percentages) unless stated otherwise

	Men				Women				
Variable	1971 – 72 (n=161)	1976 – 77 (n=174)	2000 (n=225)	Cohort trend P value*	1971 – 72 (n=221)	1976 – 77 (n=222)	1992 (n=241)	2000 (n=262)	Cohort trend P value*
Marital status:									
Married	125 (78)	132 (76)	167 (74)	0.469	90 (41) ***	92 (41) ***	130 (54)	120 (46) ***	0.034
Cohabitating	0	2 (1)	14 (6)	0	2 (1)	1 (1)	6 (3)	13 (5)	0
Live apart	0	0	12 (5)	0	0	0	2 (1)	7 (3)	0.001
Widowed	16 (10)	19 (11)	4 (2)	0	76 (34) ***	85 (38) ***	61 (25)	70 (27) ***	0.002
Divorced	8 (5)	9 (5)	24 (11)	0.013	10 (5)	17 (8)	34 (14)	43 (16)	0
Never married	12 (7)	12 (7)	4 (2)	0.004	43 (20) ***	27 (12)	8 (3)	9 (3)	0
Having a very happy relationship	49 (40)	35 (26)	109 (57)	0	32 (35)	30 (32)	69 (52)	71 (52)	0
Having a younger partner > 5 years	38 (31)	26 (19)	34 (18)	0.033	5 (6) ***	4 (4) **	-	5 (4) ***	0.864
Having a older partner > 5 years	4 (3)	5 (4)	12 (6)	0.168	19 (21) ***	22 (24) ***	-	44 (31) ***	0.058
Mean age of partner (years)	65.9	67.1	67.6	0.016†	71.3 ***	71.9 ***	-	72.3 ***	0.215 †
More than basic education	25 (16)	31 (18)	87 (43)	0	27 (13)	38 (18)	75 (38)	91 (39)	0
Depression‡	2 (1)	4 (2)	8 (4)	0.121	19 (9)	19 (9)	26 (11)	22 (10)	0.585

**=p<0.01, ***=p<0.001 (Fisher's exact test) Sex difference within birth cohort

*Cochran-Armitage X^2 for trends

† Test for group difference with asymptotic permutation *t*-test

‡Depression diagnosed according *to Diagnostic and Statistical Manual of Mental Disorders, third edition, revised*.

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Birth cohort II: All 70-year-olds living in Gothenburg and born between July 1st, 1906 and June 30th, 1907 on dates ending with 2, 5 or 8 were invited for a health examination in 1976-76. The selection procedure was similar as for Cohort I. Out of 513 invited for a psychiatric examination, 404 (78.8 %) participated (177 men and 227 women [72].

Birth cohort III comprised 70-year-old women only: All 70-year-old women living in Gothenburg and born 1922 on day 6, 12, 18, 24 or 30 each month were invited to a health examination 1992-93. Out of 381 women invited for a psychiatric examination, 249 (65.4%) participated [25].

Birth cohort IV: All 70-year-olds living in Gothenburg and born in 1930 on day 3, 6, 12, 18, 21, 24, or 30 each month, were invited to a health examination in 2000-2001. Out of 767 invited, 500 (65.2%) participated in the psychiatric examination (229 men and 271 women) [25].

Responders and non-responders in each of the four samples were similar regarding sex, marital status in cohort I and II, (non- participants in birth cohorts III and IV were less often married), and 3-year mortality rate, based on information from the Swedish Population Register. Responders and non-responders in Cohort I and II were further compared with regard to income, municipal rent allowance, previous outpatient and in-patient psychiatric care and registration with the Temperance Board for alcohol abuse. There were no significant differences between responders and non-responders regarding these factors. Responders and non-responders in cohort III and IV were compared with regard to in-patient psychiatric care during the past two years according to the Swedish Hospital Discharge Register. No differences were found.

Dementia was diagnosed according to CAMDEX criteria [73] in the 1970s and according to Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R) [74] in 1992–2001, as described previously [75], and was only used as an exclusion criterion.

Informed consent was obtained from all subjects. The study was approved by the Ethics Committee for Medical Research at Göteborg University.

3.1.1 General examinations

The general examinations included a home visit by a nurse (first three samples), physical examinations by geriatricians, psychiatric examinations by psychiatrists (psychiatric nurses in last sample), neuropsychological examinations by psychologists, dental examination by dentists, and laboratory tests including electrocardiography, chest radiology, and extensive biochemical evaluations.

3.1.2 Psychiatric examination

The semi structured psychiatric examination included assessments of psychiatric symptoms and signs and assessment of cognitive function and a history of previous and current disorders, drug use as well as questions on sexual behaviour.

3.1.3 Questions on sexuality

Participants were asked about their attitudes toward sexuality in later life, frequency of intercourse during the past year, and age of sexual debut and its timing in relation to marriage. Sexual activity was defined as having had intercourse during the past year. Intercourse was defined as sexual contact between individuals, most often with penetration. Questions asked in the examinations of all but the first sample were about whether or not sexuality was a positive or negative factor in life, satisfaction with intercourse, sexual dysfunction (including erectile dysfunction, difficulties with ejaculation, premature ejaculation in men, and orgasmic dysfunction in women), and reason for cessation of intercourse.

3.1.4 Statistics

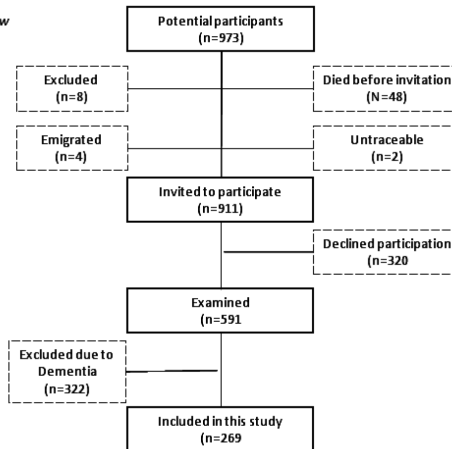
Paper I. Differences in proportions were tested for significance using Fisher's exact test. Within cohort trends were tested with Cochran-Armitage Chi-square. Differences in age of first sexual intercourse were tested for column trend with asymptotic permutation test of trend. Data were analysed by strata of sex and marital status. Binary logistic regression models were used to study the odds of reporting sexual intercourse by birth cohort, marital status, male sex, first sexual intercourse before age 20, positive attitude towards sexuality, diagnosis of depression, and educational. The associations are presented as odds ratios (ORs) and 95% confidence intervals (CIs).
Two-tailed tests were used in all analyses. Results were considered significant at $p<0.05$.

3.2 Paper II

The study is part of the 95+ study which started in 1996 in Gothenburg [76]. From the year of 1996 those recorded as residents in Gothenburg who had reached the age of 95 were invited for participation in a health survey. The study has continued at age 97 and 99-years old, then annually life-long. Names and addresses were obtained from the Swedish population register.

This study on 97-year-olds comprises those born between July 1, 1901 and December 31, 1909 (with the exception of those born 1904). Both persons living at home and in institutions were included. (N=973, 156 men and 817 women). Of these, eight individuals were excluded as they could not speak Swedish, four had emigrated, two could not be traced and 48 died before they could be contacted, leaving 911 (147 men and 764 women) eligible for the study. Among those, 591 (107 men and 484 women) participated (response rate 64.9%). Participants more often had a diagnosis of dementia according to the Swedish hospital discharge register than non-participants (16% vs. 11%; p=0.01), and men had a higher response rate than women (72.8% vs. 63.3 %; p=0.03). Participants and non-participants were similar regarding two year mortality (52.8% vs. 50.9% p=0.627). The study has been described in detail previously [77, 78]. In the present study, individuals with dementia (n=322) were excluded, leaving 269 individuals (72 men and 197 women) (Figure 1) for analyses of sexuality.

Figure 1. Participant flow



3.2.1 General examinations

All participants were examined by trained psychiatric research nurses, supervised by neuropsychiatrists. The examination included physical examinations, neuropsychiatric examinations and history of previous and current disorders, prescription drug use, assessments of activities of daily living and social factors, and questions on sexual behaviour.

3.2.2 Psychiatric examination

The semi-structured examinations included ratings of psychiatric symptoms and signs in accordance with the Comprehensive Psychopathological Rating Scale (CPRS) [79] and assessment of cognitive function. The Gottfries-Bråne-Steen Scale (GBS) [80] was used to measure intellectual and emotional functioning, and activities of daily living. In the present study, we

used four items related to motor functioning (dressing, eating, personal hygiene, control of bladder and bowel).

3.2.3 Questions on sexuality

Regarding sexuality, all participants were asked about their attitudes towards sexuality in their own age, sexual desire, frequency of sexual intercourse during the last year, whether the participant miss sexual activity or not, nocturnal sexual dreams, thoughts about sex during day time, other types of close tenderness and closeness (e.g. hugging, kissing, holding hands and physical contact), and their opinion about inclusion of questions on sexuality in the study. Sexual activity was defined as having had sexual intercourse during the last year. Questions on sexuality were not asked if a third party were present in the room during the examination.

3.2.4 Statistics

The diagnosis of dementia was made according to the criteria of the Diagnostic and Statistical Manual of Mental Disorder 3rd edition, revised [74], as described previously [81]. Dementia was used only as an exclusion criterion.
Differences in proportions were tested for significance using Fisher's exact test. Two-tailed tests were used in all analyses. Results were considered significant at $p<0.05$. Statistical analyses were done with SAS for Windows (SAS Institute Inc., Cary, NC, USA) [82].

3.3 Paper III

Sample, method and examinations are the same as in Paper I.

Table3. Characteristics of population samples of 70-year-olds without dementia in Gothenburg Sweden.

	Men		**Women**	
Examination year	1971-2/1976-7	2000-1	1971-2/1976-7	1992-3/2000-1
	% (n/N)	% (n/N)	% (n/N)	% (n/N)
Sexually related	N=325	N=203	N=422	N=457
Positive attitude towards sexuality	81% (256/317)	97% (196/203)	64% (268/419)	92% (421/457)
Sexually intercourse during past year	48% (155/325)	66% (133/203)	18% (74/422)	35% (167/457)
Sexual debut before age 20	55% (170/311)	76% (155/203)	23% (95/407)	56% (254/454)
Strong sexual desire age 20-30*	24% (36/148)	74% (151/203)	3% (7/205)	29% (65/224)
Premarital sexuality	91% (289/317)	94% (190/203)	62% (254/412)	86% (387/452)
Partner related†	N=252	N=176	N=181	N=243
Very happy relationship	33% (83/252)	58% (102/176)	33% (60/181)	51% (125/243)
Physically healthy partner	58% (143/252)	48% (85/176)	58% (104/180)	35% (85/242)
Mentally healthy partner	86% (217/252)	83% (146/176)	81% (145/180)	78% (189/241)
Older partner (>3years)‡	4% (11/252)	9% (15/176)	41% (74/181)	43% (49/115)
Younger partner (>3years)‡	69% (171/252)	51% (89/176)	18% (33/181)	14% (16/115)
Health related	N=325	N=203	N=422	N=457
More than one physical illness	44% (142/325)	36% (73/203)	28% (119/422)	22% (99/457)
Coronary Heart Disease	26% (84/325)	23% (46/203)	24% (102/421)	15% (67/443)
Hypertension	79% (256/324)	66% (135/200)	87% (368/421)	76% (325/430)
Diabetes Mellitus	7% (23/325)	10% (21/202)	6% (24/421)	8% (34/437)
Prostate Disease (no cancer)	17% (54/325)	21% (42/202)	-	-
Chronic Obstructive Lung Disease	15% (50/325)	9% (18/201)	7% (30/421)	14% (63/435)
Overweight BMI≥25	58% (189/324)	66% (134/202)	56% (235/421)	62% (271/436)
Self- reported good global health	80% (260/325)	83% (155/187)	74% (312/421)	76% (324/418)
Interviewer rated good mental health	76% (252/325)	86% (175/203)	54% (226/422)	75% (341/457)
Depression (major or minor)	7% (22/325)	7% (15/203)	18% (75/422)	16% (74/457)
Other factors	N=325	N=203	N=422	N=457
Median age of partner (years)	67	68	72	72³
Married/Cohabiting	78% (252/325)	82% (166/203)	43% (181/422)	53% (242/457)
Divorced (anytime)	10% (31/325)	25% (50/203)	11% (48/422)	29% (131/457)
Satisfied with sleep	77% (251/325)	71% (143/201)	56% (236/422)	56% (255/455)
Current smoker	45% (146/325)	14% (27/199)	11% (45/421)	17% (71/430)
Life-time smoker§	79% (256/325)	67% (134/199)	18% (76/421)	43% (184/430)
Alcohol intake ≥ 3 times/week	41% (133/325)	60% (117/195)	25% (104/421)	34% (152/447)
More than compulsory education	17% (54/325)	42% (86/203)	15% (64/422)	35% (159/457)

n/N events/Cases
*Question not asked 1976-7 and 1992-3
†Data are for the subgroup who reported that they had a current partner
‡Data on age of partner missing in 1992-3
§Ever been a smoker
BMI=body mass index

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3.3.1 Procedures

Partner-related factors included satisfaction with the relationship ("very happy" vs. "ordinary or unhappy"), partner's physical and mental health as reported by the participant, and partner's age in relation to own age (≥3 years older vs. ≤3 years younger). Partner's global physical health was dichotomized as healthy or minor symptoms vs. illness interfering with daily life or social functioning, or severe illness or hospitalization due to illness. Partner's global mental health was defined as healthy or minor symptoms vs. severe mental illness, alcohol abuse, dementia, or hospitalization due to mental illness. Assessment of health included coronary heart disease defined as angina pectoris according to the Rose criteria [34], documented history of myocardial infarction, or electrocardiogram (ECG)-evidence of ischemia(complete left bundle branch block or major Q-waves, pronounced S-wave and T-wave distance [ST]-depression, and/or negative T-waves); hypertension as systolic blood pressure ≥160 mm Hg and/or diastolic blood pressure ≥90 mm Hg in sitting position after 5 minutes rest or taking antihypertensive medication; diabetes mellitus as self-reported or diagnosed by a doctor, being on antidiabetics therapy, or having two fasting blood glucose values ≥7.0 mmol/L; no cancer prostate problems; chronic obstructive pulmonary disease defined as morning cough or taking asthma drugs; overweight as a body mass index >25. A somatic health sum score was created from the variables above (ranging from 0–4 diseases). Depression (major and minor depressive episode) was diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) [35]. Interviewer-rated global mental health and self-reported global health was dichotomized as healthy or minor symptoms vs. illness interfering with daily life or social functioning or severe illness or

hospitalization. Self-reported satisfaction with sleep was also assessed (yes or no). Smoking status was categorized as never vs. previous or current smoker. Alcohol consumption was dichotomized as three times per week or more vs. less than that. Education was dichotomized as compulsory (6 years for those born in 1901–1922 and 7 years for those born in 1930) or higher. Dementia was diagnosed according to CAMDEX [73] criteria in the 1970s and according to Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R) in 1992–2001, as described previously [36], and was only used as an exclusion criterion.

3.3.2 Questions on sexuality

Sexual activity was defined as having had sexual intercourse during the last year. The following factors were analyzed in relation to sexual activity: Sexual history included factors such as sexual debut before age 20, sexual desire in young adulthood (age 20–30 years; defined as no, weak, or average desire vs. rather strong and very strong desire), age at first sexual intercourse and its timing in relation to marriage (defined as premarital vs. marital), and attitude toward sexuality (defined by the question "do you find it natural for people of your own age to have sexual interests and needs?").

3.3.3 Statistics

To increase statistical power we merged birth cohorts I and II into one sample (Cohort 1901–1907), and birth cohorts III and IV into another sample (Cohort 1922–1930). Sexual activity was the dependent variable in all

analyses. Its relation to different determinants was first analyzed in logistic regressions including gender, marital status, and birth cohort. We tested interaction terms for gender, cohort, and marital status in relation to the other independent variables in the model in order to examine whether or not odds ratios differed in magnitude by gender, birth cohort (born 1901–1907 vs. born 1922–1930), or marital status (married/cohabiting/living apart vs. single). If the *P* value for interaction-term was <0.20, data were stratified by cohort, gender, or marital status. In these stratified analyses, the relation between sexual activity and different determinants were analyzed with logistic regressions as described above. Differences with a *P* value <0.05 (two-tailed) were regarded as statistically significant in all analyses. Determinants for sexual activity in a multivariable context were further analyzed in stepwise binary logistic regression. These analyses included all factors associated with sexual activity with *P* value <0.05, with the exception of the variables “older partner,” “younger partner,” “strong desire/ libido in age 20–30 years,” which were not asked in 1976 and 1992. Furthermore, we did not include partner-related factors as these were only asked to persons who were married/cohabiting/living apart. Statistical analyses were done with SAS for Windows [37] (SAS Institute Inc., Cary, NC, USA).

3.4 Paper IV

The study is part of the Prospective Population Study of Women in Gothenburg, Sweden [83]. In 1968–69, a representative systematically selected sample of 899 women aged 38 years (born 1930), 46 years (born 1922), 50 years (born 1918), and 54 years (born 1914) years, and living in

Table 4. Charactaristics for women in midlife, n=710. Baseline examination 1968

Social adversities in childhood	N/n	%		
Poverty	153/628	24.4		
Quarrels between parents	103/564	18.3		
Unhappy childhood	113/634	17.8		
Experience of being misunderstood as a child	267/694	38.5		
Physical punishment	74/706	10.5		
Strict upbringing				
Poor emotional relation to mother	252/662	38.1		
Poor emotional relation to father	347/624	55.6		
Broken home before age 6	100/710	14.1		
Broken home before age 17	196/710	27.6		
More than one childhood stressor	428/710	60.3		
Family social factors				
Married/cohabiting	585/710	82.4		
Partner not supportive	71/549	12.9		
Problems related to children	64/603	10.6		
Problems related to parents/parents-in-law	79/707	11.2		
Other factors				
More than compulsory school	181/710	25.5		
Health related factors				
Major Depressive Episode	51/710	7.2		
Phobia related decreased function	27/706	3.8		
Several episodes of stress last five years	120/706	17.0		
Coronary Heart Disease	18/710	2.5		
Hypertension (160/95) or treatment	131/706	18.6		
Obstructive lung problems	20/710	2.8		
Diabetes Mellitus	1/704	0.1		
Uro-genital disorders	232/706	32.9		
Current smoker last year	286/706	40.5		
Ever been a smoker	335/706	47.5		
Alcohol use once a week or more	377/530	71.1		
Sexually related factors				
Sexual debut age ≤ 20	193/688	28.1		
Sexual desire	462/678	68.1		
Sexually active during last year	554/658	84.2		
Sexually active ≥once a week	249/658	37.8		
Partner strongest desire	363/582	62.4		
Equal desire	164/582	28.2		
Self strongest desire	55/582	9.5		
Usually or always having intercourse just to please partner	124/554	22.4		
Own wish for sexual activity, not taking account to partner, ≥once a week	217/587	37.0		
Own wish for sexual activity, during maximum favourable conditions, ≥once a week	360/554	65.0		
Usually or always orgasm	351/564	62.2		
Anorgasmia epsodes earlier	294/616	47.7		
Having had pregnancy fear	188/640	29.4		
Negative expectations of menopause	175/700	25.0		
Superficial pain during intercourse	43/574	7.5		
Deep pain during intercourse	39/575	6.8		
Continuous variables		Median	Min	Max
Systolic blood pressure	706	130	82	246
Diastolic blood pressure	706	84	54	134
Body Mass Index	706	23.6	14.7	40.2
Peak flow ratio	704	38.5	12.9	54.5
Menarche age	706	14yrs	10yrs	20yrs
Menopause age #	672	50yrs	21yrs	60yrs
Extraversion	688	11.0	2.0	19.0
Neuroticism	688	8.0	0.	23.0
Economy (The household total yearly income, in thousand Swedish Crowns)	700	36	0.	255.

1968 - 2000 Retrospective information

Gothenburg, Sweden, were invited for a health examination including both a physical and a psychiatric examination [84]. The women were systematically selected from the Swedish Population Register based on birth dates. A main reason for the selection of age strata was to obtain information on pre- peri- and post-menopausal women. The attrition was 99 women (11.0%). There were no significant differences in age, socioeconomic status, work outside the home, or history of contact with mental health services among those who participated at baseline in 1968 compared to non-participants [84].

In the present study, those born in 1914 were excluded, (due to difference in age at follow-up) leaving 710 women in 1968. To explore associations between factors in 1968 and sexuality in old age, those born in 1918 (n=154) and 1922 (n=185) were followed up in 1992 (at ages 74 and 70 years) and those born in 1930 (n=77) in 2000-1 (at age 70 years). Reasons for not taking part in the follow-up examinations were death (N=102), and not traceable and refusals (n=192).

3.4.1 General examinations

The general examination in 1968 included physical examinations and interviews performed by, internist, and gynaecologist and dental examination by dentist, psychiatric examinations by psychiatrist, laboratory tests including electrocardiography and extensive biochemical evaluations [83]. Physical examinations at follow-up 1992-3 and 2000-1 were similar to the baseline examination except there were no gynaecological examinations.

3.4.2 Psychiatric examination

The semi-structured psychiatric interview included assessment of psychiatric symptoms and signs, history of current social situation and social factors in childhood and personality traits as well as questions on sexual behaviour [84]. All baseline interviews were performed by the same psychiatrist. Follow-up examinations after 24 and 32 years were made by psychiatrists in 1992 and by psychiatric research nurses in 2000-01.

3.4.3 Procedures

Questions on adversity in childhood included poverty, quarrels between parents, experience of unhappy childhood or being misunderstood by parents, physical punishment, and poor emotional relation to parents and broken home.

Social factors in 1968 included educational level (compulsory, six years for those born in 1918 and 1922, seven years for those born in 1930, versus more than compulsory), and economical situation (total yearly income). And marital status i.e. married, cohabiting, having a steady partner or being single, and problems in relation to partner, children, parents, and in laws.

Stress referred to feelings of irritability, tension, nervousness, fear, anxiety, or sleep disturbance in relation to circumstances in everyday life, such as work, health, or family situation and classified as: no stress (response 0), and previous stress (response 1), occasional stress (response 2), and several

episodes of stress (response 3–5). The stress variable was dichotomized as 0-2 *vs.* 3-5 [85].

Major depressive episode was diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R) [74]. Neuroticism and Extraversion were assessed with Eysenck Personality Inventory (EPI) [86], which measures the personality dimensions extraversion-introversion and neuroticism-stability, each with 24 items.
Coronary heart disease was defined as angina pectoris according to the Rose criteria [87], documented history of myocardial-infarction, or electrocardiogram ECG-evidence of ischemia (complete left bundle branch block or major Q-waves, pronounced S-wave and T-wave distance [ST]-depression, and/or negative T-waves). Hypertension was defined as systolic blood pressure ≥160 mm Hg and/or diastolic blood pressure ≥90 mm Hg in the sitting position after 5 minutes rest or taking antihypertensive medications. Systolic and diastolic blood pressure was also examined in separate analyses, divided by quartiles. Diabetes mellitus was defined as self-reported treatment with diet or medications (antidiabetics or insulin). Smoking was defined as current, previous or never. Body-mass index (BMI) was calculated as kg/m^2.

Obstructive lung problems were defined as morning cough or taking asthma drugs. Peak expiratory flow (PEF) was measured by peak-flow meter. Participants were asked to exhale with a maximally forced effort from a position of maximal inspiration. Each individual performed the test three times, and the mean value was used as the final result. Information on urogenital problems and alcohol use (once a week or more) was obtained by questionnaire.

Questions about sexuality in 1968 included sexual desire (dichotomised as moderate-strong versus weak-absent), sexual desire compared to partner (stronger, equal, weaker), sexual activity during the last year (zero versus more than once per week or versus at least once per year), sexual activity just to please partner (sometimes or never versus usually or always), imagined preferred frequency of sexual intercourse if not having to take account of partner, imagined preferred frequency of sexual intercourse during maximum of favourable conditions, frequency of orgasm (usually-always versus sometimes-never), periods of anorgasmia, superficial or deep pain during intercourse (never versus sometimes-usually-always). Prevalence of sexual desire and activity was measured at two occasions between baseline and follow-up examinations, in 1974 and 1980. We used these to find out if there were any changes, among those reporting no sexual desire (n=216) and activity (n=104), from 1968 to 1992 and 2000. We also asked about age of menarche and age of menopause (women who had not reach menopause 1968 were asked again in 1992 or 2000). Sexual desire and sexual activity during follow-up were assessed by psychiatrists in 1992 and by psychiatric research nurses in 2000-01.

3.4.4 Statistics

Cross-sectional analyses on data from the examinations 1968-69 were controlled for baseline age and marital status. Analyses comparing baseline data with sexual desire or sexual activity at age 70 or 74 years at the follow up 1992-3 and 2000-1 were controlled for baseline age and current marital status at follow-up.

In model 1, sexual desire and sexual activity were analyzed in logistic regression models, including the covariates marital status and age. We present the associations as odds ratios with 95% confidence intervals. We considered results significant at $p<0.05$ (two-tailed). Some initially considered factors (phobia, diabetes mellitus, coronary heart disease and obstructive lung problems) had too few cases and were therefore not reported. Most effect variables were dichotomous. The effects of continuous variables were tested as linear association in the quartile scale. In model 2, all significant variables ($p<0.05$) in model 1 were analyzed in a stepwise logistic regression. Statistical analyses were done with SAS for Window [82] (SAS Institute Inc., Cary, NC, USA).

4 RESULTS

4.1 Paper I

People with dementia were excluded (n=39). In addition, some participants refused to answer questions on sexuality or were not asked because of language difficulties or because a third party was present during the interview (n=69). Among both sexes the proportion of participants who were divorced, cohabiting, or in a relationship but living apart increased over the 30 years from the first sample to the fourth sample. The proportions that were widowed or never married decreased. In the later born samples, women were more often married or cohabiting. In both sexes the proportion divorced increased during the study period. Among those who had a partner, the proportion reporting a happy relationship increased in both sexes. Compared to men, women in all samples were less often married or cohabiting; more often widowed, and more often had an older partner. Table 5 shows the responses to questions on sexual behaviour and attitudes in the four samples. The proportion reporting that they were sexually active, that sexuality had been a positive factor in their life, and those who had a positive attitude to sexuality in later life increased during the study period, both among married and cohabiting participants and among unmarried participants. Fewer people in later cohorts reported never having had intercourse. Among those reporting intercourse, the proportion that had intercourse at least once a week increased over the 30-year period. Concurrently the reported median age of sexual debut decreased in both sexes and the proportion reporting premarital intercourse increased in women. Reported intercourse was more common among men than among women in all four samples, and men reported an earlier age of sexual debut than women although the differences between the

sexes for this variable diminished among those from later born samples. Prevalence did not change after exclusion of depressed people. In a logistic regression analysis including the entire sample, being in a later born cohort increased the odds of having intercourse (odds ratio 1.48, 95% confidence interval 1.10 to 2.00), independent of marital status, sex, sexual debut before age 20, a positive attitude to sexuality in later life, depression, educational level, and three year mortality. Table 6 shows reported sexual satisfaction and dysfunction among the sexually active participants. The proportion of women reporting high or very high sexual satisfaction increased and reports of no sexual satisfaction decreased from the second sample to the last sample. The proportion of men reporting erectile dysfunction decreased and the proportion with ejaculation dysfunction increased, whereas the proportion reporting premature ejaculation did not change. The proportion of women who reported always or usually having an orgasm during intercourse increased, and the proportion of women reporting never having had an orgasm decreased. Men reported that the main reason for not having intercourse was due to personal reasons, whereas women reported that it was most often due to partner related factors or lack of a partner (table 7). Among those who had a partner, both sexes reported that in most cases cessation of intercourse was due to male related factors. This pattern did not change over the 30 year period.

Table 5. Self-reported sexual behaviour and attitudes in four samples of 70-year-olds from Gothenburg, Sweden, examined in 1971-2, 1976-7, 1992-3 and 2000-1. Values are number who answered questions of total examined (percentage) unless stated otherwise

	Men				Women				
Variable	1971-1972 (n=161)	1976-77 (n=174)	2000 (n=225)	Cohort trend P value†	1971-1972 (n=221)	1976-77 (n=222)	1992 (n=241)	2000 (n=262)	Cohort trend P value†
Positive attitude towards sexuality in old age	121/148 (82)	139/173 (80)	200/207 (97)	0	135/208 (65)	135/215 (63)	212/238 (89)	219/232 (94)	0
Married/Cohabitating	97/117 (83)	106/133 (80)	162/168 (96)	0	62/89 (70) *	55/92 (60) **	119/135 (88)	109/117 (93)	0
Non-married	24/31 (77)	33/40 (83)	38/39 (97)	0.010	73/119 (61)	80/123 (65) *	93/104 (89)	110/115 (96)	0
Sexuality is a positive factor in life	-	44/174 (26)	196/206 (95)	0‡	-	10/214 (5) ***	121/225 (54)	181/231 (78) ***	0
Sexual intercourse during the past year	72/152 (47)	83/173 (48)	133/203 (66)		35/209 (12)	39/213 (18)	81/232 (35)	77/225 (34)	
Married/Cohabitating	62/119 (52) °	71/133 (53) °	113/166 (68)	0.002	34/89 (38) ***	34/92 (37) ***	70/130 (54) ***	63/112 (56) ***	0
Non-married	10/33 (30)	12/40 (30)	20/37 (54)	0.016	1/120 (1) ***	5/121 (4) ***	11/102 (11)	14/113 (12) ***	0
Sexual intercourse once a week or more among sexually active	7/72 (10)	22/83 (27)	41/133 (31)	0.006	3/35 (9)	7/39 (18)	16/81 (20)	20/77 (26)	0.047
Sexual intercourse before age 20 (m = median age at the sex debut)	77/148 (52) (m=19.3)	94/167 (56) (m=18.7)	159/207 (77) (m=17.7)	0§	39/203 (19) (m=22.7)	57/206 (28) (m=22.0)	112/230 (49) (m=19.6)	147/229 (64) (m=18.6)	0§
Sexual intercourse before Marriage	123/149 (83)	147/171 (86)	183/207 (88)	0.151	86/180 (48) ***	143/194 (74) **	172/229 (75)	198/226 (88)	0
Sexually inexperienced	1/156 (1)	0/173 (0.0)	0/207 (0.0)	0.308	23/210 (11) ***	15/212 (7) ***	1/231 (0.4)	1/229 (0.4)	0

Number of participants varies within cohorts as some persons declined to answer some questions.
*=p<0.05, **=p<0.01, ***=p<0.001 (Fisher's exact test) for differences between participants who were married or cohabiting and not married.
† Cochran-Armitage Chi-square for Cohort trend
‡ Fisher's exact test
§ Test for column trend with asymptotic permutation test of trends

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Table 6. Sexual satisfaction and function among sexually active 70-year-olds from Gothenburg, Sweden, examined in 1971-2, 1976-7, 1992-3 and 2000-1. Values are numbers who answered questions of total numbers examined (percentage) unless stated otherwise

	Men			Women			
Variable	1976 -77	2000-01	Sample difference P value†	1976 - 77	1992-93	2000	Cohort trend P value*
High satisfaction	48/83 (58)	94/132 (71)	0.054	16/39 (41)	38/80 (48)	45/73 (62)	0.039
Low or no satisfaction	2/83 (2)	11/132 (8)	0.086	15/39 (39) ***	12/80 (15)	7/73 (10)	0.000
Erectile dysfunction	15/83 (18)	11/133 (8)	0.051				
Ejaculation dysfunction	4/83 (5)	16/133 (120)	0.092				
Premature ejaculation	3/83 (4)	5/133 (4)	1.000				
Always or usually orgasm				23/39 (59)	44/81 (54)	58/70 (83)	0.015
Never had/having orgasm				16/39 (41)	20/81 (25)	4/70 (6)	0.000

***=p<0.001 (Fisher's exact test) for difference between the sexes in birth sample

* Cochran-Armitage Chi-Square for cohort trends

†Fisher's exact test

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Table 7. Reason for cessation of sexual intercourse reported at age 70. Values are numbers who answered questions of total numbers examined (percentage) unless stated otherwise

	Men			Women			
Variable	**1976-77**	**2000-01**	**Cohort difference P value†**	**1976-77**	**1992-93**	**2000-01**	**Cohort trend P value***
No partner	11/89 (12)	4/67 (6)	0.272	60/158 (38) ***	47/136 (35)	56/146 (38) ***	0.936
Partner´s illness, loss of desire or capability	21/89 (24)	20/67 (30)	0.462	61/158 (39) *	57/136 (42)	61/146 (42)	0.533
Own illness, loss of desire or capability	57/89 (64)	43/67 (64)	1.000	37/158 (23) ***	32/136 (24)	29/146 (20) ***	0.520

***=p<0.001 (Fisher's exact test) for difference between the sexes within birth samples

*Cochran-Armitage Chi-Square for cohort trends

†Fisher's exact test

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4.2 Paper II

Characteristics of the study population are shown in Table 8. A majority were living in their own homes, 85% of the men and 67 % of the women. None of the women and only 7 of the men (9.7%) was cohabiting.

Table 8. Characteristics of 97-year-old men and women without dementia. (N=269)

	Men		Women		
	(%)	N	%	N	P-value
Living at home	(84.5)	60	(67.2)	131	0.005
Cohabiting	(9.7)	7	(0)	0	**<0.0001**
Satisfied with sleep	(65.7)	46	(62.7)	121	0.88
Own ability to dressing and undressing*	(88.9)	64	(89.3)	175	1.0
Own ability to cope with eating*	(100)	72	(97.0)	191	0.35
Own ability to cope with personal hygiene*	(77.8)	56	(66.8)	131	0.10
No incontinence problems*	(88.9)	64	(81.7)	161	0.19
Interviewer rated good mental health	(98.6)	71	(93.4)	184	0.12

* ADL- Motor function related aspects, based on the GBS-scale.

Results on sexuality are given in Table 9. Current sexual desire was more common in men (27%) than in women (5%). Only one man and no woman were sexually active. Other types of tenderness and closeness (e.g. hugging,

kissing, holding hands and physical contact), was reported by 14% of the men and 2% of the women. One fourth of the men and one of seven women reported to miss sexual activity. Sexual dreams at night were reported by 7% of the men and 4% of the women. Sexual thoughts were reported by one third of the men and almost one fifth of the women. Almost half of the sample had a positive attitude towards sexuality and considered it to be normal for people at their own age to have sexual interest and needs. Among all responders, 88% of the men and 82% of the women considered questions on sexuality in a health survey to be positive and natural

Table 9 Self reported sexuality and attitudes in 97-year-old men and women without dementia from Gothenburg, Sweden. (N=269)

	Men		Women		
	(%)	N	(%)	N	p-value
Sexual desire/libido	(26.7)	16	(4.7)	8	**<0.0001**
Sexually active	(1.7)	1	(0)	0	0.25
Other types of tenderness and closeness	(14.3)	9	(2.2)	4	**0.001**
Miss sexual activity	(26.2)	17	(14.9)	29	0.06
Sexual dreams at night	(6.7)	4	(3.6)	6	0.30
Sexual thoughts	(32.2)	19	(18.4)	30	**0.04**
Positive attitude towards sexuality	(55.9)	33	(44.6)	75	0.17
Positive towards questions on sexuality	(88.1)	52	(81.5)	137	0.31

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4.3 Paper III

Characteristics of men and women without dementia in 1971–1977 and 1992–2001 are shown in Table 3. Determinants for sexual activity are given in Table 10. Sexual activity was related to positive attitude toward sexuality, sexual debut before age 20, having a very happy relationship, having a physically and mentally healthy partner, self-reported good global health, interviewer-rated good mental health, being married or cohabiting, satisfaction with sleep, and drinking alcohol more than three times a week. Having an older partner, diabetes mellitus, coronary heart disease, higher physical health-sum score, and depression were related to less sexual activity. Table 11 gives stratified analyses for factors with interaction effects ($P <$ 0.20). Interaction effects for cohort, with stronger positive associations in 1971–1972, were found for positive attitude toward sexuality, strong desire at age 20–30, premarital sexuality, having a younger partner, self-reported good global health, interviewer-rated good global mental health, overweight, and satisfaction with sleep. Having an older partner and depression showed negative associations in the 1970s. Physical health-sum score were negatively associated in 1992–2001. Interaction effects for gender were only found for positive attitude toward sexuality (stronger association in men), strong sexual desire at age 20–30 (stronger in men), having a younger partner (stronger in men), being married/cohabiting (stronger association in women), or being divorced at some point in life (stronger in women). Interaction effects for marital status were found for self-reported good global health, sexual debut before age 20, premarital sexuality, lifetime divorce, and satisfaction with sleep, which all had a positive association that was stronger among those who were not married or cohabiting. Chronic obstructive pulmonary disease and lifetime smoking were more strongly negatively associated to sexual activity

in married/cohabiting. Determinants for sexual activity were further analyzed in stepwise binary logistic regression analyses (Table 12). In these analyses, sexual activity was related to positive attitudes toward sexuality in old age, sexual debut before age 20, interviewer-rated good mental health, being married or cohabiting, and belonging to the later-born cohorts. Being a woman, the physical health-sum score and lifetime smoking were negatively associated.

Table 10. Determinants of sexual activity in 70-year-olds without dementia and interactions with cohort, sex and marital status for these determinants

	Sexually active						Interaction effect		
	No		Yes				Cohort	Sex	Marital status
	%	(N)	%	(N)	OR (95%CI)	P-value	P-value	P-value	P-value
Sexually related factors									
Positive attitude towards sexuality	74%	(647)	96%	(494)	7.18 (4.5-11.!	<0.0001	0.05	0.001	0.28
Sexual debut before age 20	42%	(365)	61%	(309)	1.43 (1.1-1.9)	0.01	0.63	0.68	0.01
Strong sexual desire age 20-30*	24%	(111)	47%	(148)	1.39 (0.9-2.1)	0.10	0.03	0.10	0.08
Premarital sexuality	77%	(671)	88%	(449)	1.27 (0.9-1.8)	0.19	0.20	0.28	0.003
Partner related factors†									
Very happy relationship	15%	(136)	45%	(235)	1.90 (1.4-2.5)	<0.0001	0.70	0.99	-
Physically healthy partner	19%	(171)	48%	(248)	1.75 (1.3-2.3)	0.0001	0.40	0.47	-
Mentally healthy partner	35%	(306)	76%	393)	1.96 (1.3-2.9)	0.001	0.57	0.38	-
Older partner (>3 years)‡	13%	(93)	13%	(56)	0.51 (0.3-0.8)	0.001	0.08	0.30	-
Younger partner (>3 years)‡	18%	(129)	42%	(182)	1.30 (0.9-1.8)	0.13	0.15	0.20	-
Health related factors									
More than one physical illness	32%	(284)	29%	(149)	0.65 (0.5-0.9)	0.002	0.13	0.73	0.29
Coronary heart Disease	23%	(205)	18%	(94)	0.66 (0.5-0.9)	0.01	0.99	0.99	0.81
Hypertension or treatment	75%	(653)	73%	(373)	1.04 (0.7-1.3)	0.75	0.47	0.99	0.69
Diabetes Mellitus	8%	(73)	6%	(29)	0.57 (0.3-0.9)	0.03	0.64	0.57	0.40
Prostate problems , no cancer	5%	(46)	10%	(50)	0.81 (0.5-1.3)	0.36	0.36	-	0.68
Chronic obstructive pulmonary disease	11%	(97)	13%	(64)	1.17 (0.8-1.7)	0.41	0.81	0.31	0.06
Overweight (BMI>25)	59%	(508)	62%	(321)	1.10 (0.9-1.4)	0.45	0.07	0.42	0.55
Self-reported good global health	67%	(585)	77%	(390)	1.57 (1.2-2.1)	0.002	0.16	0.81	0.06
Interviewer rated good mental health	63%	(560)	84%	(434)	2.12 (1.6-2.9)	<0.0001	0.11	0.34	0.52
Depression	17%	(148)	7%	(38)	0.51 (0.3-0.8)	0.0002	0.16	0.62	0.90
Other factors									
Married/Cohabiting	44%	(394)	86%	(447)	6.17 (4.6-8.3)	<0.0001	0.62	<0.0001	-
Divorced (anytime)	20%	(177)	16%	(83)	1.34 (0.9-1.9)	0.11	0.86	0.13	0.19
Satisfied with sleep	59%	(523)	70%	(362)	1.35 (1.1-1.7)	0.05	0.10	0.38	0.0002
Current smoker	20%	(175)	22%	(114)	0.94 (0.7-1.3)	0.71	0.33	0.25	0.04
Life-time smoker§	44%	(382)	54%	(268)	0.76 (0.6-1.0)	0.05	0.45	0.55	0.0001
Alcohol intake >3 times/week	31%	(268)	47%	(238)	1.33 (1.0-1.7)	0.03	0.39	0.21	0.13
More than compulsory education	25%	(209)	31%	(154)	1.11 (0.8-1.5)	0.53	0.72	0.64	044

*Question not asked 1976-7 and 1992-3

† Data are for the subgroup who reported that they had a current partner

‡Data on age of partner missing in 1992-3

§Ever been a smoker

BMI = body mass index; CI = confidence interval; OR = odds ratio

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Table 11. Magnitude of interactions. Odds Ratio stratified on cohort, marital status or sex for determinants of sexual activity in 70-year-olds with test of interaction at p<0.20

	Interaction with cohort													
	1971-77							1992-2001						
	Sexually active							Sexually active						
	No		Yes					No		Yes				
	%	(N)	%	(N)	OR	(95%CI)	P-value	%	(N)	%	(N)	OR	(95%CI)	P-value
Positive attitude towards sexuality	61%	(312)	94%	(212)	9.92	(5.5-18.0)	<0.0001	91%	(335)	97%	(282)	3.43	(1.5-7.7	0.003
Strong sexual desire age 20-30*	7%	(18)	24%	(25)	2.86	(1.3-6.3)	0.01	43%	(93)	59%	(123)	1.11	(0.7-1.8)	0.68
Premarital sexuality	70%	(353)	86%	(190)	1.51	(0.9-2.4)	0.09	87%	(318)	89%	(259)	0.97	(0.6-1.7)	0.92
[3] Older partner (>3 years)†	12%	(64)	9%	(21)	0.36	(0.2-0.6)	0.001	13%	(29)	17%	(35)	0.75	(0.4-1.4)	0.38
[3] Younger partner (<3 years)†	18%	(92)	49%	(112	1.59	(1.0-2.5)	0.04	17%	(37)	33%	(70)	0.94	(0.5-1.6)	0.82
More than one physical illness	35%	(179)	36%	(82)	0.78	(0.5-1.1)	0.18	28%	(105)	23%	(67)	0.52	(0.3-0.8)	0.002
Overweight (BMI >25)	55%	(283)	62%	(141)	1.38	(1.0-2.0)	0.08	64%	(225)	63%	(180)	0.87	(0.6-1.2)	0.44
Self-reported good global health	73%	(377)	85%	(195)	2.02	(1.3-3.2)	0.002	58%	(208)	69%	(195)	1.34	(0.9-1.9(	0.12
Interviewer rated good mental health	56%	(290)	82%	(188)	2.67	(1.7-4.0)	<0.0001	73%	(270)	85%	(246)	1.62	(1.1-2.5)	0.03
Depression	17%	(86)	5%	(11)	0.36	(0.2-0.7)	0.004	17%	(62)	9%	(27)	0.66	(0.4-1.1)	0.13
Satisfied with sleep	60%	(311)	77%	(176)	1.64	(1.1-2.4)	0.01	58%	(212	64%	(186)	1.06	(0.7-1.5)	0.73
	Interaction with Sex													
	Women							Men						
Positive attitude towards sexuality	74%	(476)	92%	(213)	3.99	(2.3-7.0)	<0.0001	73%	(171)	98%	(281)	19.44	(7.6-49.8)	<0.0001
Strong sexual desire age 20-30[1]	16%	(50)	20%	(22)	0.81	(0.4-1.6)	0.54	42%	(61)	61%	(126)	1.90	(1.2-3.3)	0.01
[3] Younger partner (<3 years)‡	4%	(22)	19%	(28)	1.84	(1.0-3.4)	0.06	45%	(107)	53%	(154)	1.12	(0.7-1.7)	0.60
Married/Cohabiting	34%	(222)	87%	(201)	12.26	(8.1-18.6)	<0.0001	72%	(172)	85%	(246)	2.27	(1.5-3.5)	0.0002
Divorced (anytime)	22%	(140)	17%	(39)	1.38	(0.8-2.2)	0.20	15%	(37)	15%	(44)	1.16	(0.7-2.0)	0.59
	Interaction with marital status													
	Married/Cohabiting							Not married/cohabiting						
Sexual debut before age 20	48%	(183)	59%	(258)	1.27	(0.9-1.7)	0.11	38%	(182)	71%	(51)	2.14	(1.2-4.0)	0.02
Strong sexual desire age 20-30[1]	29%	(61)	46%	(125)	1.45	(0.9-2.3)	0.10	20%	(50)	51%	(23)	1.09	(0.5-2.6)	0.84
Premarital sexuality	82%	(315)	86%	(380)	1.08	(0.7-1.6)	0.71	73%	(356)	95%	(69)	2.94	(1.0-8.6)	0.05
Chronic obstructive pulmonary disease	12%	(45)	11%	(48)	0.67	(0.6-1.4)	0.02	11%	(52)	22%	(16)	0.59	(1.0-3.9)	0.16
Self-reported good global health	70%	(273)	76%	(331)	1.38	(1.0-1.9)	0.05	64%	(312)	81%	(59)	2.99	(1.5-5.9)	0.002
Divorced (anytime)	9%	(35)	11%	(47)	1.07	(0.7-1.7)	0.78	29%	(142)	49%	(36)	1.44	(0.8-2.6)	0.23
Satisfied with sleep	65%	(256)	68%	(304)	1.06	(0.8-1.4)	0.69	54%	(267)	79%	(58)	3.66	(1.9-7.1)	0.0001
Current smoker	24%	(92)	21%	(93)	0.85	(0.6-1.2)	0.37	17%	(83)	29%	(21)	1.32	(0.7-2.5)	0.38
Lifetime smoker§	53%	(203)	51%	(222)	0.67	(0.5-0.9)	0.01	37%	(179)	64%	(46)	1.20	(0.7-2.2)	0.54
Alcohol intake >3times/week	38%	(149)	47%	(208)	1.26	(0.9-1.7)	0.11	24%	(119)	42%	(30)	1.50	(0.8-2.7)	0.17

*Question not asked 1976-7 and 1992-3
†Data are for the subgroup who reported that they had a current partner
‡Data on age of partner missing in 1992-3
§Ever been a smoker
BMI = body mass index; CI = confidence interval; OR = odds ratio

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Table 12. Determinants of sexual activity in 70-year-olds in a stepwise regression model including all variables with p<0.05

	OR	95%CI	P-value
Positive attitude towards sexuality	7.48	4.5-12.5	<0.0001
Sexual debut before age 20	1.60	1.2-2.1	0.001
More than one physical illness	0.67	0.5-0.9	0.01
Interviewer rated good mental health	1.86	1.3-2.6	0.0002
Life-time smoker*	0.65	0.5-0.9	0.01
Married/Cohabiting	6.35	4.6-8.7	<0.0001
Birth cohort 1922 – 30	1.42	1.1-1.9	0.02
Women	0.39	0.3-0.5	<0.0001

Older/younger partner and strong sexual desire at age 20-30 were excluded from this regression model.
*Ever been a smoker
CI = confidence interval; OR = odds ratio

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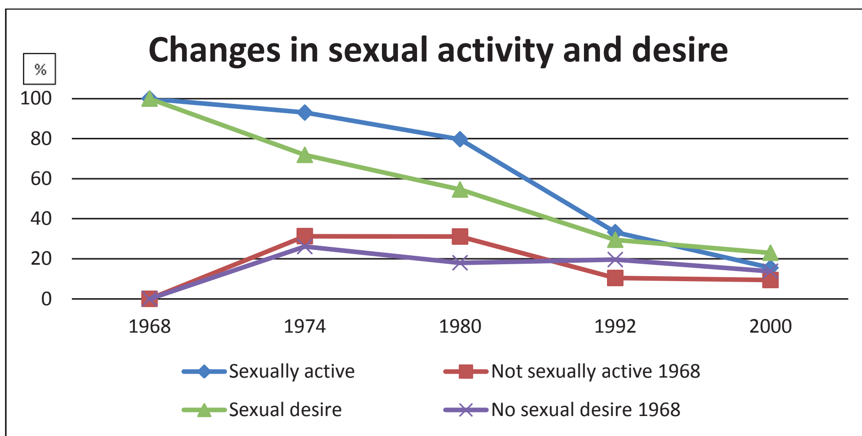
4.4 Paper IV

Figure 1 shows both sexual desire and activity decreased during the study period. Among those reporting, no sexual desire or no sexual activity in 1968, more than one third regained their desire and sexual activity at some point during follow-up. The figure is created for the purpose to illustrate changes over time only.

Figure 1 Changes in sexual activity and desire from mid- to late life.



Factors related to sexual desire

Factors related to sexual desire in Model 1 are shown in Table 13. Among *childhood adversities*, poverty, unhappy childhood, physical punishment, poor relation to mother, broken home before age 6 years, and having more than one childhood adversity were all related to less sexual desire in midlife. Only poverty was related to less sexual desire also in late-life.

Among *midlife social factors*, higher education and higher income were related to higher sexual desire in midlife, and women who reported several episodes of stress to less desire. None of these midlife social factors were related to sexual desire in old age.
Among *midlife family factors*, being married/cohabiting was related to higher sexual desire in midlife, while having a non-supportive partner or having two or more family adversities was related to less desire in midlife. None of the midlife family factors were related to sexual desire in late-life.

Among *midlife health factors*, major depressive episode was related to less sexual desire in midlife, and to higher desire in late life. Urogenital disorder was related to less sexual desire in midlife, but did not affect sexual desire in late life. Better lung function according to PEF was related to higher sexual desire in midlife, but did not affect sexual desire in late life. Hypertension (160/90mm/hg) in midlife did not affect sexual desire in mid- or late-life. Systolic blood pressure was negatively associated to sexual desire in late life (0.73, 0.59-0.91, <0.01), but not related to sexual desire in midlife. Diastolic blood pressure was not associated with sexual desire.

The *midlife personality factor* extraversion was related to higher sexual desire in both mid- and late-life. The personality factor neuroticism was related to less sexual desire in midlife, but had no impact on sexual desire in late life.
Among *midlife sexual factors*, sexual activity was related to higher sexual desire in mid- and late life. Having stronger or equal desire as partner, or usually having orgasm, were related to higher desire in midlife, but did not affect desire in late life. Having intercourse just to please partner, partner having strongest desire, previous episodes of anorgasmia and pain during

intercourse were related to less sexual desire in midlife, but did not affect sexual desire in late life.

All factors significantly ($p<0.05$) related to sexual desire were further analysed in a multivariate stepwise logistic regression in Model 2 (Table 15). Among midlife factors, younger age in 1968, more than compulsory education, higher own wish for sexual activity and usually or always having orgasm were related to higher sexual desire in midlife. Poor emotional relation to mother in childhood, higher neuroticism score and partner having stronger sexual desire were related to lower sexual desire in midlife. Current marital status, midlife major depression and higher extraversion score in midlife were related to higher sexual desire in late life, while poverty in childhood was related to less desire in late life.

Factors related to sexual activity

Factors related to sexual activity in Model 1 are shown in Table 14.
Among *childhood adversities*, quarrels between parents, unhappy childhood and physical punishment were related to less sexual activity in midlife, but were not related to sexual activity in late life.

Among *midlife social factors*, several episodes of stress were related to less sexual activity in midlife, but not to sexual activity in late life.
Among *midlife family factors*, being married/cohabiting was related to higher sexual activity in mid- and late life, while having a non-supportive partner was related to less sexual activity in midlife, but not in late life.

Among *midlife health factors*, major depressive episode was related to lower sexual activity in midlife and to higher activity in late life. Lung function

according to PEF was not related to sexual activity in midlife, but had a tendency to be associated with sexual activity in late life.

Among *midlife sexual factors*, being sexually active and having sexual desire were related to sexual activity in late-life. Partner having stronger sexual desire was related to higher sexual activity in midlife, but had no effect on late-life sexual activity. Partner having lower desire was negatively related to sexual activity in both mid- and late life. Superficial pain at intercourse was related to lower sexual activity in midlife, but did not impact sexual activity in late-life. Higher age at menopause was related to higher sexual activity in midlife, but not to sexual activity in late life.

All factors significantly ($p<0.05$) related to sexual activity were further analysed in a multivariate stepwise logistic regression in Model 2 (Table 15). Higher sexual activity in midlife was related to younger age in 1968, higher age of menopause, own sexual desire and partner having strongest desire, while less sexual activity were related to physical punishment in childhood, not having a supportive partner, several episodes of stress and having stronger sexual desire than partner. Partner having lower sexual desire was the only midlife factor negatively related to sexual activity in late life. Late life marital status and frequency of sexual activity in midlife were related to higher sexual activity in late life.

Table 13. Childhood and midlife factors and associations with sexual desire in mid- and late life

	Middleage 38 - 50 yrs[1]				Older age 70 - 74 yrs[2]			
Social adversities in childhood	N	OR	95%CI	P-value	N	OR	95%CI	P-value
Poverty	604	0.46	0.31-0.68	0.0001	351	0.53	0.28-0.99	0.05
Quarrels between parents	539	0.73	0.46-1.16	0.18	309	1.02	0.53-1.99	0.95
Unhappy childhood	608	0.49	0.32-0.75	0.001	345	0.87	0.47-1.61	0.65
Experience of being misunderstood as a child	668	0.73	0.52-1.02	0.06	383	0.93	0.59-1.49	0.77
Physical punishment	678	0.49	0.29-0.81	0.006	387	1.28	0.59-2.77	0.53
Strict upbringing	678	0.90	0.65-1.26	0.55	388	0.80	0.51-1.28	0.36
Poor emotional relation to mother	678	0.64	0.46-0.90	0.01	388	0.78	0.48-1.26	0.30
Poor emotional relation to father	678	0.77	0.56-1.07	0.12	388	0.82	0.52-1.30	0.39
Broken home before age 6	678	0.56	0.36-0.87	0.01	388	0.77	0.39-1.50	0.44
Broken home before age 17	678	0.78	0.55-1.12	0.18	388	0.98	0.59-1.61	0.92
More than one childhood adversities	678	0.63	0.45-0.89	0.01	388	0.93	0.56-1.54	0.77
Current family social factors								
Married/cohabiting[3]	678	1.88	1.21-2.92	0.005	365	0.90	0.48-1.68	0.75
Partner not supportive	547	0.31	0.18-0.53	<0.0001	303	1.38	0.60-3.17	0.45
Problems related to children	588	0.60	0.34-1.04	0.07	330	1.52	0.71-3.25	0.28
Problems related to parents/parents-in-law	677	1.26	0.73-2.15	0.40	387	0.60	0.28-1.27	0.18
More than one family-social adversities	678	0.47	0.23-0.94	0.03	387	1.42	0.57-3.58	0.45
Other social and personality factors								
More than compulsory school	678	2.25	1.47-3.43	0.0002	388	1.57	0.95-2.58	0.08
Economy (The household total yearly income, in thousand Swedish Crowns)	669	1.49	1.25-1.77	<0.0001	386	1.02	0.82-1.27	0.87
Several episodes of stress last five years	674	0.36	0.18-0.71	0.003	388	0.87	0.27-2.82	0.81
Extraversion	664	1.34	1.14-1.56	0.0002	381	1.35	1.09-1.66	0.01
Neuroticism	664	0.70	0.60-0.82	<0.0001	381	0.99	0.80-1.22	0.91
Health related factors								
Major Depressive Episode	678	0.34	0.18-0.62	0.0004	388	3.38	1.53-7.44	0.003
Hypertension (160/90) or treatment	674	1.24	0.80-1.92	0.33	388	0.59	0.35-1.01	0.06
Systolic blood pressure					388	0.73	0.59-0.91	0.004
Diastolic blood pressure					388	0.89	0.73-1.09	0.26
Uro-genital disorders	674	0.65	0.46-0.92	0.01	388	0.97	0.60-1.57	0.89
Body Mass Index	674	1.02	0.88-1.18	0.83	388	0.86	0.70-1.07	0.17
Peak flow ratio	673	1.23	1.06-1.42	0.008	388	0.95	0.77-1.16	0.59
Current smoker	674	0.73	0.52-1.02	0.06	388	0.78	0.47-1.29	0.34
Ever been a smoker	674	0.72	0.52-1.01	0.06	388	0.99	0.62-1.59	0.98
Alcohol use once a week or more	674	1.19	0.85-1.65	0.30	388	1.51	0.94-2.40	0.09
Sexually related factors								
Sexual debut age ≤ 20	668	0.73	0.52-1.03	0.08	381	0.70	0.44-1.12	0.14
Sexually active during last year	646	3.51	2.10-5.86	<0.0001	360	1.05	0.49-2.22	0.91
Sexually active ≥once a week	646	4.31	2.84-6.55	<0.0001	360	1.78	1.09-2.89	0.02
Own sexual desire	646	-	-	-	372	1.88	1.07-3.32	0.03
Partner strongest desire	580	0.33	0.22-0.50	<0.0001	322	1.18	0.69-2.01	0.55
Equal desire	580	2.35	1.51-3.68	0.0002	322	1.06	0.60-1.88	0.84
Self strongest desire	580	3.35	1.47-7.56	0.004	322	0.55	0.21-1.42	0.22
Usually or always having intercourse just to please partner	552	0.04	0.03-0.07	<0.0001	307	0.67	0.33-1.34	0.26
Own wish for sexual activity, not taking account to partner, ≥once a week	585	43.8	15.93-120.39	<0.0001	322	1.85	1.11-3.10	0.02
Own wish for sexual activity, during maximum favourable conditions, ≥once a week	552	6.12	4.07-9.21	<0.0001	309	2.15	1.16-3.98	0.01
Usually or always orgasm	562	4.86	3.24-7.29	<0.0001	315	1.47	0.86-2.51	0.16
Periodic anorgasmia previously	606	0.41	0.28-0.59	<0.0001	340	1.20	0.73-1.97	0.46
Menarche age	674	1.08	0.92-1.28	0.34	388	1.06	0.84-1.33	0.64
Higher age for menopause #	644	1.33	1.14-1.55	0.0003	387	0.88	0.72-1.09	0.24
Negative expectations of menopause	673	0.92	0.63-1.34	0.66	385	1.57	0.94-2.64	0.09
Having had pregnancy fear	630	0.90	0.62-1.31	0.59	351	1.34	0.80-2.24	0.26
Superficial pain during intercourse	572	0.32	0.17-0.60	0.001	319	0.53	0.19-1.50	0.23
Deep pain during intercourse	573	0.32	0.16-0.63	0.001	319	0.59	0.21-1.68	0.33

[1]Covariates - married/cohabiting and age. [2]Covariate - married/cohabiting at age 70-74 yrs. [3]only age as covariat

1968 - 2000 Retrospective information

Table 14. Childhood and midlife factors and association with sexual activity in mid- and late life

	Midlife 38 - 50 yrs[1]				Older age 70 - 74 yrs[2]			
Social adversities in childhood	N	OR	95%CI	P-value	N	OR	95%CI	P-value
Poverty	582	0.95	0.51-1.77	0.87	352	0.77	0.41-1.42	0.40
Quarrels between parents	520	0.49	0.26-0.94	0.03	309	1.01	0.50-2.03	0.99
Unhappy childhood	592	0.50	0.27-0.94	0.03	345	0.88	0.46-1.67	0.69
Experience of being misunderstood as a child	646	0.62	0.37-1.03	0.06	384	1.33	0.80-2.21	0.27
Physical punishment	657	0.31	0.16-0.62	0.001	388	0.67	0.27-1.68	0.40
Strict upbringing	658	0.82	0.50-1.34	0.43	389	1.22	0.74-2.02	0.44
Poor emotional relation to mother	658	0.97	0.58-1.63	0.92	389	0.91	0.54-1.55	0.74
Poor emotional relation to father	658	0.76	0.46-1.24	0.27	389	1.09	0.66-1.79	0.75
Broken home before age 6	658	0.94	0.47-1.88	0.86	389	0.60	0.29-1.22	0.16
Broken home before age 17	658	1.15	0.66-2.02	0.62	389	0.74	0.43-1.28	0.28
More than one childhood adversities	658	0.79	0.48-1.32	0.37	389	0.92	0.53-1.59	0.76
Current family social factors								
Married/cohabiting	658	21.5	12.35-37.59	<0.0001	391	3.56	1.64-7.72	0.0006
Partner not supportive	542	0.18	0.09-0.36	<0.0001	305	0.87	0.33-2.27	0.78
Problems related to children	574	0.67	0.30-1.51	0.34	330	1.57	0.67-3.64	0.30
Problems related to parents/parents-in-law	657	2.39	0.91-6.27	0.08	388	1.32	0.64-2.71	0.45
More than one family-social adversities	658	0.43	0.17-1.11	0.08	388	1.47	0.51-4.23	0.48
Other social and peronality factors								
More than compulsory school	658	0.97	0.55-1.73	0.92	389	0.87	0.49-1.53	0.63
Economy (The household total yearly income, in thousand Swedish Crowns)	649	0.96	0.74-1.25	0.77	387	0.96	0.76-1.23	0.77
Several episodes of stress last five years	654	0.22	0.10-0.51	0.0004	389	1.65	0.50-5.51	0.41
Extraversion	644	1.15	0.91-1.44	0.24	382	1.14	0.91-1.43	0.25
Neuroticism	644	0.84	0.68-1.05	0.13	382	1.04	0.83-1.31	0.72
Health related factors								
Major Depressive Episode	658	0.26	0.12-0.57	0.001	389	2.97	1.12-7.91	0.03
Hypertension (160/90) or treatment	654	1.11	0.59-2.09	0.75	389	0.78	0.45-1.35	0.37
Systolic blood pressure					389	0.95	0.76-1.19	0.65
Diastolic blood pressure					389	1.00	0.80-1.24	0.98
Uro-genital disorders	654	0.67	0.40-1.13	0.13	389	0.65	0.38-1.11	0.11
Body Mass Index	654	1.12	0.90-1.39	0.32	389	0.97	0.77-1.22	0.79
Peak flow	652	1.18	0.94-1.47	0.15	389	1.22	0.97-1.53	0.08
Current smoker	654	0.82	0.50-1.36	0.44	389	0.69	0.40-1.19	0.18
Ever been a smoker	654	0.73	0.44-1.21	0.22	389	1.02	0.61-1.69	0.95
Alcohol use once a week or more	654	1.44	0.87-2.37	0.15	389	1.30	0.79-2.14	0.31
Sexually related factors								
Sexual debut age <20 yrs	646	0.89	0.54-1.48	0.66	382	0.90	0.55-1.49	0.69
Sexually active during last year	646	-	-	-	361	3.21	1.15-9.00	0.03
Sexually active ≥once a week	646	-	-	-	361	2.35	1.39-3.97	0.001
Own sexual desire	646	3.53	2.11-5.91	<0.0001	373	1.77	0.98-3.18	0.06
Partner strongest desire	578	3.93	2.06-7.50	<0.0001	324	1.39	0.81-2.39	0.24
Equal desire	578	0.69	0.36-1.30	0.25	324	1.12	0.62-2.01	0.71
Self strongest desire	578	0.17	0.09-0.35	<0.0001	324	0.32	0.12-0.84	0.02
Usually or always having intercourse just to please partner	550	4.80	0.62-36.81	0.13	308	0.87	0.44-1.72	0.69
Own wish for sexual activity, not taking account to partner, ≥once a week	582	1.13	0.61-2.11	0.70	324	1.36	0.80-2.33	0.26
Own wish for sexual activity, during maximum favourable conditions, ≥once a week	549	1.51	0.80-2.83	0.20	310	0.98	0.54-1.77	0.94
Usually or always orgasm					316	0.94	0.54-1.62	0.81
Periodic anorgasmia previously	593	0.91	0.52-1.58	0.73	342	0.94	0.56-1.57	0.81
Menarche age	654	1.02	0.79-1.31	0.88	389	0.99	0.77-1.27	0.92
Higher age for menopause #	624	1.70	1.32-2.19	<0.0001	389	0.98	0.78-1.23	0.85
Negative expectations of menopause	650	1.36	0.74-2.49	0.32	386	1.14	0.64-2.03	0.69
Having had pregnancy fear	616	0.97	0.56-1.69	0.92	353	0.87	0.50-1.53	0.64
Superficial pain during intercourse	560	0.15	0.04-0.54	0.004	320	0.70	0.27-1.82	0.46
Deep pain during intercourse	561	0.28	0.06-1.39	0.12	320	1.67	0.61-4.61	0.32

[1]Covariates - age and married/cohabiting. [2]Covariate - married/cohabiting at age 70-74 yrs
1968 - 2000 Retrospective information

Table 15. Factors associated to sexual desire and sexual activity in mid and late life in a stepwise regression model including all variables with p<0.05

	Sexual desire					
	Midlife 1968			Older age 1992-2000		
	OR	**CI 95%**	**P-vlue**	**OR**	**CI 95%**	**P-vlue**
Age	0.94	0.89-1.0	0.04			
Poor emotional relation to mother	0.44	0.28-0.71	<0.001			
More than compulsatory school	2.36	1.33-4.17	0.003			
Neuroticism	0.75	0.61-0.92	0.006			
Partner strongest desire	0.45	0.27-0.74	0.002			
Own wish for sexual activity, not taking account to partner, ≥ once a week	4.87	2.69-8.82	<0.0001			
Own wish for sexual activity, during maximum favourable conditions, ≥once a week	3.52	1.90-6.50	<0.0001			
Usually or always orgasm	1.83	1.12-2.99	0.002			
Married/cohabiting at follow-up 1992/2000				4.21	2.36-7.50	<0.001
Poverty				0.38	0.18-0.81	0.01
Major depressiv episode in midlife				4.54	1.85-11.11	0.001
Extraversion				1.45	1.14-1.84	0.003
	Sexually active					
Age	0.88	0.79-0.99	0.03			
Physical punishment	0.27	0.11-0.68	0.005			
Partner not supportive	0.20	0.09-0.47	0.0002			
Age of menopauce	1.48	1.06-2.07	0.02			
Several episodes of stress	0.24	0.08-0.69	0.008			
Sexual desire	4.47	1.98-10.09	0.0003			
Partner strongest desire	5.87	2.42-14.21	<0.0001			
Self having strongest sexual desire	0.26	0.10-0.64	0.004			
Married/cohabiting 1992/2000				16.42	7.54-35.79	<0.0001
Sexually active ≥once a week				2.01	1.16-3.45	0.01
Self having strongest sexual desire				0.36	0.13-0.98	0.04

5 DISCUSSION

The overall aim of this thesis was to examine the prevalence of sexual desire and activity and factors affecting sexuality to improve knowledge about sexuality in an older population and try to understand the context and factors, affecting sexuality. It is based on data of general population in Gothenburg. Midlife women, aged 38 to 50 years, followed over 24-34 years. Four birth cohorts of 70-year-olds examined 1971-2001 and 97-year-olds examined 1998-2006.

Possible factors were selected based on known variables associated with sexual behaviour in mixed age populations, results from previous cross-sectional studies, and hypotheses regarding sexual function. However, there is a possibility of false positive findings due to multiple comparisons. We did not control for multiple comparisons as this may give rise to false negative results. One way to approach this problem is to make no adjustments for the number of comparisons but to give information on how many comparisons have been made and to emphasize that any new findings should be biologically plausible and considered only suggestive until further confirmed [88].

Sexual desire and activity in middle-aged women was related to a large number of factors pertaining to childhood adversities, and midlife family-social situation, physical and mental health, sexuality and personality. Our findings support the notion that sexuality in middle-aged and older women is dependent on a number of basic conditions, such as general well-being, physical and mental health and quality of the relationship or life situation [44]. However, only few of the factors measured in midlife had impact on sexuality in old age. This indicates that concurrent factors are most important,

and that factors which influence sexual activity in midlife do not necessarily have a long-term influence.

Sexual activity in 70-year-olds was related to a number of different factors pertaining to sexual history, physical and mental health, marital status (i.e. have a partner or not), and satisfaction with relationship. It is noteworthy that more factors influenced sexual activity in 70-year-olds examined in the 1970s compared with those examined in 1992–2001, indicating that later-born cohorts are less vulnerable in relation to sexual activity than earlier-born cohorts. We have previously reported that cognitive function [75] and lung function [89] were related to increased mortality in the cohort born in 1901–1902, but not in those born in 1930, and that lower social network was related to depression in the 1970s but not in the 2000s [90], suggesting that later-born cohorts are less vulnerable also in relation to other factors than sexuality. These findings have been proposed to be due to an increased cognitive, physical, and social reserve in later- born cohorts [75, 89, 90]. Our findings suggest that this reserve may be extended also to sexual behaviour, maybe due to changing attitudes toward sexuality in later life or to better physical function in general.

5.1 Childhood adversities

Sexual desire and activity in middle-aged women was related to a large number of factors pertaining to childhood adversities. Most childhood adversities had a negative effect on midlife sexual desire or sexual activity, while only childhood poverty had a negative impact on sexual desire in late

life. Childhood adversities have been related to adult mental and somatic health and mortality [91-95], which in turn is known to affect sexual health [61-66, 68, 69]. Few studies have, however, examined the relation between childhood factors and sexuality in mid- or late-life. Poor emotional relation to mother, but not to father, had a negative association with midlife sexual desire. It is possible that the mother is a more important role model for the daughter, but the finding may also reflect gender roles in the mid 20th century, where the mother was more present at home than the father. Our findings show how sexuality in mid- and later life starts to be determined already in childhood.

5.2 Personality, family and social factors

Few studies have examined personality in relation to sexuality. In our study, higher midlife extraversion, characterized as sociable, outgoing, impulsive and uninhibited, were related to higher sexual desire in both mid- and late-life, but not to sexual activity. Neuroticism, characterized by emotional reactivity, low ego-strength, guilt proneness, anxiety and psychosomatic concerns, was negatively associated with sexual desire in midlife but no association was found with sexual activity in mid- and late-life. Stress referred to feelings of irritability, tension, nervousness, fear, anxiety, or sleep disturbance in relation to circumstances in everyday life, such as work, health, or family situation. We have recently reported that neuroticism leads to increased stress levels [85]. We found that having several episodes of stress in midlife had a negative association to both sexual desire and activity in midlife, but had no association to late-life sexuality. Others have reported that Female Sexual Dysfunction (FSD) as a multicausal and multidimensional problem combining biological, psychological and

interpersonal determinants can be a cause of stress [44, 96, 97]. It is likely that the association goes in both directions.

In midlife women, socioeconomic factors, such as higher education and income were associated to higher sexual desire. This confirms findings from previous studies [36, 52, 98]. These factors have been found to have importance for general health, and are thus suggested to affect also sexual health [99]. We did not find any associations to education in self reported secular changes in sexual behaviour in 70-year-olds. It could be speculated that the changes reflect higher educational levels and better socioeconomic status in later born cohorts. The EMAS (European Male Aging Study) [49] compare regions with different socioeconomic and geopolitical backgrounds and found, particular in transitional countries, that the collapse of previous political systems and the lack of economic resources have resulted in a rapid deterioration of population health due to limited access to health care, growing inequity, increasing medication costs, and cutbacks in preventive care, a higher prevalence of morbidities and impairment of sexual function as well as a lower Quality of Life.

70-year-old women were less likely to be married or in other intimate relationships than men, as reported by others [24]. Women in later born birth-cohorts had to a greater extend been divorced at some time, but it was also more common that they have a steady partner, compared to earlier birth-cohorts. It is well known that marital status is a major determinant for sexual activity in old age [18, 22, 28, 31-33, 36, 45-47, 50, 55-58], we also found this association among 70-year-olds in both sexes with stronger association in women. The perceived quality of the relationship is also significant, midlife

women reported less sexual desire and sexual activity when having a non supportive partner, and 70-year-olds who reported having a very happy relationship was to a greater extent sexually active. We found in 70-year-olds that all partner related factors studied were important in married and cohabiting men and women. In a Chinese study, there were similar findings among married middle-aged women but not among men [59]. Several studies, including our own [25], report that both men and women disclose that the reason for ceasing sexual intercourse in old age most often is male related [17, 19]. This might be an expression of the fact that men in these generations in general take initiative to intercourse [15, 16, 19, 21, 53]. Age of partner was of significance for 70-year-old women, those with a partner three years younger or more were in a greater extent sexually active. The length of the relationship might also be of importance. A French study [60] reported that individuals living in new relations, including those aged over 70 years, had more frequent sexual intercourse. We take note of the fact that all six individuals in our study, who married after age 60 were still sexually active at age 70 [43]. Others have reported that women having positive marriages in early and middle years of marriage had a greater probability to be sexual responsive than those whose marriages were negative [100]. Furthermore, being in a relationship that fosters sharing of both sexual and nonsexual intimate information results in greater partner understanding and better sexual satisfaction [101]. Other factors to take into account regarding female sexual activity and aging is the effect of male aging problems, and the strong role of male-related factors when women cease to have sexual intercourse [17, 19, 25]. During female menopause-age, it is common with a decline in sexual desire and ability also of the male partner [66, 102]. Our findings further emphasize the importance of paying attention to the partner in sexual counselling [103].

5.3 Health related factors

Many physical and mental disorders and their treatments have negative impact on sexual activity [61-66]. Several studies have reported on a negative association between depression and sexuality [68, 69]. In midlife women major depression had a negative impact on concurrent midlife sexual desire and activity, while it had a positive effect on sexual desire and activity in late life. Depression is an episodic disorder and it is probable these women were not depressed at the time of the follow-up interview. Hällström [104] found in a follow-up of women's sexual desire in midlife that many of the mentally disordered recovered during a 6-year period and regained their earlier sexual desire. In 70-year-olds depression was related to less sexual activity with less impact on sexual activity in those born 1922 and 1930 compared to cohorts born 1901-07.

Our considered health related factors, was relatively uncommon in this group of midlife women which might explain the lack of association despite well known associations in clinical studies. Beside depression, concurrent urogenital disorder had a negative effect on sexual desire in midlife, as also reported by others [105, 106]. Good lung function was associated to higher midlife sexual desire and a tendency for higher sexual activity in late life (not significant). This might reflect a more active life style, a high fitness status is positively associated with several aspects of Health-Related Quality of Life (HRQL) in older persons [107].

In 70-year-olds we found that coronary heart disease, diabetes mellitus, a sum score of physical disorders, and lifetime smoking were associated with less sexual activity, with no difference in associations between men and women.. Diabetes mellitus and coronary heart disease have often been reported in

other studies [58, 59, 70]. There were no association between hypertension (defined as 160/90 mmHg or treatment) neither in midlife sexual desire and activity nor in the 70-year-olds sexual activity. When measuring systolic and diastolic blood pressure in separate analyses, divided by quartiles we found no cross-sectional association between high SBP and sexual desire in midlife, but there was a negative association with late life sexual desire. It is likely that high blood pressure has a long-term effect on sexuality. These disorders and lifetime smoking may influence the vascular system and thus affect the sexual organs.

We found no association with prostate problems, and chronic obstructive pulmonary disease and sexual activity in 70-year-olds. Our findings thus show that physical health is a determinant for sexual activity in later life, but the associations are not as strong as in clinical studies. A Chinese population study found that physical health condition was not related to sexual activity [59]. Thus, many older people in the population remain sexually active despite having physical disorders. The finding that global mental and physical health is related to sexual activity is supported by other studies. In a national Danish population study (aged 45–66 years), factors related to seldom having sexual desire included psychological and physical distress in both genders [67]. Self-reported global health was significant for sexual activity, and is probably related to general well-being, regardless of the presence of specific physical or mental disorders. Having a physically and mentally healthy partner was also related to higher sexual activity in 70-year-olds of both sexes. A German community study on aging men reported that sexual and partnership satisfactions were compromised in men who were dissatisfied with their health [58]. Another finding was the association between drinking more than three times per week and higher sexual activity.

The latter probably reflects an overall more liberal attitude regarding lifestyle factors, epicure persons.

5.4 Sexually related factors

Attitudes towards sexuality have changed dramatically in the Western societies during 20th century. Later born birth-cohorts of 70-year-olds are more positive towards sexuality in old age, than earlier born [25]. Most studies on older adults show that sexual desire and activity can remain into old age [24, 25]. The proportion of sexually active has increased among older adults during the 20th century [24, 25] . At the same time, most studies show that sexual desire and activity decline with increasing age [28, 37, 38].

We found that sexual desire and activity decreased from mid- to late life among women followed over 24-32 years. However, among those who reported no sexual desire or activity in 1968, more than one third regained sexual desire and activity at some point during follow-up, showing that reporting no sexual desire or activity in a cross-sectional examination is not the same as having ceased sexuality activity.

The large number of concurrent factors also illustrates how sensitive sexuality is to environmental factors, and the complexity of factors which influence sexual behaviours. One pattern was that the frequency of women's sexual activity was controlled, not only by their own desire, but also by their partner’s desire, maybe due to the historical context in which these generations socialized, by societies view on sexuality and the gender roles.

Using a prospective design (PPSW), our study confirms findings from retrospective studies reporting that previous sexual experience is important

for sexual behaviour in old age [22, 31, 43, 53, 56, 71], including higher sexual desire in young adulthood [31, 50], higher frequency of intercourse in young adulthood and midlife [51, 56, 71], and higher satisfaction with intercourse in young adulthood [31]. In our study on 70-year-olds, strong sexual desire at age 20–30 years in the 1970s and sexual debut before age 20 among not married or cohabiting were related to increased sexual activity, but in later born birth-cohorts sexuality in young adulthood do not seems to affect old age sexuality. Previous sexual experience may reflect a lifelong higher desire, a positive feedback from the early experience or personality factors. We also found that women with higher age at menopause had higher desire and were more sexually active. In contrast, the SWAN study on sexual behaviour in women aged 42- 52 years, conducted in a multi-ethnic sample, found that menopausal status was not an independent predictor of intercourse frequency, sexual touching, or oral sex [99].

Midlife women having similar sexual desire as partner were related to higher midlife sexual desire. Discrepancy in desire between partners had different consequences depending on gender. Partner having lower desire was associated with lower activity, while partner having stronger desire was related to higher activity, illustrating how gender roles influenced sexuality in these women. In addition, having sex just to please partner was related to low sexual desire. Others have reported that older women, compared to younger, more often felt obliged to comply with their partners sexual wishes [44].

5.5 Gender and history related

Most studies on older adults report that men more often are sexually active compared to women, and that men usually taking initiative to sex. It is hard

to believe it can be any biological explanation for this; it is more likely that old gender roles remain. From ancient times to the 1700s the male and female bodies were considered to be in various stages of perfection. The female was thought to be more driven by bodily instincts and was thus closer to the animals than the male who was considered guided by sense [2]. Historians are placing greater emphasis on gender differences. German Enlightenment philosophers connected male sexuality to independence and freedom while female sexuality was described as passive. This strengthened the view on gender characteristics: the man as bearer of sense, intellect and truth, while women were associated with sensuality, sensation and a shady character. These differences did also justified that the sexes should not have the same political and civil rights [2]. These values have shaped, and apparently continue to affect gender roles and attitudes toward sexuality even in today's society. Usually when we associate to historical influences on sexuality we refer to the puritan Victorian era, and quite rightly. There was a strong focus on the danger with imbalance of body fluids due to onanism, which included all non-reproductive sexual behaviour such as, masturbation, same-sex activity, interrupted intercourse and use of contraceptives. The human body resources are limited and should not be wasted. The focus turned back to female sexuality. Many prominent doctors defined the absence of sexual desire in women as normal, and come to see its presence as disease [108]. On dubious scientific basis the image of the asexual woman was repeated in the late 1800s medical, sexological and psychological literature. What has this meant for the woman, to commute between frigidity, created by ignorance and denial, and shame if she affirmed her sexuality? [109]. This was one side of contemporary values. The discourse was changing. In the survey of sex-handbooks from the period, Laskar [2] found the authors to be engaged in women´s enjoyment from various perspectives. Sexual intercourse was not

for male satisfaction only, but also for female. Mutual enjoyment got new meaning when women's voices began to be heard in sexual handbooks.

Initiatives were taken to educate common people about sexual transmitted diseases, their nature and dangerousness, usually referred to as sexual hygiene. This was supposed to incumbent upon the clergy. Nothing happened before the first female doctor in Sweden, Karolina Widerström, at turn of the century demanded popular education regarding sexual hygiene. Since it was not illegal at that time she produced anatomic posters with the reproductive organs and held lectures to adult women in sexual hygiene, and started education of elementary school teachers [110]. The fight for the right to provide information on sexual health continued for decades. After the introduction of universal suffrage, women could be eligible for election to the Swedish parliament for the first time, in 1921 [111]. During coming decades numbers of petitions according sexual health were written.

Between the years 1911 and 1938 Swedish law prohibited public information about and the sale of contraceptive devices. In 1946, pharmacies were required to sell contraceptives (condoms and diaphragms) to anyone requesting them. General sex education became compulsory in elementary schools in Sweden in 1955. By the end of the 1950s condoms were available in vending machines in public places. The “sexual revolution” followed in the 1960s, with the contraceptive pill. Homosexuality was prohibited until 1949 when it become a mental diagnosis until 1979 [112] which might explain why people refused to answer questions on that in the 70s.

The changes in attitudes and sexual behaviour in later born birth-cohorts of 70-year-olds, beside better health care, health status and living conditions might be related to attitude changes in modern society. Some of earlier sex

differences have disappeared and other has diminished. Greatest changes were seen among the women. And we should not forget the 97-year-olds, who actually were born in the first decade of the 20th century, the same as the first birth-cohorts of 70-year-olds, also have a positive attitude towards sexuality and find it natural to include questions on sexuality in health surveys. May be is not only a cohort effect but also influences of today's society.

Strengths and limitations

The PPSW

Strengths of this study the population-based design, the long follow-up periods and the comparably large response rates. And the fact that the interviews were part of a prospective multidisciplinary medical survey initiated when the women were in midlife meant that the study did not explicitly recruit individuals to talk about sexuality. Possible limitations: First, same-sex sexuality was not possible to explore due to few individuals reporting having that experience. Secondly, probably the study was underpowered to examine some of the study questions, for example the medical illnesses that were not very common in midlife.

Four birth cohorts of 70-year-olds

Major strengths of this study are that it is based on four general population samples examined using identical methods over a 30 year period, and that the interviews were part of a comprehensive investigation on ageing and people were not recruited explicitly to talk about their sexuality. Possible limitations

need to be mentioned. Firstly, although the response rate in this sample is higher than in most studies on sexual behaviour, it did decline from 80% in the first sample to 65% in the fourth sample. Comparisons between responders and non-responders identified no differences for several factors, including three year mortality rate, indicating that non-responders were similar to responders. Furthermore, the secular trends in reported sexual behaviour over the 30 year study period were so pronounced that declining response rates could not explain the differences between the samples of 70 year olds. We cannot, however, exclude the possibility that those who declined had more sexual problems than those who participated. Secondly, studies of elderly people include a survival bias; we examined only those who reached age 70. Thus we cannot draw any conclusions on sexual behaviour before this age. Thirdly, changes in evaluations of responses over time may have influenced the results. One researcher (IS) was trained by those who carried out the examinations in the 1970s, who in turn trained those doing the examinations in 1992 and 2000. Inter-rater reliability between the researcher and examiners in the 1970s and 1990s was high, ensuring consistency in the interviews over time. Fourthly, changing attitudes affect both interviewers and participants. It is possible that our results reflect a more open-minded attitude in society to sexual matters rather than real changes in sexual behaviour. We recently reported lower scores on a later-born population-based lie-scale compared with those born in the early 1900s, suggesting that older individuals of today may be more honest in their responses [113]. Fifthly, questions on homosexual behaviour and masturbation were included in the original study but then withdrawn in 1976-7, as they evoked strong reactions and many refused to respond to the questions. Thus we cannot generalize our results to other types of sexuality than intercourse between heterosexuals. As we aimed to describe secular trends, we were limited to those questions used in the 1970s.

97-year-olds

Major strengths of this study include the high age and large sample as well as the fact that data were collected as part of a comprehensive population-based investigation on ageing. In addition, we were able to assess and exclude individuals with dementia, who might not have been able to give reliable answers to questions on sexuality. Some limitations: first, since we did not ask questions on sexuality to people with dementia or when there was a third party in the room (usually because of problems to understand Swedish language), we cannot generalize our findings to others than non-demented Swedish speaking 97-year-olds. Secondly, although 65% is a fairly good response rate in this age group, we cannot exclude the possibility that those who refused to take part in the examination differed from participants. Thirdly, although we had a fairly large sample, the study was underpowered to examine some of the study questions, for example regarding gender differences and characteristics reported.

General strengths and limitations for the studies

All the interviews were carried out face-to-face by experienced psychiatrists and psychiatric research nurses experienced in asking sensitive questions. Possibly limitations: First, sexual behaviour can be a sensitive matter to report to strangers but it might be easier to report sexual behaviour to a professional within the context of an examination on different aspects of ageing. Most reports indicate that people are reasonably open about their sexual behaviour when the observer is objective and comfortable with the topic of inquiry[17]. In line with this; the Duke studies [17] reported a high correlation among married couples regarding answers on the frequency of sexual intercourse. Secondly, the study is based on self report, which lends itself to reporting bias. Two qualitative studies indicated that participants from later born cohorts reported that they had learnt to speak more openly

about sexuality[114] and that many welcomed the opportunity to talk about sex and discuss issues they had never talked about before [115]. Thirdly, definition of sexual activity was limited to intercourse between heterosexuals Thus; we cannot conclude anything about other types of sexual behaviour.

6 CONCLUSION

Attitudes toward sexuality have changed dramatically during the 20th century, quantity and quality of sexual experiences among 70 year olds improved over a 30 year study period. Determinants of sexual activity in midlife women and older people are multifactorial, including sexuality-related, partner-related, and health related factors. It is also noteworthy that many older people have sexual desires and remain sexually active despite having severe physical disorders. It is important to have a multifactorial, and a multidisciplinary approach in the exploration of mid- and late life sexuality. We should not forget the large proportion of older people who have ceased having sex, and reporting they miss it. A great majority find it natural to include questions on sexuality in health examinations why health professionals should not hesitate to ask about sexual concerns despite age.

7 FUTURE PERSPECTIVES

7.1 Clinical implications

Sexual health is an important part of quality of life. The knowledge that older people are willing to talk about sexuality, and find it natural to include in health examinations make it easier to dare to ask. If health professionals are comfortable with the topic it would lead to that patients of all ages can feel confident when it comes to sexual concerns.

In many disciplines of medicine, the illness itself can give sexual problems or dysfunctions, and so also the treatment. It is therefore important to talk about consequences. The patient should not need to have feelings of shame of wanting to maintain sexual activity, in spite a serious illness.

Therefore health professionals as doctors and nurses should be educated in sexology, to increase knowledge on sexuality, and realize that sexuality is part of life, the whole life, despite age.

7.1 Research implications

We have had an intention to have a multifactorial approach in our studies, and have succeeded quite well because the studies are a multidisciplinary collaboration. And in present time it is more common, many other researchers have the same approach.

In our studies, as in many others, there has in a quit high degree been focus on heterosexual, penetrating vaginal intercourse. We have not been able to report on other types of sexual behaviour. In the future we should have more open questions, and let the participants define what sexual behaviour is. Qualitative studies on a systematically selected sample in future population studies could improve our knowledge even more.

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