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Effect of urinary incontinence on negative self-perception of health and depression in elderly adults: a population-based cohort

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Abstract *The scope of this study was to measure the prevalence of negative self-perceived health and depressive symptoms in elderly adults according to the presence of urinary incontinence, after a follow-up of nine years. This is a prospective population-based cohort study entitled Bagé Cohort Study of Aging, from Rio Grande do Sul. A total of 1,593 elderly adults were interviewed in the baseline study (2008) and 735 between September 2016 and August 2017. The "urinary incontinence (UI)" exposure was assessed in the baseline study and the outcomes "negative self-perceived health" and "depressive symptoms" in 2016/17. The odds ratio and 95% confidence interval were calculated by Logistic Regression and adjusted for demographic, social, behavioral and health conditions. The prevalence of UI was 20.7% in 2008 and 24.5% in 2016/17; the incidence was 19.8%, being 23.8% among women and 14.6% among men (p = 0.009). Elderly adults with UI at the baseline study had a 4.0 (CI95%: 1.8-8.8) and a 3.4 (CI95%: 1.8-6.2) greater chance to develop negative self-perception of health and depressive symptoms, respectively, after nine years of follow -up, compared to those without UI. The results show a greater probability of mental problems among elderly adults with UI.*

Key words *Elderly, Urinary incontinence, Self-assessment, Depression, Longitudinal studies*

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Introduction

The International Urogynecology Association and the International Continence Society (ICS) define urinary incontinence (UI) as any report of involuntary loss of urine[1]. UI is considered to be one of the main geriatric syndromes[2,3], with a rising tendency among the elderly, especially the oldest adults and women[4-6].

Most of the literature has shown that the occurrence of UI may vary between 20% and 45%[7-12]. Such variability depends on the selection of the sample (age, sex, place of residency – long-term institutionalization or communities)[13,14]; tool used (self-report or clinical diagnosis); lack of uniformity in the definitions[5]; and cultural differences (perception of UI by the interviewed individuals)[15].

Factors associated with UI include social status; the lack of or a low level ofeducation[6]; behavioral factors, such as not being physically active enough[6]; and chronic conditions, such as hypertension[8], diabetes mellitus[5,8], obesity[5], cardiovascular and respiratory diseases[5,6,16], as well as arthritis/rheumatism[9], background of falls[9], limitations or functional inability[5,6,10], cognitive defficiency[10], fragility[9], and polipharmacy[6].

UI results in negative repercussions on the physical and especially psychosocial aspects of the elderly[10], since it causes changes in routine, distancing and social isolation due to embarrassment, and a reduction in self-esteem[17,18]. National and international studies have shown a significantly higher prevalence of depression[10,19-24] and a negative self-perception of health[10,25] among individuals with UI when compared to those with no incontinence. However, most studies on this problem use a cross-sectional approach, which may show a bidirectional association that hampers the definition of the causes that lead to UI. Moreover, there is a scarcity of population-based longitudinal studies about UI among elderly Brazilians[12], especially with focus on outcomes of negative self-perception of health and depression among elderly Brazilians with UI.

Considering the gaps in knowledge on the theme and the negative repercussions of UI on the health of the elderly, this study seeks to measure the prevalence of negative self-perception of health and depression symptoms on the elderly according to the presence of urinary incontinence after a nine-year follow-up period.

Methodology

The population-based prospective cohort study, entitled Bagé Cohort Study on Aging (SIGa-Bagé, in Portuguese) was conducted with older adults from the town of Bagé, located on the Brazilian border of the state of Rio Grande do Sul with Uruguay, between July 2008 and September 2016/August 2017.

SIGa-Bagé was implemented from a cross-sectional study conducted from July to November 2008 (baseline) in which older adults, 60 years of age and older, residing in privately owned homes in the urban area of the town covered by primary healthcare services. There were approximately 122,461 residents in the town, from which 14,792 (12.0%) were elderly. Of the total population, 82% were urban residents.

The size of the sample was calculated for the outcomes "needs assistance at home" and "received assistance at home"[26,27]. We established a minimum sample of 1,530 individuals and 1,713 were found, selected by simple random sampling considering only the areas and micro-areas of the primary healthcare services. 1,593 older adults accepted to participate in the study. Detailed information about the sample and the sampling can be found in Thumé et al.[26,27].

In the period between July 2008 and August 2017, 638 deaths were identified, 579 of which(36.3%) were confirmed in the Mortality Information System (SIM, in Portuguese). In 2016/2017, 757 older adults were re-interviewed (47.5%), from which there were 22 losses during data transfer (n = 735). Of the 1,593 older adults interviewed in 2008, 198 were not followed up for the following reasons: 81 refused, 57 could not be located, 7 were admitted to institutions such as retirement homes, and 53 no longer resided in the town of Bagé[27,28].

Both data collections were performed by properly trained interviewers after a pilot study had been carried out, by means of a structured questionnaire with pre-codified questions, answered by the older adults themselves at home and, in the case of incapacity, applied to the caretaker. In 2008, the printed questionnaire was applied, followed by double typing,whilein 2016/2017, the Personal Digital Assistant (PDA) was applied, and the data was transferred to a computer.

The prevalence and incidence of urinary incontinence was investigated with the question: *Do you have problems with urine loss and wet yourself accidentally (you cannot get to the bath-*

room in time, or when you are sleeping; or when you cough or sneeze, or make an effort)? (yes/no), with 1,592 older adults responding in 2008 and 730 responding in 2016/2017. Using UI as an exhibition factor for the baseline study (2008), the following outcomes were evaluated after nine years of follow-up: prevalence of negative perception of health (bad and terrible), investigated by the question: "How do you consider your health?" (711 responding in 2016/2017); and prevalence of depression symptoms, evaluated according to the *Geriatric Depression Scale*[29] and with dichotomic answers (yes/no) (622 responding in 2016/2017). The presence of depression symptoms was considered when the answer was positive for 6 of the 15 questions on the scale. It is important to note that the outcomes were self-evaluated; thus, the questions were asked to the elderly who had cognitive conditions to respond. The number of responding individuals was therefore less than n = 735.

The covariables used were: sex (male; female); age in years (continuous); education in years (none; 1 to 7; 8 to 20 years); physical inactivity (no; yes), the participants were classified as physically inactive if they did not walk or practiced vigorous or moderate intensive activities for at least ten minutes once a week or more; current smoker (no; yes); obesity (no; yes), according to the definition set forth by the World Health Organization (≥ 30)[30] (WHO, 2020); previous diagnosis of diabetes, hypertension, and rheumatism (no; yes); functional incapacity (no; yes), when there was incapacity to perform the basic activities of one´s daily routine(ABVD, in Portuguese) or for the instrumental activities of one´s daily routine (AIVD, in Portuguese), evaluated by the Katz and Lawton scale; and cognitive deficiency (no; yes), evaluated by a brief mental exam[2].

The data analysis was performed using the statistical program Stata, version 14.0 (Stata Corporation, College Station, EUA). A descriptive analysis was performed, using the Chi-square for proportion comparison. Longitudinal analyses were conducted, to verify the incidence of total UI and by sex, as well as the prevalence of negative self-perception of health and depression symptoms, after nine years of follow-up conducted among the elderly with UI in the baseline study (2008).

To verify the association between negative self-perception of heath and depression symptoms, with UI, this study applied Logistic Regression, crude and adjusted: model 1 = sex and age and model 2 = model 1 + social factors, behavioral and health conditions (education, physical inactivity, smoking, obesity, diabetes, hypertension, rheumatism/arthritis, functional incapacity, and cognitive deficiency). For that analysis, this study excluded all individuals with missing data for any covariable used in the analysis (n = 281). Thus, the sample for the regression analysis consisted of 1,312 participants in 2008, and 625 and 552 participants in 2016 and 2017 for the negative self-perception and depression symptom outcomes, respectively. The results were presented as odds ratio (OR), and its respective 95% confidence intervals (CI). Associations with values $p < 0.05$ were considered to be statistically significant.

This study was submitted to and approved by the Research Ethics Committee of the Universidade Federal de Pelotas, logged under CAAE: 31497314.0.0000.5317, number 678.664, according to the definitions of Resolution 196/1996 and 466/2012. The participants were informed of the study objectives, and read and signed the Free and Informed Consent Form.

Results

Among the elderly who responded to the study conducted in 2008, 62.8% were female, with an average age of 71.2 years (95%CI: 70.8-71.6); in 2016/2017, the sample had 65.3% females, with an average age of 77.1 years of age (95%CI: 76.6-77.6).

In the baseline study (2008), the prevalence of UI was 20.7%, and in the follow-up (2016/2017), it was 24.5%, which is always higher among females ($p < 0.001$). The incidence of UI in the period of study was 19.8% (n = 120), which was also significantly higher among women (23.2%, p-value = 0.009) (Table 1). Among the elderly who were incontinent in the 2008 baseline study (n = 330; 20.0%), 52.0% (n = 64) did not present UI in 2016/2017 and 48.0% maintained the health condition.

During nine years of follow-up, the number of deaths was higher among the elderly who had UI at the time of the baseline study (46.4%), as compared to those without UI (33.7%) ($p < 0.001$), according to Figure 1. In 2016/2017, this study included 711 and 622 participants for the outcomes of "negative self-perception of health" and "depression symptoms", respectively (Figure 1). When we analyzed separately for exhibition, we obtained 590 and 522 individuals for "negative self-perception of health" and "depression

Table 1. Occurrence of urinary incontinence by sex, inthe baseline study and inthe follow-up. SIGa-Bagé, 2017.

	Total		Men		Women		
	n	%	n	%	n	%	p-value*
UI 2008 (1592)							
No	1,262	79.27	531	89.70	731	73.10	< .001
Yes	330	20.73	61	10.30	269	26.90	
UI 2016/2017 (730)							
No	551	75.48	212	83.79	339	71.07	< .001
Yes	179	24.52	41	16.21	138	28.93	
Incidence of UI 2016/2017 (607)							
No	487	80.23	205	85.42	282	76.84	0.009
Yes	120	19.77	35	14.58	85	23.16	

Note: UI = urinary incontinence; *chi-square.

Source: Authors, with data from SIGa-Bagé Study (2008-2016/17).

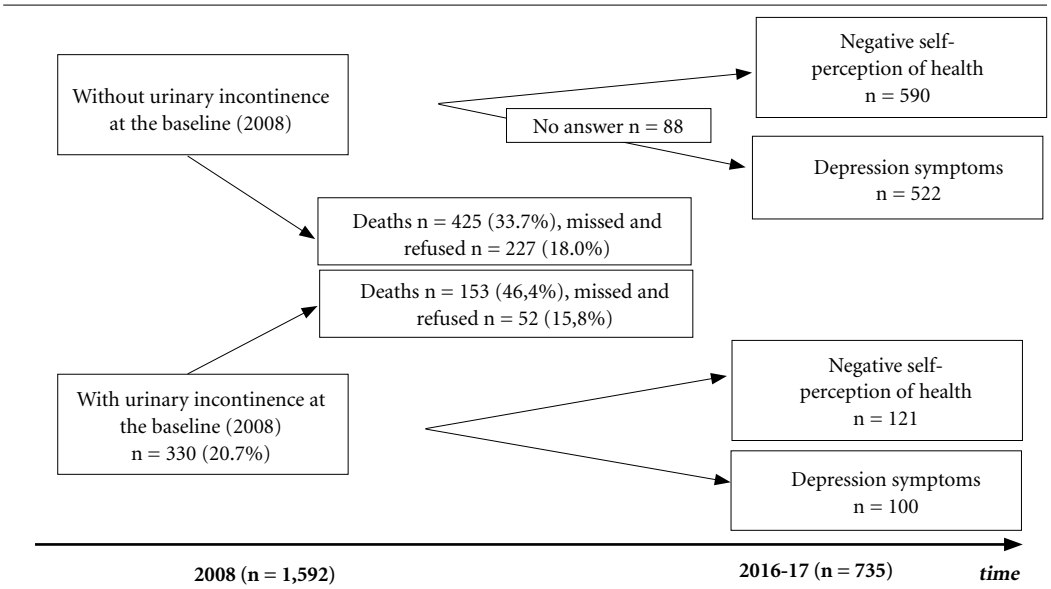


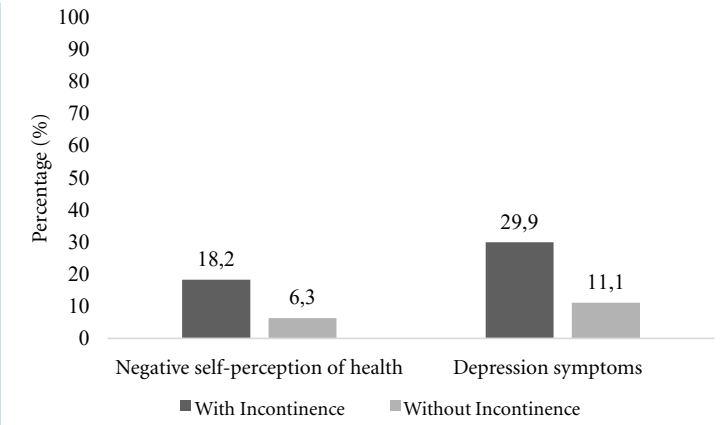
Figure 1. Population with and without UI in 2008 and diagnosed with negative self-perception of health and depression symptoms after nine years of follow-up. SIGa-Bagé, 2017.

Source: Authors, with data from SIGa-Bagé Study (2008-2016/17).

symptoms", respectively, among the older adults without UI; and 121 and 100 individuals for "negative self-perception of health and depression symptoms", respectively, among incontinent older adults (Figure 1).

Graph 1 shows the prevalence of negative self-perception of health and depression symptoms after nine years of follow-up (2016/2017) among older adults with and without UI at the time of the baseline study (2008) ($p < 0.001$ for both). Both outcomes showed more prevalence after nine years of follow-up among incontinent elderly in the baseline study.

Table 2 shows the RO and the 95% CI for a negative self-perception of health and depression symptoms after nine years of follow-up among



Graph 1. Prevalence of negative self-perception of health and depression symptoms among elderly individuals with or without urinary incontinence in 2008. SIGa-Bagé, 2017 (n = 1,592).

Source: Authors, with data from SIGa-Bagé Study (2008-2016/17).

Table 2. Odds ratio (OR) and 95% confidence interval (CI) for negative self-perception of health and depression symptoms after nine years of follow-up of elderly individuals with urinary incontinence at the time of the baseline study. SIGa-Bagé, 2017.

			Negative self-perception of health#					
UI	**n**	**%**	**OR (95%CI)***	**p-value**	**Model 1: OR (95%CI)****	**p-value**	**Model 2: OR (95%CI)*****	**p-value**
No	37	6.3	1.0		1.0		1.0	
Yes	22	18.2	3.32 (1.88-5.87)	< **.001**	3.02 (1.66-5.48)	< **.001**	4.02 (1.85-8.77)	< .001
			Depression#					
IU	**n**	**%**	**RO (IC95%)***	**p-valor**	**Modelo 1: RO (IC95%)****	**p-valor**	**Modelo 2: RO (IC95%)*****	**p-valor**
No	58	11.1	1.0		1.0		1.0	
Yes	29	29.0	3.27 (1.96-5.45)	< **.001**	2.89 (1.71-4.88)	< **.001**	3.35 (1.81-6.20)	< **.001**

Note: UI = urinary incontinence; *non-adjusted model; **model 1: adjusted for sex and age; ***model 2: adjusted for sex, age, education, physical inactivity, smoker, obesity, diabetes, hypertension, rheumatism/arthritis, functional incapacity, and cognitive deficiency; #logistic regression.

Source: Authors, with data from SIGa-Bagé Study (2008-2016/17).

older adults who had UI at the time of the baseline study. The estimates changed little after the adjustment for each co-variable, and therefore, for the sake of simplicity, the results were summarized only for model 2. After the final adjustment, the older adults who had UI showed a 4.02-fold and 3.3-fold greater chance of developing a negative self-perception of health and depression symptoms, respectively, after nine years of follow-up, when compared to older adults without UI at the time of the baseline study ($p < 0.001$ for both) (Table 2).

Discussion

The prevalence and incidence of UI was significantly higher among women when compared to men. The longitudinal analyses demonstrated that older adults with UI at the time of the

baseline study showed more prevalence and have a higher chance of developing a negative self-perception of health and depression symptoms after nine years of follow-up. To the best of our knowledge, this is the first Brazilian longitudinal and population-based study that examines the relation between negative self-perception of health, mental health, and UI in an elderly population.

The prevalence of UI increased between 2008 and 2016/2017, which was expected, since the average age of the population increased and there was no addition of individuals in the sample that underwent follow-up. Such a prevalence corroborates with findings from other population-based studies conducted with older adults in Brazil[5,6].

After nine years of follow-up, 80.3% of the elderly were not identified with UI and 52.3% showed remission. This study demonstrates that the condition can be prevented or reversed by means of preventive actions and rehabilitation. In a study conducted by Walters[31], it was found that a significant remission of UI in the case of women rarely occurs when simply making lifestyle changes, with no other behavioral treatment using a medical or surgical approach. It is important to note that Bagé was one of the first towns with more than 100,000 inhabitants to implement the Family Health Strategy (FHS),which rapidly expanded throughout the municipal area[26,28], and it is also a reference in the field of elderly health care, with a Secretary of Social Assistance, Housing, and Elderly Rights, which worked in cooperation with the Center for the Aging, enabling the practice and promotion of physical activities, which may have had a positive effect on health conditions.

The incidence of UI among the elderly was 19.8%, 14.6% among men and 23.2% among women. Our findings are similar to other studies found in the literature. A Brazilian study conducted with older adults identified a rate of incidence of UI of 25.6 and 39.3 (×1000 people-years) for men and women, respectively, after four years of follow-up[12]. In a study done in the USA with women 50 to 74 years of age, the cumulative incidence of UI was 37.2% after 10 years of follow-up[32]. Another American study identified an incidence of 29% for UI among women and 24% among men, after three years of follow-up[33].

In every analysis, the occurrence of UI was higher among women in comparison to men, corroborating the findings available in the national and international literature[5,6,34]. The association of the female sex with the occurrence of UI may be related to the differences in the length of the urethra for men and women, the anatomy of the pelvic region, the effects of gestation and delivery on the mechanisms of UI, and hormonal alterations[5].

The longitudinal analyses demonstrated an even higher incidence of negative self-perception of health and depression symptoms among the elderly with UI in the baseline study, as compared to those without incontinence. The regression analyses confirmed such an association: older adults with UI in 2008 showed, respectively, 3.3 and 2.7-fold greater chances of having a negative self-perception of health and depression symptoms after nine years of follow-up (2016/2017), even after the final adjustment. Those results reveal the need and the importance of evaluation and follow-up of feelings and psychosocial factors in the elderly who have UI, and the adoption of rehabilitation actions.

A cross-sectional analysis of the "Health, Wellbeing, and Aging" study (SABE in Portuguese), conducted in the city of São Paulo, Brazil, showed that the prevalence of UI was 22.5% among older adultsaged75 years and older who self-reported having excellent or good health, and 41.5% among older adults who self-reported having regular or bad health[5]. Another cross-sectional, population-based study, developed in the city of Cuiabá, Brazil, found that the self-evaluation of health as bad or terrible was 1.33-fold higher among incontinent elderly individuals as compared to those without UI[25].

The findings related to the association between UI and depression corroborate results from cross-sectional and population-based studies conducted both in Brazil[10,35] and in other countries[19-24]. One Norwegian study conducted with elderly women found that women with UI had about a 1.6-fold greater chance of developing depression disorder and anxiety when compared to women without UI, even after adjustments[22]. In the US, elderly women with severe and moderate incontinence had, respectively, 1.82 and 1.41-fold higher chances of having depression[20]. Another American study found that the increase in frequency and severity of UI was associated with a higher prevalence of depression symptoms in black and white women[23]. One study conducted in Ireland showed that UI was associated with loneliness, but that association was explained by issues of mental health, particularly linked to the presence of depression[24]. In a Korean study, also conducted with females, the depression scores were higher with the worsening of the UI among the elderly[19].

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Such results demonstrate that incontinence interferes negatively in the manner in which the elderly perceive their health and in the development of depression symptoms. However, there are few studies and longitudinal analyses, making comparisons difficult.

UI may cause embarrassing and stressful situations which have a negative impact on self-esteem and on quality of life[5]. We can say that incontinent elderly individuals avoid social activities as they feel ashamed about their conditions, and therefore the changes in lifestyle resulting from a decline in social relationships may have a negative impact on mental health, thus contributing to the development of depression[20]. Those conditions corroborate with the social stigmatization caused by the disease and often are not recognized by health professionals[22].

The methodical evaluation of the prevalence and incidence of UI in the elderly population and its impact on the perception of health and mental health is the core issue of this study. The results are representative of the population from the urban area of Bagé and point to the need for actions aimed at the prevention and early diagnosis of UI in order to minimize the development of a negative self-perception of health and depression symptoms, reduce the worsening of health conditions, and avoid premature death. Since this is a longitudinal study, it was possible to identify that the presence of UI determined the occurrence of a negative self-perception of health and of depression symptoms among the elderly.

One of the limitations of this study was the interval of eight to nine years between the two measurements, as well as the consequent rate of reduction in answers (due to a 30% death rate and a 14% rate of missed and/or refused doctor´s appointments), which reduced the statistical power of the analysis and affected the capacity to identify other possible significant associations. Moreover, although it is a valid procedure, used in various studies, the UI was defined by one key question and did not use validated instruments to track down the problem. it should also be pointed out that the majority of the published studies which approach UI and mental problems resulting from it have been conducted with women. It is therefore necessary to expand and develop in detail studies on perceptions, feelings, and mental problems resulting from UI among males as well. However, this was not possible in the current study when considering the limitations related to the size of the sample, which made stratifications inviable.

In conclusion, the results show that UI determines the occurrence of a negative self-perception of health and depression symptoms among the elderly in the community. These results reinforce the importance of expanded care for the elderly, with a broad and qualified evaluation of the health of these individuals, enabling the early detection, treatment, and rehabilitation of UI as protective measures for poor outcomes, with emphasis on the negative self-perception of health and depression symptoms among the elderly. Other longitudinal, population-based studies are required to more accurately characterize the risk factors associated with UI and its impact on the mental health of the elderly.

Collaborations

M Kessler participated in the creation of this article, the data analysis, the writing of the first version of the article, critical revision of the content, and approval of the final version. JD Bender, PM Volz, MU Soares and KP Machado participated in the writing of the first version of the article, critical revision of the content, and approval of the final version. BP Nunes participated in the creation of this article, data analysis, critical revision of the draft, and approval of the final version. E Thumé, MO Saes, and LA Facchini participated in the creation of the manuscript, critical revision of the manuscript, and approval of the final version.

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ERRATUM

p. 2262,

the correct Figure 1 is:

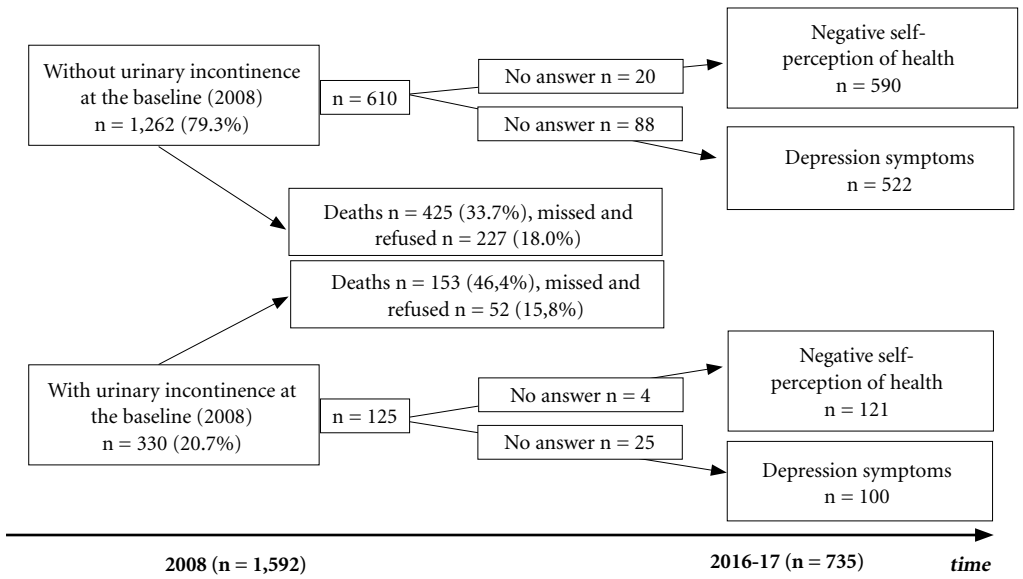

Figure 1. Population with and without UI in 2008 and diagnosed with negative self-perception of health and depression symptoms after nine years of follow-up. SIGa-Bagé, 2017.

Source: Authors, with data from SIGa-Bagé Study (2008-2016/17).