# Factors affecting elderly people's behaviour to technology

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**Abstract**

The elderly population is increasing, both relatively and in numbers, implying future challenges for the care services. Innovation and internet based well-fare technology have been proposed as part solutions. The new pensioners are supposed to be more positive to internet based technology but very few studies have explored this. In order to initiate innovation and long term planning a broader understanding of the attitudes in the elderly population is needed. On basis of Theory of planned behaviour, we developed a questionnaire to assess a broad variety of factors; socioeconomics, housing, health, social network, attitudes of the elderly population on giving and receiving care, and attitudes towards the use of internet based solutions. A 66 items questionnaire was sent to the population of new pensioners (age 67-70 years, n=1011) in the municipality of Grimstad with a response rate of 56.5%. The analyses indicated that the questionnaire was relevant and that socioeconomic factors were associated with attitudes towards the use of internet based solutions. Further validation of the questionnaire in a broader set of municipalities is needed

Keywords

Elderly, Welfare technology, Socioeconomic factors

## 1 INTRODUCTION

In 2040 the number of elderly (< 80 years) will double in Norway (Tønnesen, Leknes and Syse, 2016) compared with today. This has been a focus of concern amongst policy makers due to the presupposed increase in the need of publicly financed care, and implementation of welfare technology is a major strategy in meeting this challenge (Parliamentary report 29 (2012-13)).

Data from Norwegian and Swedish surveys among home-dwelling elderly people showed that self-reported health increased positively in the period 1998-2008 even though the incidence of illnesses has increased the last 20 to 30 years (Fors et al., 2013) (Mørk, 2011). According to the National Institute of Public Health, it is expected that more people will live with chronic diseases and cancer, while fewer will die of heart disease. Furthermore, it is pointed out that more people will have dementia and that the incidence of bone fractures is particularly high in Norway (Norwegian Institute of Public Health, 2017).

The next generation of elderly is expected to have higher education, be more resourceful and have better health than today's elderly. To a greater degree than today's elderly they will also be used to and expect to be able to decide on their own lives (Parliamentary report 25 (2005-2006)). There is however surprisingly little data on the elderly's beliefs and attitudes on services in the years to come, their own health, and life situation.

A Danish study showed a picture of increased polarization, where a smaller group of elderly people will be hanging after the majority in terms of health, economics, technology and social conditions.

This group had an overweight of women and singles, and had otherwise high age, bad health, low household income and shorter education (Ældre Sagen, 2010). If the results from Denmark is applicable to Norway, special considerations should be done to meet the needs of this elderly group.

To plan the future, policy makers need to establish a knowledge base on beliefs and attitudes among the coming cohort of elderly people. Newly pensioners (67-70 years of age) will in 10-15 years be a part of the large cohort of elderly (> 80 years), and the expectations and attitudes of this group on future services is important to map.

The main aim of this study was to develop and preliminary test a questionnaire that measures socioeconomic factors, data on housing, health, social network and beliefs and attitudes towards giving and receiving help and care, and attitudes on the use of information technology. A secondary aim was to assess predictors for positive technology attitudes among new pensioners.

## 2 MATERIALS AND METHODS

We did not find suitable and validated instruments covering our questions. Some survey instruments focus on elderly groups (often > 80 years) or on specific behaviours among senior citizens (physical activity) and we found the need to develop a questionnaire tailored to the circumstances relevant for our target population.

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As a starting point, we used theory of planned behaviour (Ajzen, 1985) which improves the predictive power of the theory of reasoned action by including perceived behavioural control. The theory focuses the relations between beliefs, attitudes, intentions and behaviours.

Based on this theory we developed a questionnaire focusing on beliefs and intentions toward welfare technology, housing, receiving (and giving) care and general expectations towards becoming elderly. The questionnaire was grouped into the following sections; Background/demographics, general housing conditions, health, to give and receive care and practical help, social network, use of technology, attitudes towards welfare technology, and expectations towards future needs. The SF-12 is a 12-item measure of general health related quality of life (Ware, Kosinski and Keller 1995) and were used to assess physical and mental health status. The SF-12 questionnaire consists of 8 items using a 3-7 points Likert scale, and 4 dichotomous questions (yes/no). Items are scored into 2 sum-scores (physical component summary, PCS and mental component summary, MCS). The scores range from 0 to 100, where higher score represents better health.

The questionnaire was pretested in a group of 7 volunteers in the age between 67-71 years, and some questions were altered or removed. The final questionnaire consisted of 66 questions. In order to elicit scales, questions were either scored on a 10-point Likert scale or were dichotomous.

The municipality of Grimstad (22692 inhabitants) cooperated in the study. All inhabitants between 67 and 70 years (n=1011) were included in the study. A total of 36 persons lived abroad or had no address, leaving a sample of 975 participants. Each participant was given a unique ID-number corresponding with a name and address list. The ID-number was printed on each questionnaire.

The survey was presented in the local newspaper. The questionnaire, together with an information letter, and a recommendation to respond signed by the mayor, together with a ready-made reply envelope were sent by mail to the participants. After 2 weeks, a reminder was sent to the non-responders. The returned questionnaires were scanned at University of Oslo.

### 2.1 Statistical methods

Using IBM SPSS v. 24.0 the SF-12 questions were scored in accordance with the instructions given by the authors (Ware, Kosinski and Keller 1995) resulting in 2 scales, physical and mental component score (PCS and MCS). Each scale is scored from 0-100, highest scores indicates best health. The population mean is set at 50, with standard deviations = 10.

A total of 11 questions measured attitudes towards technology. These questions are as follows: I'm following the technology front, I think it's fun to use technology, I would like to use technology that can help me to cope with everyday life, If I got sick I could think of using technology to master my own health (e.g. blood pressure or blood glucose measurement, I would like to pay for technology that can help me in everyday life, I may install security technology (security alarm, door sensor, fall sensor etc.) in my home, I may be one of the recipients of alarms if one of my closest relatives has security alarms, Electronic communication with healthcare professionals can be a supplement to physical meetings, The elderly must be able to use computer technology to handle chronic diseases, The internet has useful information about health conditions. Each question was given with an 11-point response scale, ranging from 0 (“strongly disagree”) to 10 (“strongly agree”).

These 11 questions have acceptable internal consistency with Chronback’s alpha coefficient = 0.89. Bartlett's test was statistically significant ($p < 0.001$) and the Kaiser-Meyer-Olkin test was not significant ($p = 0.895$) and data were therefore adequate for Principal Component Analysis (PCA). The 11 variables were analysed in a varimax rotation with selection criterion equal to eigenvalue > 1.0 giving 2 components. Component 1 had eigenvalue = 5.544 with explained variance = 50.4% and component 2 had eigenvalue = 1.116 with explained variance = 10.2%. Catell's scree-plot confirmed this, with a bend in the curve at component 2. At PCA, the selection of components is critical, and therefore Parallel Analysis (11 variables, n = 507, 100 iterations) was performed and component 2 had a lower eigenvalue (1,116) than the eigenvalue criterion in a randomly generated data matrix (1,174). Component 2 was therefore rejected. The 11 variables were additionally summed and converted to a scale of 0-100. In this Technology Attitude Scale (TAS) higher scores indicate positive attitudes towards internet based technology.

To describe any gender differences in the material, Mann-Whitney U tests and Student T tests were conducted on continuous skewed and normalized variables respectively, and chi-square tests and Fisher Exact Tests (2x2) on categorical variables. Furthermore, bivariate correlation analyses calculating Spearman and Pearson correlation coefficients for skewed and normally distributed continuous variables) on TAS. Categorical variables were analysed via Mann-Whitney U tests and Student T tests on TAS. Stepwise linear multiple regression analysis was performed on significantly associated independent variables (n=28) on TAS as dependent. A p value < 0.05 was set as a limit for statistical significance.

### 2.2 Data collection

A total of 36 persons lived abroad or had no address, leaving a sample of 975 participants. Each participant was given a unique ID-number corresponding with a name and address list. The ID-number was printed on each questionnaire.

The survey was presented in the local newspaper. The questionnaire, together with an information letter, and a recommendation to respond signed by the mayor, together with a ready-made reply envelope were sent by

mail to the participants by an administrative person at municipality of Grimstad.

After 2 weeks, a reminder was sent to the non-responders.

The returned questionnaires were scanned at University of Oslo and transformed into an SPSS datafile.

### 2.3 Ethical considerations

The Norwegian Centre for Research Data (NSD) approved this study with the project number 2017-50835. All participants received written information about the project and by returning the paper based questionnaire they accepted the consent form.

## 3 RESULTS

The sample consisted of 975 persons with registered address in the municipality of Grimstad. A total of 552 questionnaires were returned (56.5%), consisting of 279 males (50.5%) and 272 females (49.5%). Around 80% of the sample was married or cohabitant, and there was a greater proportion of widows (13.2%) than widowers (3.6%). There was also a larger proportion of males (48.1%) with higher education than females (33.5%). In terms of access to technology, nearly all had mobile phones, and 91% of respondents had access to a PC or tablet at home. There was no statistically significant gender difference in terms of access to technology, but females compared to males had mean score of 53 versus 58 points (of maximum 100). It is worth noting that a quarter of females and males scored less than 36 and 43 points respectively. Males had a yearly mean income of NOK 415,000 and females NOK 267,000. A quarter of the females had a yearly income of less than NOK 183,000 (minimum pension). We found no gender difference on health. When it came to receiving care from people other than family members, females reported to a greater extent than males that they thought this was okay. Males reported to a higher degree that they were willing to pay for services, whether it was upgrading housing, care assistance or practical assistance. The stepwise linear multivariate regression analysis revealed 8 of 28 variables significantly associated with TAS. These were grouped into three categories: personal background factors, demographic factors and environmental factors (Table1).

**Table 1.** Stepwise regression. Variables affecting TAS.

| | Regression coefficients | | |
|---|---|---|---|
| | Unstandardized | Standardized | p-value |
| *Personal attitudes* | | | |
| Willing to be a helper for the family[1] | 1.542 | .172 | < .001 |
| Intending to live at home even if sick[1] | 1.056 | .139 | .001 |
| Positive to receive help from others[1] | .745 | .103 | .017 |
| *Demographical factors* | | | |
| Education[2] | 4.295 | .186 | < .001 |
| Tecnology access[3] | 18.175 | .217 | < .001 |
| Income: willing to pay for housing upgrade[1] | .984 | .137 | .004 |
| Income: willing to pay for personal help[1] | 1.459 | .181 | < .001 |
| *External factors* | | | |
| Age of housing[4] | .041 | .106 | .013 |

1 = Scale 0-10. 2 = scale 1-4. 3 = dichotomous 0-1. 4 = number of years.

## 4 DISCUSSION

The questionnaire seems to be relevant for assessing socioeconomic factors, data on housing, health, social network, and beliefs and attitudes towards give and receive help and care, and also attitudes on the use of information technology in a population of newly pensioners.

The questionnaire was developed on basis of Theory of planned behaviour (Ajzen, 1985) which postulate that background, demographical and external factors affect attitudes. In our case TAS was significantly associated with factors that fitted into the theoretical model.

We found that personal attitudes like being there for other people, especially the family, and a positive attitude towards receiving care from others, together with an intention to live home as long as they could. Seen together these characteristics may be interpreted as an ability to reflect over the individual's life in a longer time span, and maybe as an intellectual sort of reflection pointing to a drive towards independence and a wish to be in control over one's life.

We also found that level of education, technology access and income related variables were significantly positively associated with TAS. If you have a higher income, you have more positive attitudes to paying yourself, probably because you have better chance to do so. Higher income may be due to higher education. Our findings correspond to the findings made by Claes et al. (2015), which indicated that payment willingness may be related to factors such as education and income, which in turn were related to a positive attitude towards using technology.

The last finding, age of house may also be coupled to a socioeconomic association. A newer, and thus more expensive, house is positively associated with an attitude towards using technology.

Seen together, our findings support findings from Denmark drawing a picture of increased polarization, where a smaller group of elderly people will be hanging after the majority in terms use of technology (Ældre Sagen, 2010).

The study's main weakness is that the questionnaire is not fully validated. A further investigation on a larger sample is necessary to thoroughly validate the questionnaire for use in a broader set of municipalities. Our findings should be interpreted with care.

## 5 CONCLUSION

The questionnaire seemed relevant to explore attitudes towards the use of technology in a population of pensioners. We found that socioeconomics may be an important determinant on positivity towards the use of information technology.

### Acknowledgments

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