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How do people spend their time before and after retirement?

Johannes Binswanger

DESIGN 48

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DESIGN PAPER 48

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HOW DO PEOPLE SPEND THEIR TIME BEFORE AND AFTER RETIREMENT?

Summary

This paper presents evidence on how time use changes with age and retirement and discusses implications for pension design. The study is based on a sample of participants aged between 45 and 90 who are representative for the Dutch population. The study shows that the elderly are strikingly active until a fairly advanced age. This may have important implications for an adequate level of retirement spending. The evidence also suggests that it may be worthwhile to (further) facilitate part-time employment among the elderly and to promote informal care provided by elderly for their older peers. Finally, the study also has implications for pension communication.

1. Introduction

How do the elderly spend their time? How does time use of the elderly differ from younger people? This paper uses a technique developed by Nobel Prize winner Daniel Kahneman and his colleagues to address these questions for the situation in the Netherlands. Time use refers to activities as diverse as cooking, shopping, watching TV, volunteering for charitable work, helping older people, caring for grandchildren, etc. The main aim of this paper is to explore what can be learned from time use data that is relevant for pension and pension product design.

There are several reasons why time use data are worth studying for pension design. Generally, time use data offer valuable insights into how active the elderly still are. Do they do much volunteering for charitable work, do they help their older peers and work in the garden? Or do they mainly watch TV and relax or rest? At what age do important changes in the activity patterns manifest themselves? How active the elderly still are may have important implications for several aspects of pension design. If the elderly are found to be very active, they may be able to continue working part-time for an extended period, and they may complement formal care for the very old. How active the elderly still are has also implications for their financial needs. In relation to this, knowledge about the lifestyle of the elderly is also crucial for providing advice with respect to third-pillar pension products. Finally, knowledge about time use of the elderly may also be valuable for communication and marketing purposes. For providers of pension funds, a good relationship with their members is crucial. It is a key insights of modern marketing that good communication relies on the similarity of the

"source" of a communication message and its target audience.[1] In other words, communication with elderly participants of a pension fund that is based on knowledge of their lifestyle makes this communication more effective.

The data on time use underlying this study were collected via the CentERpanel, a panel that is representative of the Dutch population. In total, roughly 1,500 participants were interviewed online to provide information on time use based on a questionnaire developed by Kahneman et al. (2004). The questionnaire was somewhat adopted to the target group. The administration of the CentERpanel is conducted by CentERdata, an independent research unit located on the campus of Tilburg University. CentERdata is one of the world's leading institutes in the collection of online data. To ensure that the sample of participants is representative, even when interviews are conducted online, CentERdata provides computers for free to those who do not have a computer of their own.

So far, few studies on time use have been conducted with representative samples. The original study of Kahneman et al. (2004) was based on a "convenience sample" of about 1,000 employed women. Oerlemans, Bakker, and Veenhoven (2011) conducted a time use study among 500 Dutch senior citizens. Although their target group is similar to the one in this paper, their sample is substantially smaller and not representative. Representative information on time use of the elderly was also collected within the scope of the US Health and Retirement Study (2012). However, this study relies on a short paper-and-pencil questionnaire, whereas our study is conducted online. An important advantage of the online format is that it allows for a more flexible questionnaire format. Otherwise, the main difference

1 See Briñol and Petty (2009) for an overview of the related literature.

between the Health and Retirement Study and this study relates to the respective countries; time use and aging patterns in the Netherlands may differ substantially from those in the US. There may be important differences relating to habits, cultures, and institutions.

The rest of this paper is organized as follows. Section 2 explains the method underlying the collection of time use information. Section 3 describes the sample of this study. Section 4 presents the results on time use. Section 5 considers how various forms of time use are associated with varying levels of happiness. Section 6 discusses implications for pension design. Section 7 presents conclusions.

2. The DRM Method

In theory, the "ideal" way to measure time use would be to contact participants of a study several times a day and ask them each time: What are you doing right now? This method is called the experience-sampling method (ESM). In practice, this has been tried out with the help of pagers, mobile phones, or smartphones. While this method may lead to rather precise measurements, it has two major disadvantages. First, it is very intrusive. As a result, it may be difficult to convince a representative sample of the population to participate in such a study. Second, it is very expensive. In a paper published in *Science*, Nobel Prize winner Daniel Kahneman and his colleagues (Kahneman et al., 2004) showed that similarly reliable results can be obtained by using a much simpler method. In this method, participants of a study just fill out a survey where they are asked questions about "yesterday". Participants provide their answers in the form of a number of *episodes* that constitute "yesterday". This is called the Day Reconstruction Method (DRM).

The DRM questionnaire asks participants in the study about what they did "yesterday". After general questions about the participant's health and general life satisfaction, the DRM questionnaire starts with the text:[2]

2 The Dutch version reads as follows. *We willen graag meer weten over wat u gisteren deed en hoe u zich voelde. Niet alle dagen zijn hetzelfde – sommige zijn goed, sommige zijn slecht en andere zijn vrij gewoon. [...] Hierna volgen enkele vragen over de dag van gisteren. Denkt u aan gisteren als een aaneenschakeling van verschillende soorten tijdsbesteding. Op het volgende scherm vragen we u een aantal van deze periodes van tijdsbesteding te beschrijven. Een periode waarbinnen u bezig bent met een bepaalde tijdsbesteding duurt over het algemeen tussen de 15 minuten en 2 uur.*

> *We would like to learn what you did and how you felt yesterday. Not all days are the same – some are better, some are worse and others are pretty typical. [...] Here we are only asking you about yesterday. Think of yesterday as a continuous series of scenes or episodes. On the next screen, we will ask you to describe the episodes. In general, an episode lasts for at least 15 minutes but probably not more than 2 hours.*

In the original version of Kahneman et al. (2004), participants are asked to report episodes over the entire day, from waking up to going to bed. Since the study follows with many questions about every single episode, this makes the questionnaire long and tedious, and there is a substantial risk that many participants of this study will shut their browsers after a while and quit the survey. Therefore, for the project described in this paper, the questionnaire was limited to four episodes. An essential concern is then, however, how to still get a representative picture of activities spread over the entire day. In order to get a representative picture, it is not desirable to ask all participants to describe four episodes starting, for instance, at 5 P.M. in the afternoon. To see this, suppose that the elderly mainly do gardening before 5 P.M., and mostly rest after 5 P.M. In such a world, interviewing everyone after 5 P.M would lead to an underestimation of how active the elderly still are.

To guarantee a representative picture of the activities of the elderly, the start time of the first episode was determined *randomly* for each participant. Specifically, participants were asked at what time they woke up yesterday, and at what time they went to bed. The software underlying the online survey then chose a start time that was equally likely to be at any point in time between getting up and two hours before going to bed.

The latter time was chosen as the latest starting point to ensure that there is still room for up to four episodes *after* the latest start time.

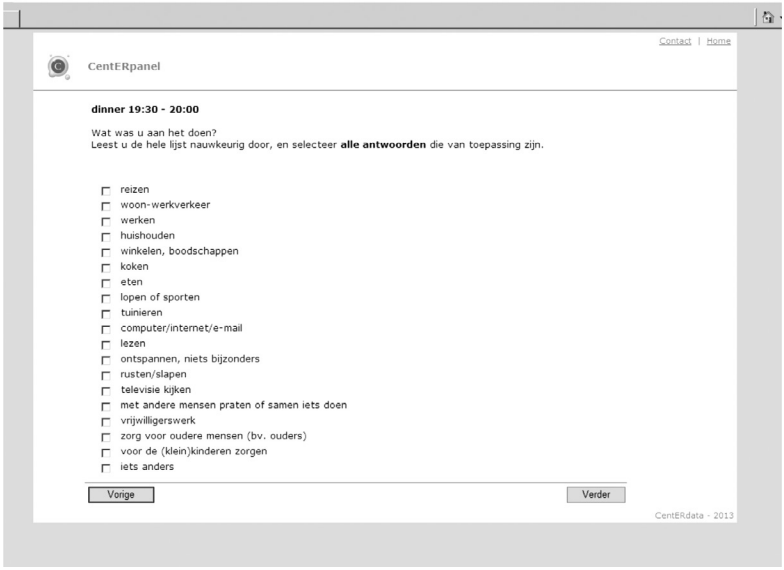
Participants were asked to fill in four consecutive episodes. Thereafter, they were asked a number of questions per episode. These questions constitute the core of the DRM questionnaire. In particular, for each episode, participants were asked:
What were you doing? Please read the entire list carefully and check all that apply. ("Wat was u aan het doen? Leest u de hele lijst nauwkeurig door, en selecteer alle antwoorden die van toepassing zijn.")

- *traveling ("reizen")*
- *commuting ("woon-werkverkeer")*
- *working ("werken")*
- *doing housework ("huishouden")*
- *shopping ("winkelen, boodschappen")*
- *preparing food ("koken")*
- *eating ("eten")*
- *walking or exercising ("lopen of sporten")*
- *gardening ("tuinieren")*
- *computer/internet/email*
- *reading ("lezen")*
- *relaxing, nothing special ("ontspannen, niets bijzonders")*
- *resting/sleeping ("rusten/slapen")*
- *watching TV ("televisie kijken")*
- *talking, socializing ("met andere mensen praten of samen iets doen")*
- *volunteering ("vrijwilligerswerk")*
- *taking care of older people ("zorg voor oudere mensen, bv. ouders")*

- *taking care of (grand)children ("voor de (klein)kinderen zorgen")*
- *Other ("iets anders")*

Figure 1 shows a screenshot of this list.

Figure 1: A screenshot of the list of possible activities during an episode



3. Sample of this study

In total, 1,506 participants aged between 45 and 90 filled out the DRM questionnaire between September 20 and October 1, 2013. Their "yesterdays" were spread mostly over Thursdays, Fridays, Saturdays, Sundays, and Mondays. The virtual absence of Tuesdays and Wednesdays relates to the time schedule of how CentERdata sends invitations and reminders to complete a questionnaire.

Below age 65, the categorization of ages into subgroups as shown in Table 1 was chosen because of the relationship between age and employment status. The sample did not include any formally retired participants aged less than 60. Between the age of 60 and 62, 10 percent were retired; at 63 to 64, 61 percent were retired. Above 65, the share of retired participants is 97 percent.

Table 1: Age distribution of the workday sample

	N. of observations	*Percentage of sample*
<60	334	35.99
60-62	94	10.13
63-64	78	8.41
65-70	201	21.66
71-75	100	10.78
76-80	64	6.90
81-90	57	6.14
Total	**928**	**100.00**

4. Results on time use

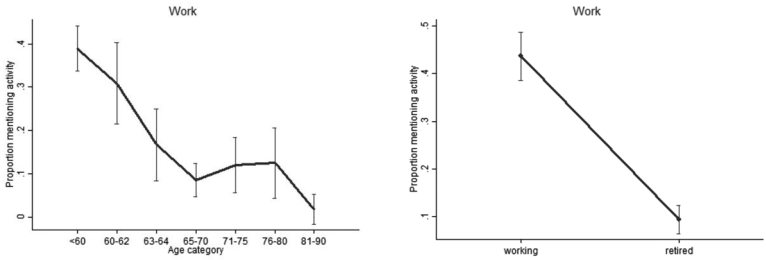
The results on time use were grouped into five categories: work-related activities; common daily activities carried out at home; social activities; activities outside the home; and passive versions of time use. For each activity, the paper reports estimates of how an activity changes with age and retirement status.

Work-related activities

It is natural to start with an analysis of working as a time use category. This provides a picture of the working patterns and effective retirement age of participants. Unlike information about official retirement status, time use data may also show whether those retired continue working on a reduced scale. To begin, consider the left part of Figure 2. This figure indicates the proportion of participants in the study who report "working" as an activity for *at least one* of the four episodes that are sampled in this study. The figure shows that, among those aged less than 60, a little less than 40 percent mention working as an activity during at least one of the four episodes that they report. Recall that the episodes are randomly spread across the entire day. Thus, even if all participants worked full-time, a certain percentage of participants would *not* report working since their episodes may be sampled during evening hours. However, the fact that only 40 percent of those younger than 60 mention working suggests that quite a number of participants may work only part-time. Recall that the figure only refers to workdays.

The vertical line segments at each age category in Figure 2 indicate 95-percent confidence intervals. They indicate that, statistically speaking, there is a 95 percent chance that the "true" proportion of those who were working during at least one of the

Figure 2: Working



four episodes is between the lower and upper end of the vertical line. The shorter this line segment, the more reliable is the estimate.

The proportion of participants reporting working as an activity steadily declines until the age of 65 and then levels off. However, it is interesting to observe that around 10 percent of participants keep mentioning working until the age of 80. This suggests that at least a small proportion of people remain active, to some degree, until a fairly old age. We will get back to this in Sections 5 and 6. The right panel in Figure 2 shows how the frequency of reporting "working" as an activity varies with retirement status. Again, we see that about 10 percent of participants mention "working" as an activity. Note that information about retirement status is unclear for a number of participants. Therefore, the sample underlying the right panel in Figure 2 contains only 751 (rather than 928) observations.

An important question is which of the patterns are statistically significant rather than the result of sampling error. If we only compare two categories on the horizontal axis, such as two age groups or the categories of those working and those retired, statistical significance can be inferred from the confidence intervals. In particular, a change is significant if the two line segments

indicating the confidence intervals do not overlap. In the right panel of Figure 2 this is clearly the case. Returning to the left panel, it is interesting to know whether there is, statistically speaking, a significant change in the profile across *all* age categories. Information about this is shown in Table 2. Specifically, the table contains information on the significance level at which the hypothesis that there is *no* change can be rejected. For working, the entry in the first column of 0.0000 means that, when rejecting the null hypothesis of no change, the chance of making a mistake is less than 0.01 percent (loosely speaking). In other words, the observation of a change with age is statistically highly significant. The entry in the third column of Table 2 provides the significance level of an estimate of the age profile that is simply based on a quadratic polynomial in age. Also in this case, the change is highly statistically significant.

Figure 3 shows the age and employment status profile for commuting. As expected, the general patterns reflect those for working. The significance level for tests of no changes in activities with age are again indicated in Table 2. As expected, the changes are statistically highly significant.

Common daily activities at home

Figure 4 shows the patterns for housework. The profile shows a pronounced increase with age and retirement status. For the age profile, the level increases from 25 percent for those below age 60 to almost 50 percent for the oldest age category. In fact, housework represents the mirror image of working and is one of the principal substitutes for working time. This observation is consistent with economic theory, which stresses that as people stop working, the opportunity costs of doing housework become lower. Table 2 shows that the increase in the age profile

Table 2: Statistical significance of change in activities with age

	Equality of activity for all age categories	*Equality to zero of age terms in quadratic specification*
	Work-related activities	
Working	0.0000**	0.0000**
Commuting	0.0000**	0.0000**
	Common daily activities at home	
Housework	0.0028**	0.0022**
Cooking	0.8068	0.5257
Eating	0.3186	0.4241
Computer	0.4198	0.5875
	Pro-social activities	
Caring for elderly	0.4027	0.6006
Care for (grand)children	0.0000**	0.0000**
Charity	0.1043	0.0256*
Socializing	0.5185	0.2567
	Activities outside home	
Shopping	0.3358	0.0984
Travelling	0.1557	0.0439*
Gardening	0.0028**	0.0000**
Sports/walking	0.0428*	0.0437*
	Passive forms of time use	
Reading	0.0000**	0.0000**
Watching TV	0.8497	0.6917
Relaxing	0.0612	0.7069
Resting	0.3460	0.0965

NOTE: The table presents probability values for testing the hypothesis that there is no change in an activity with age. The first column refers to a regression with age dummies as indicated in the left panels of Figure 2 to Figure 20. One asterisk indicates a probability value between 0.01 and 0.05. Two asterisks indicate a probability value below 0.01.

Figure 3: Commuting

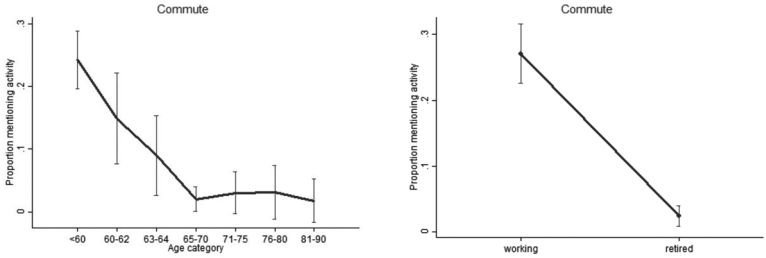
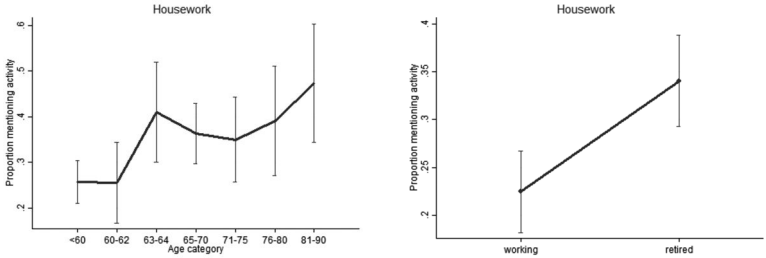


Figure 4: Housework



for housework is indeed statistically highly significant. The effect of retirement shown in the right panel of Figure 4 is also clearly significant.

Figure 5 and Figure 6 show the profile for cooking and eating, respectively. There are no striking patterns here. None of the age or retirement effects is significant.

Figure 7 shows the profiles for using computer, the internet, or email. Again, there are no statistically significant changes (see Table 2, again, and the confidence intervals in the right panel of Figure 7). Recall that the figures show the proportion of participants who mention an activity during at least one of the four

Figure 5: Cooking

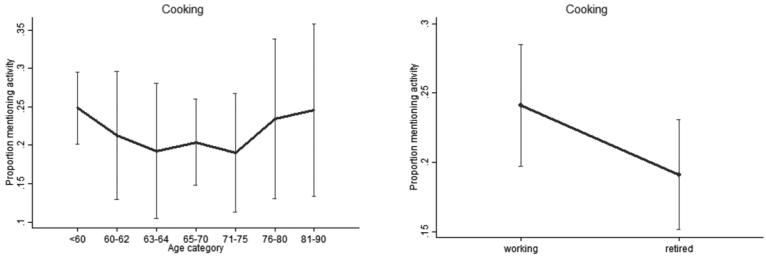
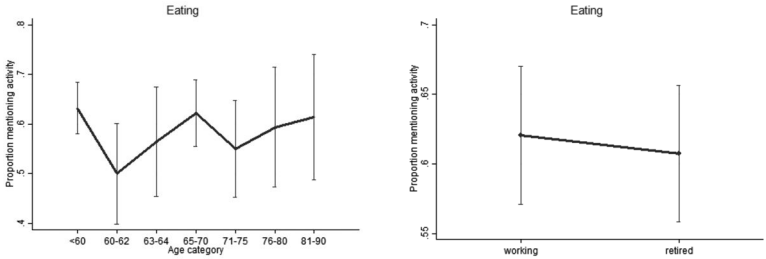


Figure 6: Eating



episodes sampled from yesterday.[3] For computer, internet, and email use, the proportion lies between 20 and 35 percent; this is rather high, given that episodes are randomly sampled over the entire day. A priori, one might expect the proportion of participants mentioning computer use to decline with age, at least at higher ages. However, the survey data do not indicate this.

Since the survey is conducted online, participants of the study may be more likely to use computers than the general population. However, it is important to note that CentERdata recruits participants on the basis of population registers in such a way that

3 Note that the survey question asks about computer use "yesterday", not "today" when the participants are actually filling out the survey online.

Figure 7: Computer, email, internet

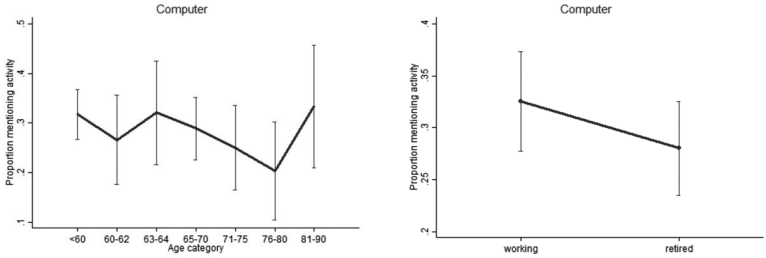
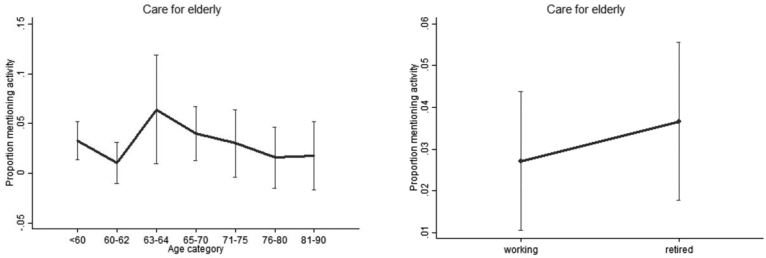


Figure 8: Care for elderly people



they are representative for the Dutch population, independent of whether they own a computer. When a potential participant approached has no computer, CentERdata will provide a device.

Social activities

We next consider social activities such as spending time caring for elderly persons, spending time with (grand)children, volunteering for charitable work, and socializing in general. The profiles for caring for elderly persons are shown in Figure 8. Elderly persons may include parents, an older spouse, but also older friends. While the age profile shows a small hump for the 63 to 64 age group, it is striking that the changes are small, and none are statistically significant. The level for the age category above 80

hardly differs from the level of those aged between 60 and 62. At first sight, the level of the activity seems very low. Only between 2 and 5 percent of participants report that they spend their time caring for older persons during at least one of the four sampled episodes. To assess whether these numbers are low or not, it is important to keep in mind the setup of the study. Caring for older persons is an activity that someone would realistically perform (only) a few times per week. Thus, if a survey just randomly samples a few hours of a particular day, we would expect that only a very low percentage of participants happened to care for the elderly during this particular time. Therefore, a level of 2 to 5 percent does not seem particularly low for the activity of caring for elderly persons. In Section 5 below we will consider whether caring for elderly persons triggers positive or negative emotions for those providing care.

A typical image used in communication and marketing about old age is elderly people spending time with their grandchildren. This raises the question how commonly retirees actually do spend time with their grandchildren, and how this changes with age. To prevent overloading the survey with questions, the respective question combines caring about children with caring about grandchildren. Participants also independently provide information on the number of children (rather than grandchildren) still living in their home. This allows disentanglement of children and grandchildren. For participants in the sample below the age of 60, on average slightly less than one child still lives at home. Between the age of 60 and 62, the respective number is 0.25. This means that, on average, every fourth participant still has a child living at home. For those aged 63 or 64, only one in ten participants has a child living at home; and for participants with a higher age, the number is virtually zero.

Figure 9: Caring for (grand)children

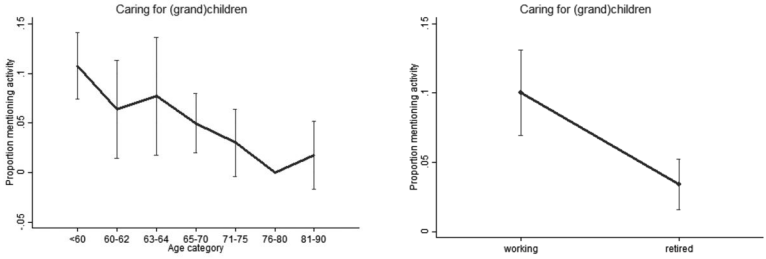


Figure 9 shows that there is a decrease in the frequency with which the elderly care for children or grandchildren. This decrease is statistically highly significant (see Table 2). When interpreting this pattern, it is important to keep the above-mentioned numbers of children still living at home in mind. These explain the relatively high level of this activity for those below the age of 60. However, the profile also significantly falls for ages 63 and higher (not shown in Table 2). This may come as a surprise since 40 percent of the participants in the sample aged 63 and 64 are still working, whereas 95 percent are officially retired at ages between 65 and 70. A priori, one would therefore expect that the latter age group would spend more time with their grandchildren than those aged 63 or 64. However, this does not seem to be the case.

The numbers discussed so far are strictly based on workdays. This raises the question whether the elderly spend more time with their grandchildren during the weekend. It turns out that the age profile for weekends looks similar to that for workdays (not shown). However, the decrease happens to be less pronounced and is only statistically significant for the quadratic specification (at the 5-percent level, not shown).

Based on the above numbers, spending time with grandchildren does not strike as a prototypical activity of the elderly. Therefore, the prevalence of this picture in marketing material may not be warranted at first sight. However, the elderly may experience spending time with their grandchildren as particularly positive. We will come back on this in Section 5.

Figure 10 turns to volunteering for charitable work ("vrijwilligerswerk" in the Dutch survey). The left panel shows a steep increase in the activity until the age of 65 to 70, and a somewhat less pronounced decline thereafter. Table 2 indicates that, overall, there are no significant changes for the estimation on which the left panel of Figure 10 is based. By contrast, the changes are significant for the quadratic specification. However, when testing the hypothesis that there is no change in the frequency of charity work for ages only below 70, we see that this hypothesis is strongly rejected also for the specification underlying the left panel in Figure 10 (not shown in Table 2).

Figure 10 shows that between 5 and 12 percent of participants per age group indicate having done charity work during at least one of the four sampled episodes from yesterday. As in the case of caring for elderly persons, charity work is naturally a somewhat infrequent activity, one that may be done during a few times per week at most. Thus, a priori, the chance of sampling this activity during four episodes at random times of a particular day is rather low. Against this background, the number of 12 percent for those between 65 and 70 is strikingly high.

We conclude the analysis of social activities with the simple activity of just "socializing" ("met andere mensen praten of samen iets doen" in the Dutch survey). Figure 11 and Table 2 not only show that this activity is very frequent, but also that there is no significant change with age. The stereotype of the elderly

Figure 10: Charity

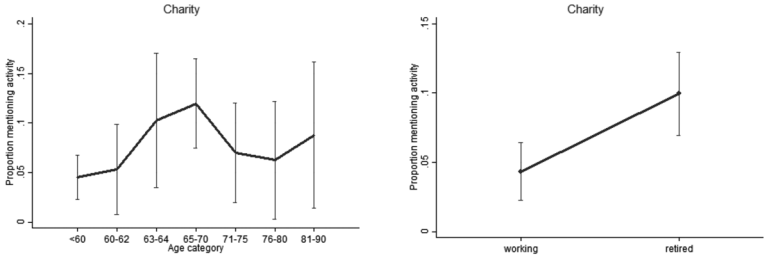
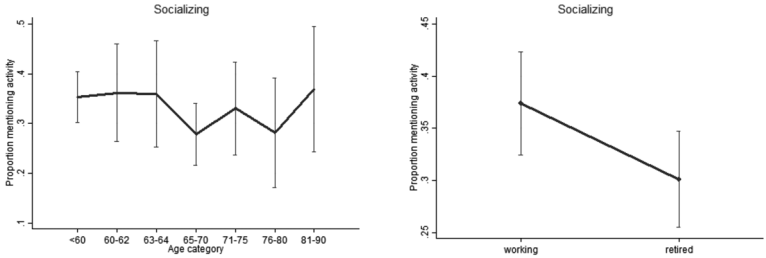


Figure 11: Socializing



getting lonely does not seem to apply to the typical elderly person. However, the pattern in Figure 11 does not exclude the possibility that the elderly may *feel* lonelier with increasing age. The DRM survey also includes a question about how participants feel during the four episodes (discussed further in Section 5). Based on this question, 8 percent of those still working report that they feel lonely during at least one of the four sampled episodes. For retirees, the respective number is a strikingly low 9 percent. Zooming in more narrowly on how the feeling of loneliness changes with age, we get the following results. The feeling is least frequent for the group aged 65 to 70, as only 6 percent report a feeling of loneliness during any sampled episode. Below the age of 60, the respective number is 7 percent. Between the

ages of 60 and 65, about 10 percent mention the feeling of loneliness, and at ages above 70 this number ranges between 10 to 13 percent.

The increase is not statistically significant. In summary, according to the time use data, the elderly do not feel lonelier than younger people.

Activities outside the home

In this subsection, we consider the activities of shopping, travelling, gardening, and walking/exercising. Among these, the most basic activity is shopping. The profiles for shopping are shown in Figure 12. Shopping is a frequently mentioned activity. The proportion of participants who mention shopping for at least one episode increases with age and retirement status. However, the increase is not statistically significant. The increasing pattern may partially be an artefact of the fact that we only consider workdays. If we consider shopping on Saturdays, there is no longer a visible increase in the age profile, and the changes are again insignificant (not shown).

Figure 13 shows the patterns for travelling. In interpreting the meaning of "travelling", it is important to recall that people report this as an event of "yesterday" while sitting in front of their computer "today". Thus, "travelling" is unlikely to refer to long-distance holidays. Rather, it would refer to trips of up a day. The data suggest a declining travelling profile.

For an age polynomial and for retirement status, the effect is statistically significant. For the specification with age category dummies underlying the left panel of Figure 13, the decline is not significant.

We turn now to particularly "intense" activities outside the home, namely gardening and walking/exercising. The picture for

Figure 12: Shopping

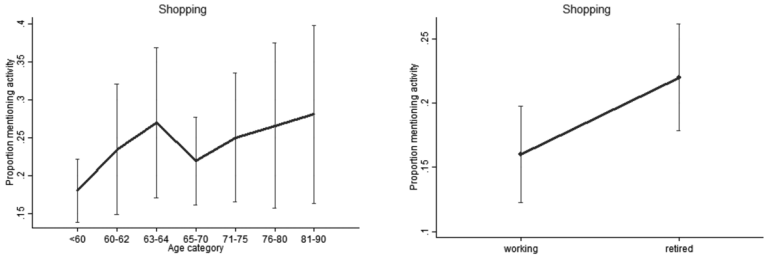
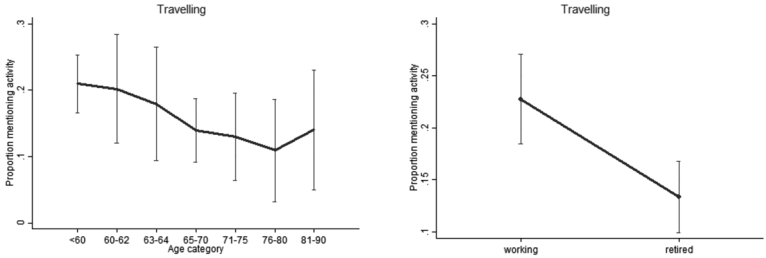


Figure 13: Travelling



gardening (Figure 14) is striking. The changes are highly statistically significant. The age profile increases until the age of 76–80. This picture suggests that gardening is highly popular among the elderly.

For sports/walking (Figure 15), the general trend is a decrease, although a rather modest one. The decrease is significant for age at the 5 percent level, and not significant for retirement status. The magnitude of the change seems surprisingly small, and the general level of the activity is rather high, keeping in mind the sampling setup of this study. The profiles for gardening and sports/walking portray the elderly as a rather active group.

Figure 14: Gardening

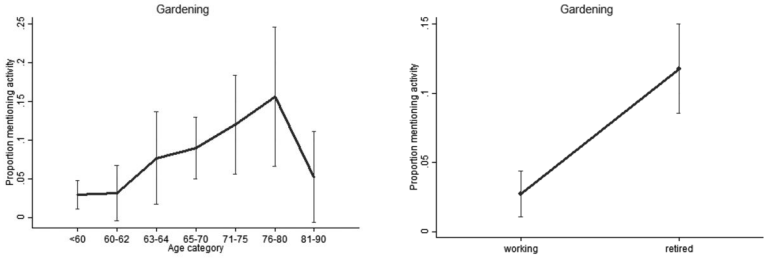
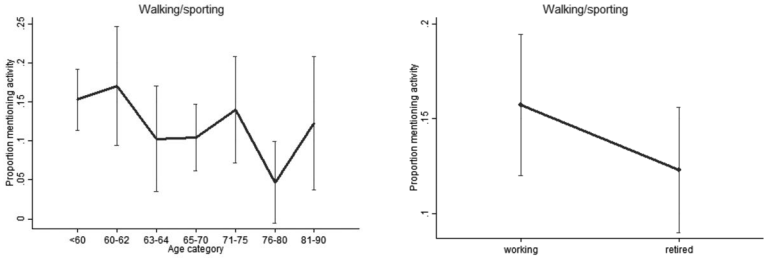


Figure 15: Walking/exercising



Passive forms of time use

We conclude our data analysis with activities that are more or less "passive", including reading, watching television, relaxing, and resting.

The least passive of these activities is reading, shown in Figure 16. The data indicate that reading is immensely popular among the elderly. In the 71 to 75 age category, a staggering 50 percent of participants mention reading during at least one of the episodes. With the exception of eating and relaxing, this is the highest frequency of any activity found in this study.

It is quite a common perception that many elderly persons spend a large amount of time watching TV. Figure 17 shows that

Figure 16: Reading

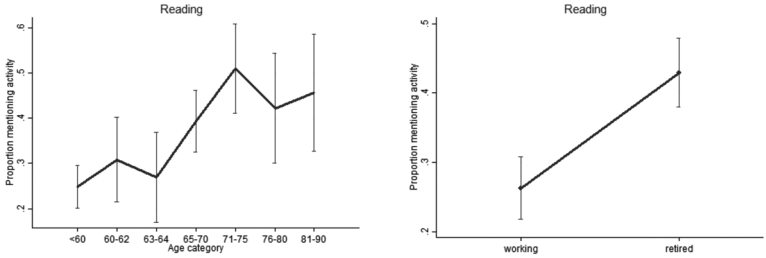
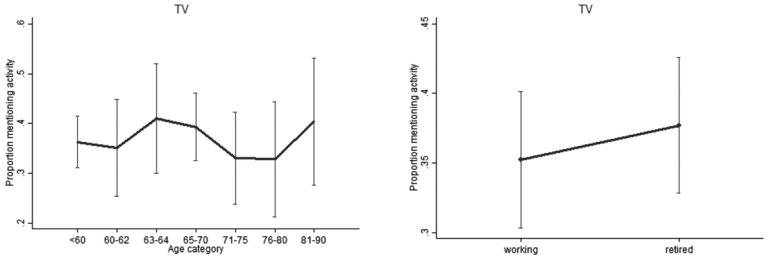


Figure 17: TV



watching TV is indeed a frequently mentioned activity; however, none of the changes are significant. Thus, the elderly do not spend more time watching TV compared to younger people.

The pattern for relaxing ("ontspannen, niets bijzonders") is shown in Figure 18. The age pattern fluctuates somewhat. Surprisingly, again, none of the changes are significant. The picture for resting is shown in Figure 19. Again, the hypothesis of no overall change cannot be rejected. In summary, the evidence strongly suggest that the elderly are rather active.

Figure 18: Relaxing

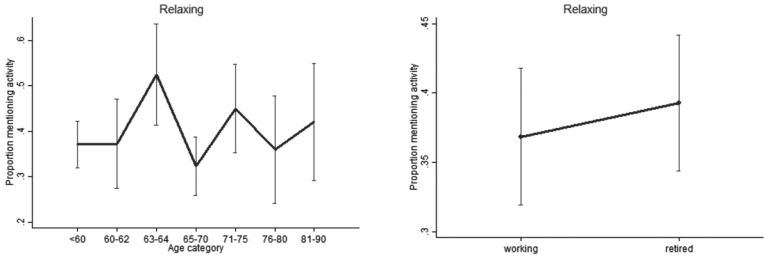
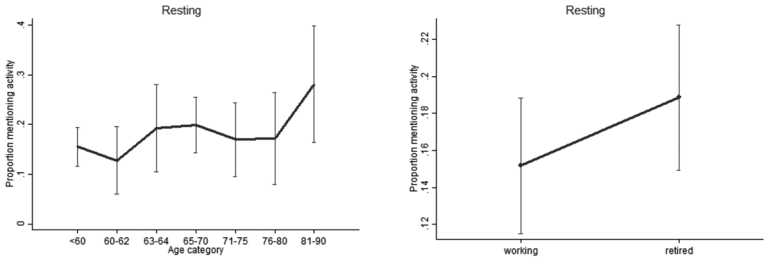


Figure 19: Resting



5. What makes people happy?

The questionnaire on time use also contains questions on emotions experienced during the sampled episodes. Based on these questions, we can address several important questions. First, it is interesting to see whether there is a general decline in happiness and life satisfaction as a person's age progresses. Second, it is of interest to see which activities are associated with particularly high or low levels of happiness. Finally, knowing how the elderly evaluate different forms of time use is also useful for communication and marketing purposes. For instance, maybe surprisingly, the above analysis suggests that the elderly do not

spend a particularly large amount of time with their grandchildren. However, this activity could still be highly effective for communication purposes if it is experienced as particularly satisfying.

In the survey, respondents indicated to what degree they felt certain emotions, for each of the four episodes. They indicated the intensity of their feelings on a seven-point scale, where the lowest intensity means "I did not experience this feeling at all", and the highest intensity means "the feeling was extremely strong". Here, we focus on the feelings of happiness ("ik voelde me gelukkig").[4]

Analyzing happiness individually per episode and activity is somewhat cumbersome and involves the risk of losing the bigger picture. It is therefore useful to provide a more aggregate analysis. To begin with, an indicator variable is defined that takes on a value of one if the respondent indicates one of the *two* highest levels of the happiness scale during at least one episode.[5]

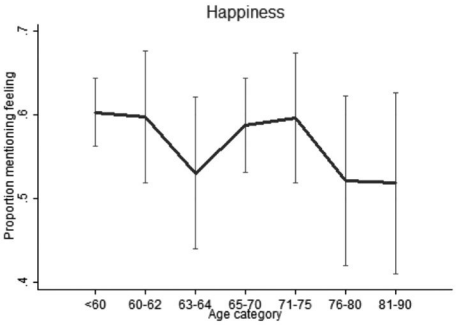
The analysis in this section is based on the entire sample, including both workdays and weekend days. Since some relevant information is missing for some participants, the effective sample size is 1,439.

Figure 20 shows the age profile for our happiness measure. A value of about 0.6 for those aged below 60 means that about 60 percent of participants in this age group reported one of the two highest levels of the happiness scale for at least one for the four episodes. It is surprising to see how frequently participants indicate a high level of the happiness during at least one activity.

4 The remaining feelings asked in the survey are: enjoyment, satisfaction, being interested, feeling lonely, feeling worried, feeling tired, and feeling stressed.

5 Analyses similar to the one discussed below have been carried out for different indicator variables for happiness, as well as for other related emotions. The results are very similar to those presented below.

Figure 20: Happiness



The profile is somewhat declining but not monotonically, and the decline is not statistically significant.

To investigate which activities are most strongly correlated with a feeling of happiness, we estimate the regressions shown in Table 3 with the indicator for happiness as the dependent variable. These regressions address the following question: which activity reported during any of the four episodes makes it more likely that a participant will indicate a high level of happiness during any of the four episodes?[6] The natural interpretation of a high coefficient for a particular activity is that this activity is associated with a high level of happiness.

The right-hand side variables in the regressions include all activities that participants are asked about, with the exception of watching TV. Watching TV serves as the baseline category against which the others are compared. Watching TV is chosen for this purpose since it is a very common activity at all ages, i.e. its age profile is rather flat (see Figure 17). A positive significant coefficient

6 This method of analysis is particularly suited for showing the bigger picture of the relationship between activities and happiness levels, without the need of providing separate analyses for each activity.

for any other activity in the table means that the activity leads to a significantly higher share of participants reporting a high level of satisfaction compared to the baseline activity of watching TV. The first column in Table 3 refers to estimates for all age groups. The remaining columns refer to progressively older age groups as indicated in the header of each column. This allows for examination as to whether a particular activity is associated with a high level of happiness for some ages but not for others.

Table 3 reveals several striking patterns. First, which activities are associated with a particularly high level of happiness depends on age. For instance, caring about (grand)children is only associated with significantly higher levels of happiness for people older than 65.

Some activities have a particularly high and significant coefficient for only the oldest age group. This concerns walking/exercising, and, remarkably, working and caring for older people. In fact, the coefficients for working and caring for older people (by people who are themselves older than 75) are the largest of all coefficients in the table.

Many activities that appear very popular from the activity profiles discussed in the previous section are not associated with a significant increase in happiness. This applies for gardening, volunteering for charitable work, and reading (except for those below age 60). Housework, arguably the most important substitute for working, is not associated with any significant effect on happiness. Interestingly, relaxing is associated with an increase in happiness only for the youngest group, and its effect is relatively moderate. Resting does not appear to have any positive emotional value at all (relative to watching TV).

Table 3: Regressions for happiness

	(1)	(2)	(3)	(4)	(5)
	All ages	Ages below 60	Ages 60–64	Ages 65–74	Ages 75+
Traveling	0.00596	−0.0249	−0.0170	0.0307	0.0370
	(0.0243)	(0.0356)	(0.0593)	(0.0479)	(0.0845)
Housework	−0.0365	0.00248	−0.101	−0.0854	0.0254
	(0.0225)	(0.0340)	(0.0531)	(0.0457)	(0.0643)
Shopping	0.00753	0.00722	0.0569	0.0181	−0.0978
	(0.0240)	(0.0364)	(0.0532)	(0.0463)	(0.0671)
Cooking	0.0242	0.0434	0.0109	0.0678	−0.0482
	(0.0244)	(0.0334)	(0.0592)	(0.0509)	(0.0771)
Eating	0.0697**	0.0441	0.0389	0.102*	0.0471
	(0.0217)	(0.0338)	(0.0492)	(0.0421)	(0.0679)
Walking/exercising	0.0653**	0.0482	0.00342	0.0519	0.297**
	(0.0232)	(0.0326)	(0.0595)	(0.0488)	(0.0484)
Gardening	0.0202	0.0171	−0.188	0.0484	0.0900
	(0.0361)	(0.0625)	(0.127)	(0.0573)	(0.0767)
Computer	−0.0310	−0.0139	−0.0247	−0.0621	−0.0423
	(0.0233)	(0.0337)	(0.0587)	(0.0482)	(0.0714)
Reading	0.0320	0.0657*	−0.0333	0.0484	0.0761
	(0.0201)	(0.0298)	(0.0522)	(0.0399)	(0.0589)
Relaxing	0.0647**	0.0982**	0.0716	0.0326	0.0627
	(0.0197)	(0.0301)	(0.0503)	(0.0392)	(0.0584)
Resting	−0.0369	−0.0526	0.0164	−0.0970	0.0409
	(0.0260)	(0.0424)	(0.0580)	(0.0543)	(0.0689)
Socializing	0.0888**	0.0520	0.107*	0.109**	0.107
	(0.0196)	(0.0290)	(0.0465)	(0.0387)	(0.0611)
Charity	0.0434	0.00282	0.0606	0.0842	−0.0820
	(0.0348)	(0.0737)	(0.0755)	(0.0509)	(0.117)
Older people	0.0172	−0.0286	0.0292	0.00692	0.360**
	(0.0460)	(0.0682)	(0.0908)	(0.100)	(0.107)
(Grand)children	0.0964**	0.0656	0.0586	0.139*	0.194*
	(0.0271)	(0.0350)	(0.0673)	(0.0603)	(0.0782)
Working	0.0867**	0.0365	0.0917	0.0808	0.310**
	(0.0240)	(0.0359)	(0.0470)	(0.0574)	(0.0704)
Commuting	−0.0137	0.0119	−0.0158	−0.00307	−0.453*
	(0.0353)	(0.0450)	(0.0666)	(0.118)	(0.217)
Constant	0.689**	0.724**	0.767**	0.673**	0.577**
	(0.0258)	(0.0402)	(0.0580)	(0.0486)	(0.0832)
Observations	1,441	544	266	426	205
R2	0.062	0.067	0.079	0.090	0.157

NOTE: One asterisk indicates a probability value between 0.01 and 0.05.
Two asterisks indicate a probability value below 0.01.

6. Implications for pension design

This section discusses how the above results may help to address a number of important questions related to pension design. It also discusses further findings from the literature that are relevant in this respect, and it highlights areas that call for further research.

Probably the most striking observation from the above analysis is that the elderly are very active. The elderly do not spend significantly more time than younger people relaxing or resting or watching TV. Rather, the elderly enjoy engaging in activities like volunteering for charitable activities, or gardening, and there is only a minor decline in the activity of walking/exercising and no significant decline in caring for older persons. Finally, it is striking how the age group of 75 and older value walking/exercising, working, and caring for older persons very highly. Of course, the analysis refers to the *average* representative of an age group. Not every single retiree is equally active, but the pattern as a whole is nevertheless remarkable.

One crucial question is whether a high degree of activity implies a higher or lower desire to spend money on marketable products and services in retirement. In other words: does an active elderly generation need more money or less money during retirement compared to a less active one? The answer to this question is important for estimating the financial needs of today's and tomorrow's retirees.

On the one hand, being more active means a higher capacity for preparing food at home and more time for searching for lower-priced ingredients. Similarly, it means a higher capacity for housework activities. Furthermore, a generation of active elderly people may even engage in part-time work (see below) and thus

still earn some money. All this suggests lower financial needs during retirement, or at least a lower need for pension benefits, all other factors being equal. On the other hand, an active lifestyle also means more capacity for enjoying marketable products and services. For instance, an active elderly couple will enjoy going on vacation and eating out more than a less mobile couple that mostly spends time at home.

The findings of this study suggest that the elderly are very active indeed. However, due to the conflicting implications that this has for financial needs, the findings of this paper are not well suited for any definite conclusion about the latter and thus for the implications for retirement saving and pension benefits. There are only very few studies that investigate desired spending levels of the elderly. These studies include Binswanger and Schunk (2012), Knoef, Hussem, Soede, and De Bresser (2014), and De Bresser and Knoef (2015). Unfortunately, even these studies do not allow for any direct conclusions on whether a higher activity level leads to higher or lower desired spending levels. On the other hand, De Bresser and Knoef (2015) provide some indirect evidence on this. They show a regression with desired spending during retirement as the dependent variable. They include an independent variable for suffering from disability in their regression.[7] Since disability can be regarded as an indicator for a lower level of activity, the estimated coefficient provides some hint on the relationship between activity levels and desired spending. The coefficient for disability in their estimation is weakly negatively significant for men, and insignificant for women. Thus, if anything, the available evidence points to a positive, if potentially weak relationship between desired spending and the activity level. Clearly, more research will be required to clarify this

7 See their Table 3 on p. 106.

relationship. Such research would have direct practical consequences for the determination of desired retirement spending for current and future cohorts. This in turn will help to determine adequate pension benefits as well as the demand for third-pillar products.

The studies by Binswanger and Schunk (2012), Knoef et al. (2014), and De Bresser and Knoef (2015) also provide information on the relationship between desired spending during retirement and desired spending during working age. The studies are based on data where participants from a representative sample of the Dutch population were asked to indicate what level of retirement spending they would choose. In the setup of the study, people were explicitly made aware that a higher retirement spending level necessarily means more savings or higher pension contributions during working life. Information about the respective trade-off was provided to the participants in a particularly accessible form and was fine-tuned to their personal income situation. De Bresser et al. (2014) found that desired spending during retirement amounts on average to around 75 percent of pre-retirement spending. Binswanger and Schunk (2012) show that a substantial number of individuals desire a ratio of between 80 and 100 percent.[8] It is worth noting that the same questions were presented to subsamples of non-retired as well as retired participants. There was no difference in the preferences between these two subsamples.

8 Importantly, participants in the study underlying these results did not directly choose between consumption ratios (such as 80 or 100 percent). Rather, they made choices between absolute levels of spending, such as a choice between option A and B, where A means spending 2,750 euros during working life and 2,400 during retirement, and B means spending 2,650 euros during both phases etc. Participants were obviously shown more than just two profiles. The numbers were chosen such that they matched the participant's personal income.

The observation that the elderly remain fairly active also suggests that employers might offer more possibilities to work part-time until a relatively high age. After all, this may be the most promising contribution to preventing insolvency of the pension system or the need for excessively high private savings for retirement. It is particularly inspiring to see that the group of those aged above 75 exhibits a very high valuation for working. Recall that one of the largest coefficients in Table 3 is the one for working for the 75+ age group. While this is good news indeed, it comes from only one side of the market. De Grip, Fouarge, and Montizaan (2015) showed that many employers are very skeptical about the productivity of elderly employees. It is still very uncommon to provide training to elderly employees to increase their productivity. Furthermore, employing the elderly at a larger scale may require a rethink of salary age profiles. Eventually, salaries might start to decrease with age. However, if an elderly person's satisfaction from working is very high indeed, then such a person may also be prepared to work for a lower salary.

There are some further caveats concerning employment of the elderly, however. The elderly may only become aware of their high satisfaction for work once they have spent some idle time at home. Thus, it seems important to keep the door to re-entry into the labor market open. Second, the high satisfaction may only apply for those working environments that show appreciation for the work of older employees. This may require a further change in culture among employers.

A further inspiring result of this study is the high valuation of the 75+ age group, as well as the 60 to 64 group, for caring about their older peers. This result naturally raises the question to what degree the possibility of the elderly caring for themselves is already sufficiently exploited in today's society. As noted

by Kalwij, Pasini, and Wu (2014), this question is understudied. Naturally, the data from the DRM survey analyzed in this paper do not allow any conclusions in this respect. However, Kalwij et al. (2014) provide some interesting hints. They analyzed a sample of elderly people from nine European countries, including the Netherlands. In their sample, between 10 and 15 percent of the elderly aged 85 and above receive care from friends. In most cases, it is plausible to assume that the latter are elderly, too. In contrast, between 20 and 35 percent receive care from their children. For formal care, the respective numbers range between 35 and 50 percent. Furthermore, the number of weekly hours provided by children and formal carers is substantially higher than for care provided by friends.[9] It is difficult to judge from this information whether the potential from the elderly caring for themselves is fully exploited or not. In particular, it is difficult to judge whether the help provided by the elderly to their peers is sufficiently skilled such that it can fully or partially substitute formal care.

Nevertheless, the high satisfaction that the elderly get from caring for their peers, together with the high costs of formal care, allows one to speculate that it may be worth conducting experiments for promotion of informal peer-to-peer care. One such experiment may be to let retirees "earn" extra pension benefits through providing care for elderly people in need. A potential risk of such a scheme is the crowding out of intrinsic motivation through the provision of explicit incentives (Frey and Oberholzer-Gee, 1997). This means that, once the elderly receive money for providing something that they previously merely felt morally obliged to, they may provide less of it. Nevertheless, we

9 The amount of care received differs for couples, single men and single women. See Table 2 in Kalwij et al. (2014) for further information.

do not know to what degree this would be a problem in this context. The only way to find out is to actually introduce such a policy in an experimental way and to observe the reactions.

Finally, our time use study has also implications for facilitating an effective communication of pension funds with their older participants. This is based on the fact that communication becomes more effective when it fits the lifestyle of the target audience (Briñol and Petty, 2009). Activities such as volunteering for charitable activities, gardening, and reading are very popular among the elderly. A pension fund that wishes to intensify the relationship with its older participants may therefore consider organizing "book clubs" or feature articles on gardening in magazines. However, these activities are not the ones that lead to the highest levels of satisfaction. The most important activities that are experienced as particularly rewarding are walking/exercising, caring for grandchildren, caring for older people, socializing, and, remarkably, working.

7. Conclusion

This paper presents the results from a time use study conducted with participants who are representative for the Dutch population. The measurement of time use is based on the day reconstruction method (DRM) developed by Nobel Prize winner Daniel Kahneman and his colleagues. The most remarkable result is that the elderly remain very active. Furthermore, the study also indicates that the elderly derive high satisfaction from many active forms of time use. Based on these results, as well on findings from related literature, and on some degree of speculation, a number of tentative conclusions emerge.

First, it seems likely that the more active the elderly, the higher are their desired expenses and hence their financial needs. However, more research is needed to verify this. Second, the results of this paper encourage bold experiments for increasing the employability of elderly persons. This may require a rethink on the part of both employers and elderly employees; it may require a more positive attitude by employers towards the elderly, as well as the elderly accepting a salary profile that eventually decreases with age. Third, the findings in the paper encourage experiments with ways to increase the provision of informal care by the elderly themselves. Finally, the analysis provides hints for an effective communication between pension funds and their participants. Importantly, the paper also points out important areas for further research that, ideally, go hand in hand with bold policy experiments. The findings in this paper suggests that these experiments are worth conducting.

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How do people spend their time before and after retirement?

This paper presents evidence on how time use changes with age and retirement and discusses implications for pension design. The study is based on a sample of participants aged between 45 and 90 who are representative for the Dutch population. The study shows that the elderly are strikingly active until a fairly advanced age. This may have important implications for an adequate level of retirement spending. The evidence also suggests that it may be worthwhile to (further) facilitate part-time employment among the elderly and to promote informal care provided by elderly for their older peers. Finally, the study also has implications for pension communication.

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