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Published in:
The journals of gerontology. Series A, Biological sciences and medical sciences

DOI:
10.1093/gerona/glx113

Publication date:
2018

Document version:
Accepted manuscript

Citation for pulished version (APA):
Rasmussen, S. H., Thinggaard, M., Højgaard, M. B., Jeune, B., Christensen, K., & Andersen-Ranberg, K. (2018). Improvement in Activities of Daily Living among Danish Centenarians? A Comparative Study of Two Centenarian Cohorts Born Twenty Years Apart. *The journals of gerontology. Series A, Biological sciences and medical sciences*, *73*(8), 1125–1131. https://doi.org/10.1093/gerona/glx113

Improvement in Activities of Daily Living among Danish Centenarians?

A Comparative Study of Two Centenarian Cohorts Born Twenty Years Apart

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Abstract

Background: With the continued rise in the proportion of the oldest-old in high income countries, it is of interest to know whether the functional health of today's oldest-olds is better or worse than in previous cohorts. Using two Danish centenarian birth cohorts born twenty years apart we aimed at investigating if the later born cohort had better functioning in terms of activities of daily living (ADL).

Methods: Identification, methodology and assessment instruments were identical in the 1895-West and 1915-West Birth Cohort Studies: All persons living in the western part of Denmark and turning 100 years old in 1995 and 2015, respectively. Data were collected through structured in-home interviews. Participation rates were 74% (n=106) and 79% (n=238), respectively.

Results: The proportion of non-disabled women of the 1915-West cohort was more than twice as high compared to the 1895-West cohort and with corresponding lower proportions of moderately and severely disabled persons (17% vs 7%, 33% vs 40% and 50% vs 53% in the 1915-West and 1895-West cohorts, respectively, p=0.047). Only non-significant improvements were seen among men in the 1915-West cohort. In both sexes, considerably higher proportions of the latest cohort used assistive devices than the former (statistically significant for the majority of assistive devices).

Conclusion: This comparative study shows improvements in reported ADL in the later born cohort of centenarians, even though only significant among women. As women constitute the majority of the oldest-olds, our findings are encouraging from a public health care view.

Key words: Longevity, Disability, Cohort studies, Methodology

Introduction

The considerable decline in old age mortality has led to an increasing proportion of the oldest-old [1-3]. According to the U.S. Census Bureau, the number of 100+ year olds in the United States increased from 15,000 in 1980 to 64,000 in 2015 and increase will most likely continue [4]. In 2015, the 100+ year olds constituted a similar proportion in Denmark, i.e. 0.2‰ of the total population [5]. According to Danish cohort life tables, the chance of surviving from birth to 100 years almost doubled from birth year 1895 to birth year 1915 (0.37% vs 0.73%) [6]. The rise in the proportion of centenarians is largely explained by an increase in women reaching these high ages, while there has been a less pronounced increase in centenarian men [5].

Aging is associated with a higher risk of physical and cognitive disabilities. With the continued rise in the proportion of the oldest-old in high income countries, it is of interest to know whether the functional health of today's oldest-olds is better or worse than in previous cohorts. Two hypotheses stating different views on aging populations are currently debated [7]: "The Failures of Success" hypothesis states that a cohort with an increasing proportion of individuals surviving to very old age will also show higher mean levels of disability and disease [8]. The opposite hypothesis, "The Success of Success", states that more individuals are living to the highest ages in better functional health [7]. The latter hypothesis is supported by our previous findings from comparing two birth cohorts of Danish nonagenarians born ten years apart: despite being on average two years older more individuals of the later born cohort lived into their nineties with better overall functioning in terms of cognition and activities of daily living [7].

Cohort comparison studies of centenarians

Previous comparative studies on centenarians are scarce. In Japan, the study of Okinawan centenarians showed a decline in independence in activities of daily living (ADL) from the 1970s to

the 1990s [9, 10]. In contrast, in the United States, the Georgia Centenarian Study compared two cohorts of home-dwelling and cognitively intact individuals and found improvements in ADL in the later born cohort (birth cohorts 1901-1907; mean age 99 years) compared to the earlier born cohort (birth cohorts 1881-1885; mean age 102 years) [11]. Although this improvement may be explained by different mean ages and different recruitment strategies for the birth cohorts, the same result was found in a comparison study of two Danish centenarian cohorts born ten years apart (1895 vs 1905). In that study ADLs improved also for the later born cohort (1905), but only among women [12]. However, the two cohorts had different participation rates (75% vs 63% in the 1895 and 1905 cohorts, respectively) and used different types of interviewers (geriatrician and nurse vs trained lay interviewers). Different methodologies were thus applied in both the Georgia Centenarian and the Danish 1895-1905 birth cohort studies, and this may have biased the results [13].

The study we present here also investigated two centenarian cohorts, this time using the same survey methodology and type of interviewer, but in cohorts born twenty years apart. Our aim was to find out if the improvement seen in the 1905 cohort compared to the 1895 cohort [12] could be extended to the 1915 cohort, i.e. when comparing the 1895 cohort with the 1915 cohort? And could an improvement be found among men in the later born cohort? Would the results support the "Success of Success" [7] hypothesis by showing improvements in ADL in the later born cohort of centenarians compared to a cohort born 20 years earlier?

Materials and Methods

Study Populations: The 1895 and 1915 Birth Cohorts

Eligible centenarians were identified through the Danish Civil Registration System (CRS), which keeps a record of all people living in Denmark [14]. Both were population studies with no exclusion criteria, and proxy interviews were allowed if the centenarian could or would not participate in-

person. An informed consent was collected before beginning each interview, and the surveys received approval from the Committee on Health Research Ethics (trial numbers, 1895: 95/93 and 95/93 MC; 1915-East and baseline: S-20100011; 1915-West: S-20140099) and the Danish Data Protection Agency (1915: 2016-41-4552).

The 1895 Birth Cohort Study: This first Danish nationwide study on centenarians included all persons born between April 1, 1895 and May 31, 1896, alive on their 100th birthday and living in Denmark [15].

The 1915 Birth Cohort Study: This birth cohort was first surveyed in 2010 (aged 94-95) by trained lay interviewers from the Danish Institute of Social Research [7, 16]. A follow-up study was carried out in 2015, including previous non-participants, and the 1915 birth cohort was divided into two geographical parts separated by the Great Belt: the 1915-West and the 1915-East birth cohorts. Only the 1915-West birth cohort study used the same methodology as the 1895 birth cohort study [16]. Fewer than 3 persons moved between the eastern and western part of Denmark in the period from 2010 to 2015.

1915-West Birth Cohort: Eligible were all persons born between January 1, 1915 and December 31, 1915, alive on their 100th birthday and living in the western part of Denmark i.e. west of the Great Belt [16].

To ensure geographical comparability we divided the 1895 birth cohort population into 1895-West and 1895-East by the same geographical separation as in the 1915 cohort study. This choice was supported by comparative analyses of ADLs in 1895-West and 1895-East showing a tendency (non-significant) of 1895-East cohort members reporting better ADL compared to 1895-West, despite using identical methodologies. The same East-West tendency could also be shown when analyzing other Danish birth cohorts born 1905 (aged 99-100 years), 1910 (aged 99-100 years) and 1915

(aged 94-95 years) (unpublished data). Therefore the cohort comparisons for this study were carried out between the 1895-West and 1915-West birth cohorts.

The 1895-West and the 1915-West Birth Cohort Studies

Out of 144 and 303 eligible persons, living in the western part of Denmark, 106 (74%) and 238 (79%) participated in the 1895-West and 1915-West cohort studies, respectively (Table 1). The proportion of proxy interviews was similar between the two cohorts.

The study designs and assessment instruments were identical in both studies. Also, both studies were conducted by one survey team, each consisting of a geriatrician (KAR in the 1895 cohort and SHR in the 1915-West cohort) accompanied by a geriatric nurse. All participants were visited in their homes, including nursing homes, consecutively as they turned 100 years and within three months after their 100th birthday.

Reported Activities of Daily Living (ADL)

ADL was assessed by self-report of eleven physical tasks (Tables 2a and 2b), which represent Physical Activities of Daily Living (PADL) [17]. Five Basic Activities of Daily living (BADL) were derived from these eleven tasks (Figures 1 and 2) [18]. Each of the eleven tasks had three possible answers: (i) can do the activity independently, (ii) can do the activity with a little help, or (iii) need a lot of help/cannot do the activity at all. Doing an activity independently included using an assistive device if needed, but no help from a person.

Disability

Disability was measured as a disability score based on the five BADL tasks presented in hierarchical order of difficulty [19] (most difficult task first); bathing, dressing, toileting, transferring and feeding. Each of these BADLs comprised one task (specified in Tables 2a and 2b) except for “dressing” which comprised three tasks: (i) dress upper part of the body, (ii) dress lower

part of the body, and (iii) take on/off socks and shoes. To calculate a disability score each of the five BADL tasks was changed to binary variables: "1" can do the activity independently and "0" can do the activity with help or cannot do the activity at all. For the task "dressing" the same "0/1" binary division was made i.e. an individual had to be independent on help in all three tasks to get a "dressing" score of "1", while dependence in one or more tasks resulted in a score of "0". Thereby a total score between 0-5 could be obtained, which was divided into three groups: 0-2 (severely disabled), 3-4 (moderately disabled) and 5 (non-disabled). These tasks have been used in other Danish cohort studies [12, 20].

Assistive Devices

Assistive devices were assessed by the reported use of the following: (1) cane, (2) crutches, (3) walker/walking frame, (4) wheelchair, (5) elevated toilet seat, (6) handle/handgrip/rail, and (7) bath bench. An individual could have multiple devices.

Statistical Analyses

The STATA statistical software package 14.2 was used to analyze data. The analyses were made separately for women and men to detect potential sex differences. The Fisher's exact test was used to test differences between the cohorts on categorical variables. A binary regression model was applied to analyze the effect of assistive devices on non-disability. Assistive devices were split into using 0-2 and 3+ assistive devices. Being non-disabled or disabled was calculated based on the five BADL items.

Due to the very few number of participants with missing values (maximum 5 out of 344 in the analyses), these were excluded from the specific analysis without compromising the validity of the analysis.

Results

Men constituted a significantly higher percentage in the 1895-West compared to the 1915-West (24% vs 15%, p=0.025). However, the participation rates and male/female participation rate ratios were similar in the 1895-West and the 1915-West cohorts (Table 1). Also, the participants and non-participants did not differ with respect to sex and housing across the two cohorts (Table 1). There was no difference in educational level between the two cohorts (data not shown).

Gender specific cohort comparison of each of the eleven ADL tasks is shown in Tables 2a and 2b. Among women higher proportions in the 1915-West cohort were independent in all eleven ADL tasks compared to the 1895-West cohort (Table 2a), and statistically significant in nine. Also, in each of the eleven tasks there was a lower proportion who reported being dependent, and a higher proportion needing help in performing the activity in the 1915-West compared to the 1895-West cohort. Among men higher proportions in the 1915-West compared to 1895-West were independent, but only in eight out of the eleven ADL tasks, and statistically significant only in ADL task number 3 (Table 2b). Additionally, in seven tasks there were a lower proportion of dependent centenarian men in the 1915-West compared to the 1895-West cohort, while higher proportions were observed for those needing help also in seven tasks (Table 2b).

The comparison of Tables 2a and 2b shows that a substantially higher proportion of men in both cohorts reported to be independent in each of the eleven ADL items compared to their female counterparts.

Disability

Figures 1 and 2 show the five BADL tasks derived from Tables 2a and 2b. In four of these tasks significantly more women of the 1915-West reported higher independence than the 1895-West cohort (Figure 1). No significant differences were seen among men in the BADLs but the tendency was the same as for women (Figure 2). The derived score of the five BADLs (the disability score)

showed that the proportion of non-disabled women in the 1915-West cohort was more than twice as high compared to the 1895-West cohort (Table 3), and with correspondingly lower proportions of moderately and severely disabled women in the 1915-West cohort.

Similarly, a higher proportion of non-disabled men and a lower proportion of moderately disabled men were found in the 1915-West compared to the 1895-West cohort. But in contrast to women, there was a small increase in the proportion of severely disabled men in the 1915-West cohort, and as for the individual five BADLs there was no significant difference. However, numbers were small.

Assistive Devices

Each of the specified assistive devices was used by a considerably higher proportion of both women and men of the 1915-West cohort compared to the 1895-West cohort (Table 4). The largest increases were seen in assistive devices used for mobilization (walker/walking frame, handle/handgrip/rail), for personal hygiene (bath bench) and for using the toilet (elevated toilet seat). Overall, 91% (n=96) and 99% (n=232) from the 1895-West and 1915-West cohorts, respectively, used at least one assistive device.

Table 5 shows the proportion being independent in the five BADL items adjusted by sex and the use of assistive devices. Being non-disabled showed an absolute improvement of 0.28 higher proportion in the 1915-West cohort compared to the 1895-West cohort (prevalence proportion difference (PPD)). Similar analyses of being non-disabled adjusted by sex in the group using 0-2 assistive devices was PPD 0.41 and in the group using 3+ assistive devices PPD 0.13, which was statistically significant (p=0.006).

Discussion

This comparison of two cohort studies of 100-year old Danes using the same methodology and having similar high participation rates beyond 70% shows that centenarian women born in 1915 have better physical functioning compared to their age peers born in 1895. In men, only insignificant improvements were observed, even though the proportional improvements of the non-disabled men in the later born cohort were similar to those observed among women. These improvements should be seen in relation to a concurrent doubling in the number of Danish centenarians between 1995 and 2015.

Our results confirm and extend the findings of the earlier comparison study where the 1905 birth cohort was compared to the 1895 birth cohort [12] and showed an improvement in reported ADL among women in the later born cohort. However, while the 1895-1905 cohort comparison revealed a lower proportion of non-disabled men in the later born cohort [12], the present comparison showed a higher proportion of non-disabled men in the 1915-West than in the 1895-West cohort (Table 3). As both the methodology and participation rates were highly comparable, the observed changes in ADL between the 1895-West and 1915-West cohorts may be regarded as more reliable and less biased than the results presented in the previous cohort comparison of centenarians (1895 vs 1905) [12].

The improvement in ADL may be explained by a general progress in functional health per se in the 1915-West compared to the 1895-West cohort, and by improvement in housing conditions, but the improvement may also to some extent reflect the substantial increase in the use of several assistive devices in the 1915-West compared to the 1895-West cohort, especially those assistive devices used in connection with mobilization (walker/walking frame, handle/handgrip/rail). However, the improvement in being non-disabled in the 1915-West cohort compared to the 1895-West cohort did not seem to be due to the use of assistive devices (Table 5). In the 1915-West cohort 28% more of

the participants were non-disabled compared to the 1895-West cohort when adjusting for sex and assistive devices. There was approximately a three times higher increase of those being non-disabled in 1915-West cohort using 0-2 assistive devices compared to those using 3+ assistive devices (PPD 0.41 vs 0.13). These findings can be extended to the previous 1895-1905 comparison study, where the largest improvement in ADL was in the group not using assistive devices [12]. Differences in the educational level might also have contributed to the improvement. There was no difference in education between the two cohorts, but a potentially higher educational level in the offspring of the later born cohort might have contributed to the observed improvement in the 1915-West cohort. Higher education in offspring has been shown to have a positive effect on functional limitations in the parents [21-23].

Also, a higher focus on rehabilitation activities in the last decades in order to increase independent living as community-dwellers may have played a positive role. Rehabilitation aims at maintaining or improving functioning, but it was first implemented in the Danish Health Legislation after the turn of the millennium [24]. Before the implementation there was a gap between the rehabilitative training provided in a hospital setting and in a primary care setting. The new legislation made it mandatory for the municipalities to provide rehabilitative training activities, not only after hospital discharge, but also whenever a significant decrease in functioning is apparent. Additionally, in the 1990s the oldest-old were fewer, and it was the general view that they were too frail to train in order to maintain functional abilities - a view which is in contrast with today's view on oldest-olds. Therefore the 1895-West cohort members might have been subject to some degree of agism resulting in less training activities than their cohort peers born twenty years later. The environmental factors e.g. housing conditions, rehabilitation and less agism may have been important factors to explain the increased level of functional ability in 1915-West cohort compared

to the 1895-West cohort. The findings and possible explanations in this article are comparable to those in the WHO world report on aging and health from 2015 [25].

The gender disparities are noteworthy. While the proportion of non-disabled men of the 1915-West cohort was approximately two times higher than their female cohort peers, the similar proportion of non-disabled men in the 1895-West cohort was four times higher (Table 3). In both cohorts, women outnumbered men in a ratio of 5.0 and 3.7 in the 1915-West and 1895-West cohorts, respectively. The paradox that men in both cohorts had much better ADL than women but that women outlive men is consistent with current knowledge [26-29]. As the gender difference with respect to reported ADL decreased in the 1915-West compared to 1895-West cohort, results from this study might imply that women in the later born cohort seem to approximate their male peers with respect to ADL.

Strengths

A major strength is that both cohort studies were population surveys using the same methodologies i.e. no selection criteria, in-home face-to-face interviews, and identical assessment instruments. The probability of selection bias is low due to the register-based identification and high participation rates, which otherwise could have biased the results towards higher proportions of independent centenarians [13]. Furthermore, the proportion of interviews conducted by proxies (20% vs 22%) was similar. The survey teams of the 1895-West and 1915-West cohort studies comprised both a geriatrician and a geriatric research nurse. Additionally, the main supervisor (KAR) in the 1915-West cohort study conducted the 1895 cohort study, and she also participated in the first visits of the 1915-West cohort study to ensure harmonization of methodologies in the field.

Limitations

A potential limitation is the small sample sizes of centenarian men in both cohorts, which are likely to explain the lack of statistical power. This is, however, a result of the relatively few eligible

centenarian men as the participation rates among men in both cohorts were beyond 80%. Moreover, the proportion of men in the 1895-West constituted a significantly higher proportion than in the 1915-West cohort. However, the male/female participation rates were similar in both cohorts. Also, despite a similar methodology and recruitment strategy we cannot reject the influence of a potential inter-interviewer bias between the two studies. Yet, the geriatrician conducting the 1895 cohort study supervised the geriatrician carrying out the 1915-West cohort study and we believe that this minimizes the risk of bias.

Conclusion

This comparative study shows improvements in reported ADL in the later born cohort of centenarians, but only significantly among women. The findings support the "Success of Success" hypothesis generally seen among nonagenarians that more individuals are independent in ADL, and this study suggests that the improvement continues into the 11th decade of life. As women constitute the majority of the oldest-olds, our findings are encouraging from a public health care view and may add to the knowledge needed in future health care planning. Additionally, this study may also support the continued effort to achieve independence in activities of daily living through rehabilitative initiatives and increased use of assistive devices. Despite our positive results, more studies are needed in the future to see whether these improvements in functional health continue into the next generations of oldest olds.

Conflict of Interest

None declared.

Funding

This work was supported by the Novo Nordisk Foundation; the Faculty of Health Sciences, University of Southern Denmark; The Health Foundation (Helsefonden) (Grant nr.16-B-0271); the Danish Interdisciplinary Research Council. The Danish Aging Research Center is supported by a grant from the Velux Foundation.

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Table 1: Characteristics of the 1895-West and 1915-West Cohorts

		1895-West		1915-West	
	Invited: Total, N (Male/Female)	144 (35/109)		303 (46/257)	
Sex	[a]Male proportion (95% CI)	24 (18;32)		15 (11;20)	
Participation	[b]Total participation rate, N (%)	106 (74)		238 (79)	
	Male participation rate, N (%)	29 (83)		40 (87)	
	Female participation rate, N (%)	77 (71)		198 (77)	
	[c]Male/female participation rate ratio (95% CI)	1.17 (0.97;1.42)		1.13 (0.99;1.29)	
Age of participants	Median age, years (range in months[d])	100.1 (0.2-4.8)		100.1 (0.1-5.5)	
Interview type	Interview by proxy, N (%)	21 (20)		53 (22)	
		Participants	*Non-participants*	*Participants*	*Non-participants*
Type of housing	At home, N (%)	38 (36)	17 (45)	83 (35)	30 (46)
	Sheltered house, N (%)	12 (11)	3 (8)	30 (13)	12 (19)
	Nursing home, N (%)	56 (53)	18 (47)	125 (52)	23 (35)

Notes: The group of non-participants included 5 and 8 deceased in the 1895-West and 1915-West cohorts, respectively.

[a]The proportion of males in relation to females in the 1895-West and 1915-West cohort studies, and the 95% Confidence Interval for the proportion.

[b]Both sexes combined.

[c]Male/female ratio showed with 95% CI = 95% Confidence Interval for the ratio.

[d]Range in months after the 100th anniversary.

Table 2a: Activities of daily living (ADL): Women in the 1895-West and 1915-West Cohorts

Answers to the following questions: Are you able to?		**Yes, N (%)**		**With help, N (%)**		**No, N (%)**		[b]P-value
		1895-West	*1915-West*	*1895-West*	*1915-West*	*1895-West*	*1915-West*	
[a]Bathing	1. Take a bath	5 (6)	37 (19)	16 (21)	48 (25)	56 (73)	110 (56)	0.013
[a]Dressing	2. Dress upper part of the body	33 (43)	102 (53)	14 (18)	78 (40)	30 (39)	14 (7)	<0.001
	3. Dress lower part of the body	22 (29)	86 (44)	12 (15)	58 (30)	43 (56)	51 (26)	<0.001
	4. Take on/off socks and shoes	17 (22)	71 (36)	5 (7)	49 (25)	55 (71)	75 (39)	<0.001
[a]Toileting	5. Go to the lavatory	39 (51)	118 (61)	6 (8)	46 (24)	32 (41)	30 (15)	<0.001
[a]Transferring	6. Rise from a chair/bed	46 (60)	130 (66)	7 (9)	36 (18)	24 (31)	32 (16)	0.011
[a]Feeding	7. Eating	41 (53)	111 (57)	24 (31)	67 (34)	12 (16)	18 (9)	0.32
Others	8. Wash upper part of the body	41 (53)	106 (55)	13 (17)	70 (36)	23 (30)	18 (9)	<0.001
	9. Wash lower part of the body	23 (30)	81 (42)	3 (4)	28 (14)	51 (66)	85 (44)	0.001
	10. Walk around indoors	43 (56)	131 (66)	4 (5)	21 (11)	30 (39)	46 (23)	0.025
	11. Get outdoors	25 (32)	84 (43)	13 (17)	37 (19)	39 (51)	75 (38)	0.16

Notes: 1895-West n=77and 1915-West n=194-198. Number of participants of the 1915-West varied due to missing values.

[a]These five basic ADL tasks constitute the disability score (Table 3). Curly bracket: The basic ADL task "Dressing" comprises ADL task numbers 2, 3 and 4.

[b]Obtained by the Fisher's exact test.

Table 2b: Activities of daily living (ADL): Men in the 1895-West and 1915-West Cohorts

Answers to the following questions: Are you able to?		**Yes, N (%)**		**With help, N (%)**		**No, N (%)**		[b]P-value
		1895-West	*1915-West*	*1895-West*	*1915-West*	*1895-West*	*1915-West*	
[a]Bathing	1. Take a bath	8 (28)	16 (40)	2 (7)	6 (15)	19 (65)	18 (45)	0.27
[a]Dressing	2. Dress upper part of the body	17 (58)	24 (60)	6 (21)	12 (30)	6 (21)	4 (10)	0.45
	3. Dress lower part of the body	16 (55)	23 (58)	3 (10)	12 (30)	10 (35)	5 (12)	0.045
	4. Take on/off socks and shoes	13 (45)	20 (50)	3 (10)	7 (17)	13 (45)	13 (33)	0.51
[a]Toileting	5. Go to the lavatory	20 (69)	27 (68)	3 (10)	8 (20)	6 (21)	5 (12)	0.43
[a]Transferring	6. Rise from a chair/bed	21 (72)	32 (80)	4 (14)	2 (5)	4 (14)	6 (15)	0.57
[a]Feeding	7. Eating	19 (66)	29 (73)	9 (31)	8 (20)	1 (3)	3 (7)	0.58
Others	8. Wash upper part of the body	22 (76)	25 (63)	4 (14)	11 (27)	3 (10)	4 (10)	0.43
	9. Wash lower part of the body	17 (59)	21 (53)	1 (3)	5 (12)	11 (38)	14 (35)	0.57
	10. Walk around indoors	21 (72)	29 (73)	2 (7)	3 (7)	6 (21)	8 (20)	1.00
	11. Get outdoors	17 (59)	24 (60)	5 (17)	3 (7)	7 (24)	13 (33)	0.43

Notes: 1895-West n=29 and 1915-West n=40.

[a]These five basic ADL tasks constitute the disability score (Table 3). Curly bracket: The basic ADL task "Dressing" comprises ADL task numbers 2, 3 and 4.

[b]Obtained by the Fisher's exact test.

Table 3: Disability score derived from basic activities of daily living (BADL) by cohort and sex

BADL performed independently	**Women, N (%)**		**Men, N (%)**	
	1895-West	*1915-West*	*1895-West*	*1915-West*
Total	77	193	29	40
5 (Non-disabled)	5 (7)	34 (17)	8 (28)	15 (38)
3-4 (moderately disabled)	31 (40)	63 (33)	12 (41)	11 (27)
0-2 (severely disabled)	41 (53)	96 (50)	9 (31)	14 (35)
[a]P-value	0.047		0.56	

Notes: The disability score was calculated based on the five BADL tasks; bathing, dressing, toileting, transferring, and feeding. Each BADL task was dichotomized into "0/1" variables, thereby a total score between 0-5 could be obtained (high score indicated independence). The disability sum score was grouped into three; 5 (non-disabled), 3-4 (moderately disabled), and 0-2 (severely disabled).

[a]Obtained by the Fisher's exact test.

Table 4: The use of assistive devices by cohort and sex

[a]Use of the following assistive devices	[b]**Women, N (%)**		Cohort differences [d]p-value	[c]**Men, N (%)**		Cohort differences [d]p-value
	1895-West	*1915-West*		*1895-West*	*1915-West*	
Cane	17 (22)	97 (49)	<0.001	18 (62)	27 (68)	0.80
Crutches	5 (6)	14 (7)	1.00	2 (7)	4 (10)	1.00
Walker/walking frame	29 (38)	155 (79)	<0.001	5 (17)	28 (70)	<0.001
Wheelchair	30 (39)	95 (48)	0.18	7 (24)	17 (43)	0.13
Elevated toilet seat	12 (16)	69 (35)	0.001	2 (7)	15 (38)	0.004
Handle/handgrip/rail	15 (19)	170 (87)	<0.001	4 (14)	32 (80)	<0.001
Bath bench	14 (18)	169 (86)	<0.001	7 (24)	25 (63)	0.003

Notes: [a]Number and proportion answering "yes" to the use of assistive devices. An individual may have multiple devices.

[b]Women: 1895-West n=77 and 1915-West n=196-198. Number of participants in the 1915-West varied due to missing values.

[c]Men: 1895-West n=29 and 1915-West n=40.

[d]Obtained by the Fisher's exact test.

Table 5: Proportion of non-disabled in the 1915-West Cohort compared to the 1895-West Cohort adjusting for sex and assistive device, shown as prevalence proportion difference (PPD)

	PPD	[a]95% CI	P-value	[b]Participants, N
Adjusted by sex	0.11	0.037;0.18	0.003	339
Adjusted by sex and [c]assistive devices	0.28	0.23;0.33	<0.001	337
Adjusted by sex in the group using 0-2 assistive devices	0.41	0.23;0.59	<0.001	120
Adjusted by sex in the group using 3+ assistive devices	0.13	0.083;0.19	<0.001	217

Notes: Non-disabled: Being able to perform the five BADL items (bathing, dressing, toileting, transferring and feeding) independently. Doing an activity independently included using an assistive device if needed, but no help from a person. The 1895-West cohort is the reference.

[a]95% CI= 95% Confidence Interval for the prevalence proportion difference (PPD).

[b]The total number of participants in the 1895-West (n=106) and 1915-West (n=238) cohorts. Number of participants varied due to missing values.

[c]The total of the seven reported assistive devices (Cane, Crutches, Walker/walking frame, Wheelchair, Elevated toilet seat, Handle/handgrip/rail, Bath bench). Assistive devices were divided into binary variables 0-2 and 3+ assistive devices.

Figure 1: Basic activities of daily living (BADL): Women in the 1895-West and 1915-West Cohorts

1895-West: n=77.

1915-West n=194-198 (number of participants varied due to missing values).

Proportion which is (i) “Independent”: can do the activity independently, (ii) “Need help”: can do the activity with a little help, or is (iii) “Dependent”: need a lot of help/cannot do the activity at all. Doing an activity independently included using an assistive device if needed, but no help from a person.

*p<.05 **p<.001

Figure 2: Basic activities of daily living (BADL): Men in the 1895-West and 1915-West Cohorts

1895-West: n=29.

1915-West n=40.

Proportion that is (i) “Independent”: can do the activity independently, (ii) “Need help”: can do the activity with a little help, or is (iii) “Dependent”: need a lot of help/cannot do the activity at all. Doing an activity independently included using an assistive device if needed, but no help from a person.

Figure 1

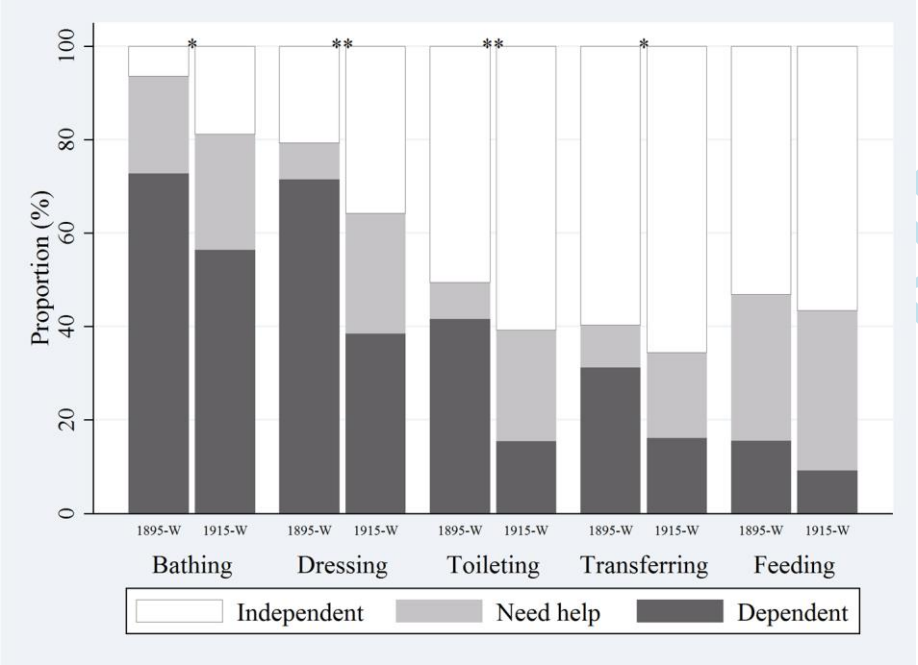

Figure 2