

# Frail or frailer? A longitudinal study of elderly individuals in nursing homes in Sweden

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## INTRODUCTION

The demographic trend in the Western countries, including Sweden, is in general a positive phenomenon. However, one of the side effects is that the increased amount of old persons with risk of disease, disability and dependence among elderly individuals, and the followed increased risk of moving to nursing homes. The most common reasons for transmission from ordinary homes to nursing homes are impaired cognitive ability and physical impairments in combination with a shortage of carers (1, 2). There are approx. 94 200 beds in nursing homes in Sweden (3) and the number has declined steadily over the past decade. The knowledge about the population of elderly living in nursing homes in Sweden is limited. Government statistics and reports from the National Board of Health and Welfare report that most people who live in nursing homes are females with an average age of about 85 years, and they live an average of 2-3 years at a nursing home before death (4).

A significant proportion of the beds in nursing homes are occupied by these persons with dementia or not diagnosed cognitive dysfunction. Older people are generally sensitive to side effects from drugs, and not least the cognitive adverse drug reactions (7), and persons with cognitive dysfunction suffer from even higher risk of confusion or behavioral problems at an inappropriate medication. Even though elderly individuals in general are more vulnerable to drug treatment (7), they often use many drugs, particularly elderly who live in nursing homes, where the average use per resident and day is about 10 drugs (8). In addition, elderly individuals in nursing homes often suffer from increased risk of falls, malnutrition and bedsores (9, 10, 11). There are indications that multi-morbidity and poly-pharmacy is largely associated with the increased risk of malnutrition, pressure ulcers and falls, but the relationships are complex. Today the risks are assessed separately - risk of malnutrition with MNA, the risk of pressure ulcers with the modifying Norton scale and the risk of falls with DFRI - but one can assume that they relate to each other and that risk in one area leads to a risk in another.

In summary, there is a need for detailed knowledge of how physical and psychological parameters evolve over time in this population and how these are related to mortality, morbidity, and treatment with drugs. The overall aims of SHADES (Study of Health and Drug use in Elderly in nursing homes Sweden) are to describe and analyze the mortality, morbidity, health status and medication use in persons living in nursing homes over 3 years. The analyses are supposed to provide information to tackle and to give possibilities to provide a better medical and social care and to improve health, reduce drug-related problems and reduce the need for acute hospital care.

## AIM

The aim of this study is to longitudinally describe a population of the elderly living in institutions with focus on morbidity, use of drugs, and risk of malnutrition, pressure ulcers, and falls, and to explore their associations with mortality.

## METHOD

### Sample

SHADES is a longitudinal cohort study in which all residents who lived in a selection of nursing homes in Jönköping, Linköping and Eslöv were invited to participate. When included residents moved or died, the next person who moved in to the room was invited to participate. Inclusion thus lasted throughout the study period. Participants were examined every 6 months starting in autumn 2008 to spring 2011. A total of 423 individuals in In Person Testing (IPT) 1 and 130 individuals were examined on six occasions. At IPT2, 63 of the participants had died, at IPT3 an additional 47 had died, 40 more at IPT4, another 18 at IPT5 and another 16 at IPT6 - thus a total of 184 individuals died during the study. Participants were on average 85 years old (M=84.8, sd=7.27) at IPT1. Almost two-thirds were women (301). Exclusion criteria: planned short-term accommodation for such rehabilitation or palliative care.

### Measures and analyzes

Following variables were examined:

**Mini Mental State Examination (MMSE)** evaluates cognitive functions such as orientation, memory, naming, spatial ability and attention (12). Total score ranges from 0 to 30 points, 24 or less usually indicate some form of cognitive dysfunction.

**Modified Norton Scale (MNS)** assesses the risk of pressure ulcers and includes cognitive status, physical activity, mobility, food and fluid intake, incontinence and general condition. Total score ranges from 7 to 28 points, 21 points or less indicates an increased risk of pressure ulcers (13).

**Downtown Fall Risk Index (DFRI)** assesses risk of falls and includes questions about previous falls, the use of certain drugs, sensory dysfunction, cognitive dysfunction, gait. Gives an overall score 0-11, and 3 points or more indicates an increased risk of falls (14).

**Mini Nutritional Assessment (MNA)** is subdivided into a short form (MNA-SF), and a full-scale (MNA). In this presentation, only MNA SF analyzed. It consists of questions about anorexia, weight loss, mobility, psychological stress or acute illness, psychological problems and Body Mass Index (BMI). Each item is assessed with either 0-2 points or 0-3 points where 0 indicates lack of function and 2 or 3 indicates normal function. A score below 10 indicates a risk of malnutrition (15).

**SNAC** consisting of 25 questions on ADL, needs of care, different symptoms and behaviors that add up to 0-98 (after weighting), higher score indicate higher need of care. SNAC was originally used by the Swedish National Study on Aging and Care, SNAC-study, which was initiated in 2001 by the Swedish government in order to analyze future needs for care of older people (16).

From the municipality records and medical records SHADES also collected data on: **diagnosis/diseases and use of drugs**. At the IPT **blood pressure, B-Hb, weight and length** was measured.

**Analyzes** of changes over time were analyzed with General Linear Models (GLM). Differences between groups based on survival was analyzed by independent t-test samples.

## RESULTS

### Number of diseases and drugs

As seen in Table 1, the participants on average had three diagnoses at IPT1 of which the most common was some type of dementia diagnosis. Number of diagnoses remained stable until IPT6. Further they used on average seven drugs at IPT1, but there was a significant decrease in use of drugs up to IPT5 to on average six. There was no significant difference in the number of diseases between survivors and those who died during the study ( $t=-.64^{ns}$ ) but in number of drugs ( $t = -2.51^*$ ) there was a difference, where those who died had fewer drugs.

Table 1. Longitudinal description of the participants (means and standard deviations) and change from each IPT.

	IPT1 N=423	IPT2 N=360	IPT3 N=304	IPT4 N=228	IPT5 N=172	IPT6 N=130
<b>Nr of diseases</b>	2.93 (1.33)	2.69 (1.64)	2.60 (1.62)	2.58 (1.62)	2.80 (1.62)	2.90 (1.62)
F		12.62*	8.04*	3.79ns	.88ns	6.17*
<b>Nr of drugs</b>	6.90 (3.04)	5.74 (3.98)	5.66 (3.83)	5.41 (3.74)	5.88 (3.57)	6.03 (3.80)
F		44.75**	35.16**	28.41**	6.44*	2.37ns
<b>MNS</b>	22.61 (3.46)	22.12 (3.79)	21.66 (3.91)	21.49 (3.74)	21.11 (3.66)	20.90 (3.98)
F		8.57**	26.85***	34.95***	49.25***	35.43***
<b>MNA</b>	10.37 (2.48)	10.67 (2.58)	10.00 (2.69)	9.83 (2.48)	9.58 (2.39)	9.54 (2.44)
F		.39ns	8.67**	7.84**	15.85***	15.71***
<b>DFRI</b>	4.81 (.91)	4.75 (.91)	4.59 (1.62)	4.58 (1.68)	4.72 (1.58)	4.81 (1.60)
F		.57ns	3.15ns	.60ns	1.67ns	3.30
<b>MMSE</b>	18.90 (5.82)	18.28 (6.15)	18.12 (6.74)	16.64 (7.57)	15.62 (8.12)	15.52 (8.52)
F		10.60**	22.77**	26.55***	38.44***	26.33***
<b>SNAC</b>	41.23 (12.76)	43.01 (12.22)	45.36 (11.42)	47.11 (10.71)	47.21 (10.05)	47.52 (9.96)
F		50.12***	90.98***	91.00***	79.55***	43.23**
<b>Weight</b>	66.7 (14.19)	66.9 (14.08)	66.8 (15.33)	66.7 (14.56)	67.1 (14.86)	66.1 (15.25)
F		.96ns	3.15ns	.03ns	4.24*	5.77*
<b>Pulse pressure</b>	62.41 (19.88)	61.37 (19.57)	60.60 (21.25)	59.62 (19.77)	59.43 (18.46)	58.34 (18.71)
F		1.07ns	10.05**	5.62*	4.73*	5.77*
<b>Hb</b>	126 (.81)	127 (.80)	124 (14.23)	125.5 (1.26)	125 (15.57)	124 (1.67)
F		.30ns	6.44**	6.97**	5.19*	3.88ns

### Changes in selected parameters

Participants demonstrated significant declines in risk assessments of Modified Norton Scale and MNA) but not in DFRI. Furthermore, there were significant differences at IPT1 between survivors and those who died during the study concerning modified Norton Scale ( $t = 6.91^{***}$ ), MNA ( $t = 3.74^{***}$ ) and DFRI ( $t = -4.32^{***}$ ). As seen in Figure 1-3, the participants are also fragile with the risk of pressure ulcers, falls and malnutrition.

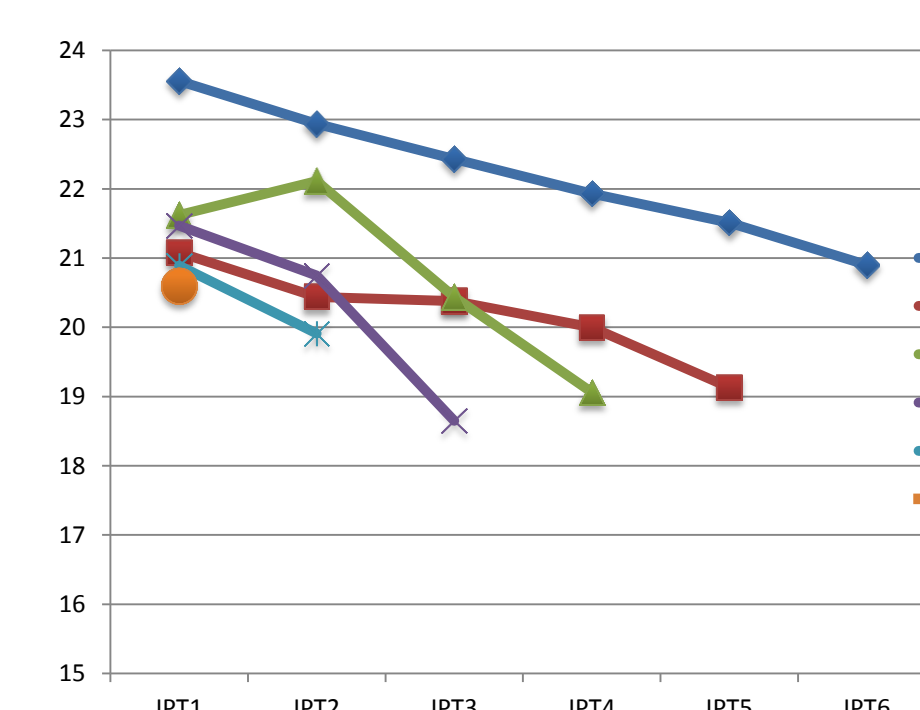


Figure 1. Change in MNS and differences between survivors and deceased.

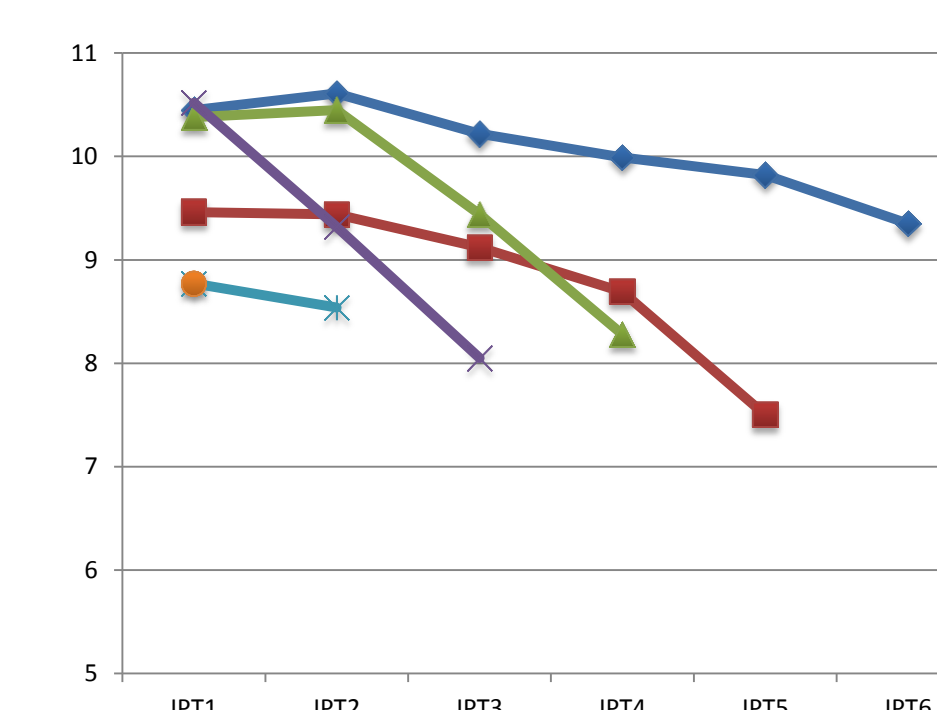


Figure 2. Change in MNA and differences between survivors and deceased.

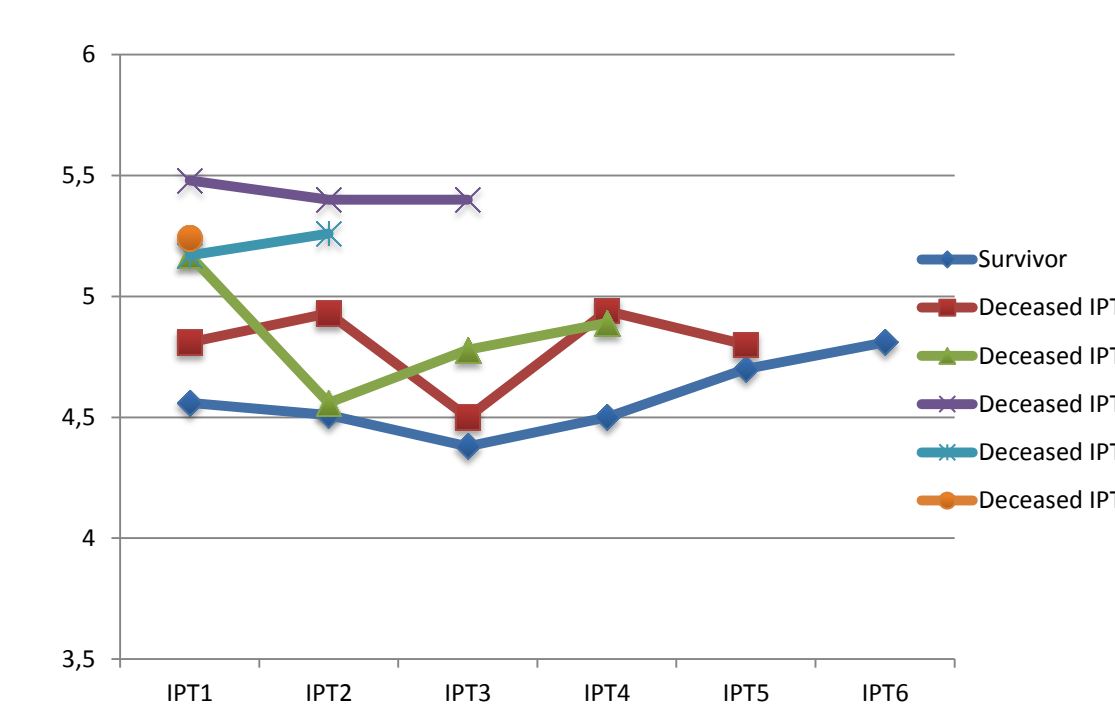


Figure 3. Change in DFRI and differences between survivors and deceased.

Participants showed significant declines in MMSE and the burden of care (SNAC). There were also significant differences between survivors and those who died for MMT ( $t = 2.92^{**}$ ) and SNAC ( $t = -6.15^{***}$ ). Cross-sectional on SHADES at baseline demonstrated that some single parameters from risk assessments as well as weight and pulse pressure was significantly associated with burden of care (frailty). Therefore, weight and pulse pressure was analyzed longitudinally, which showed significant declines in weight and pulse pressure. There were also significant differences between the survivors and the deceased for weight ( $t = 2.25^*$ ) and the pulse pressure ( $t = 2.93^{**}$ ).

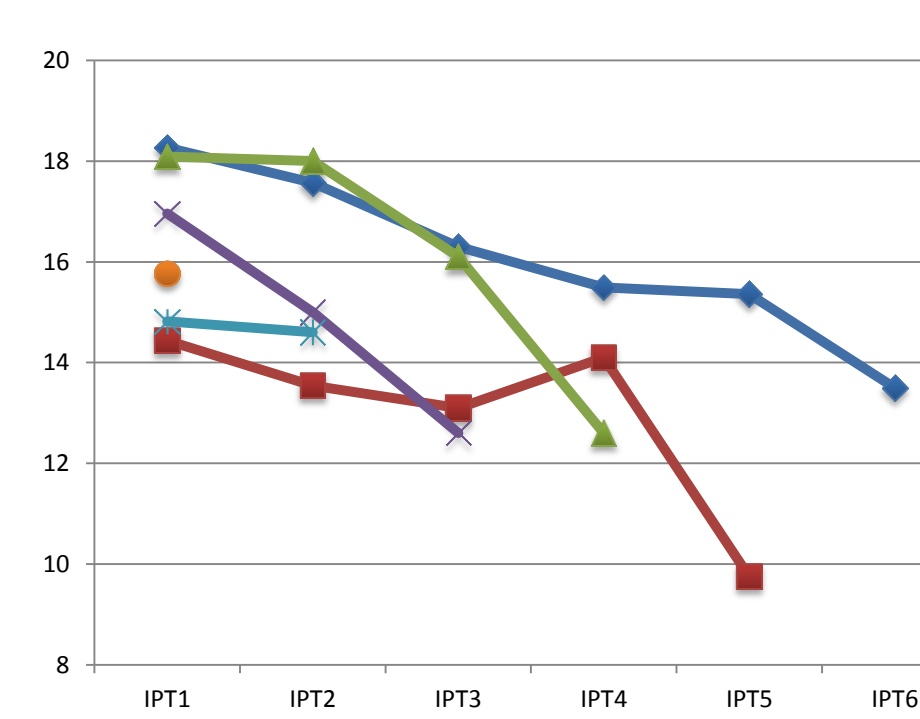


Figure 4. Change in MMSE and differences between survivors and deceased.

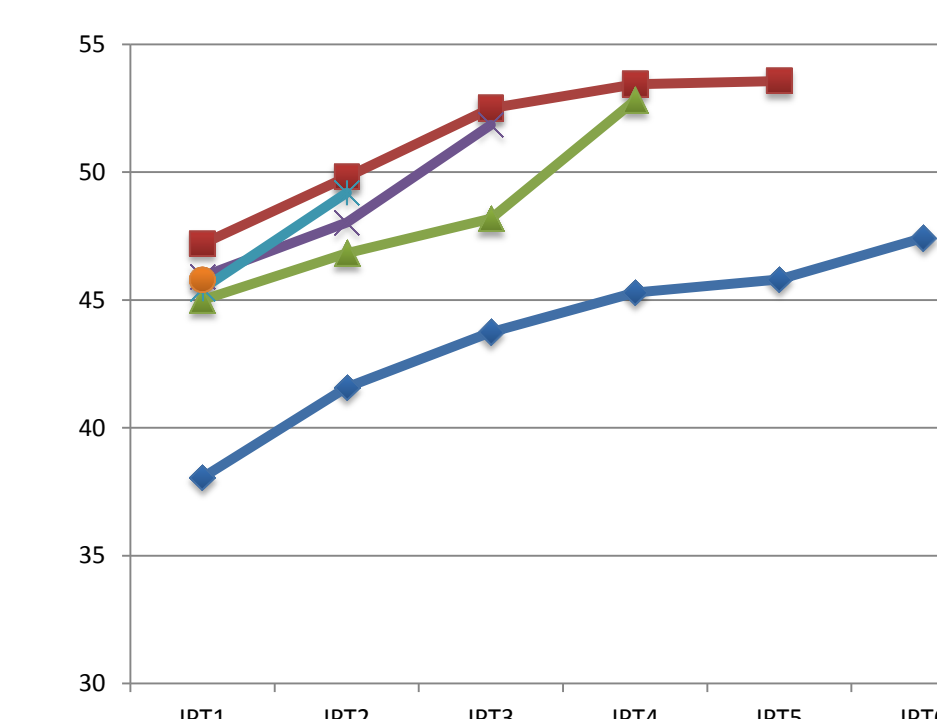


Figure 5. Change in SNAC and differences between survivors and deceased.

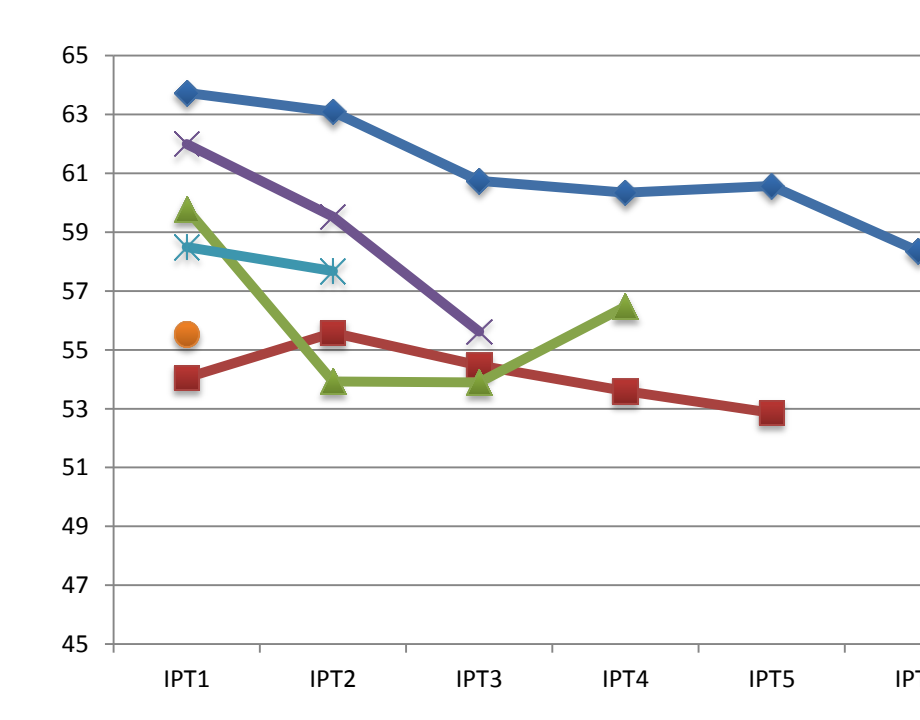


Figure 6. Change in pulse pressure and differences between survivors and deceased.

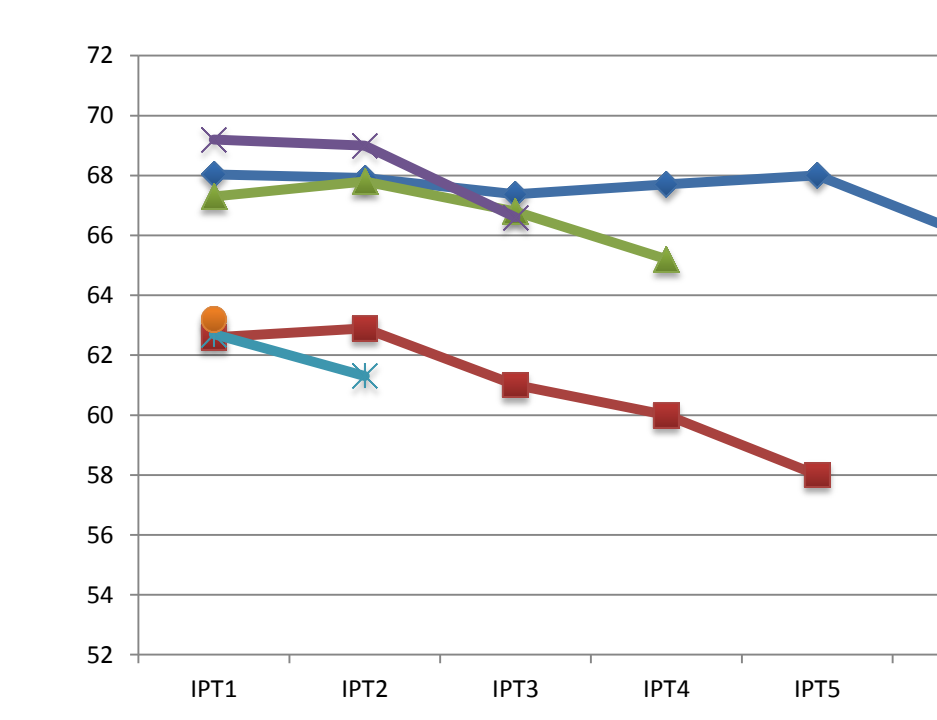


Figure 7. Change in weight and differences between survivors and deceased.

## Conclusion

The population of residents in nursing homes is fragile with risks for various conditions such as pressure ulcers, falls and malnutrition and the situation tends to deteriorate gradually. Earlier cross-sectional analyzes of the material (17) demonstrated that the need for care (frailty) was related to certain parameters in the different risk assessments, weight and pulse pressure but not to the number of diseases and number of drugs. The longitudinal analyzes suggest that number of diseases and drugs are not strongly associated with mortality and need of care (frailty). These results can be used to improve individualized care and treatment for older people in nursing homes.