

# CONSUMPTION CHANGES ON RETIREMENT FOR SOUTH AFRICAN HOUSEHOLDS

**By MBJ Butler and CJ van Zyl**

*Submission received 18 December 2011*

*Accepted for publication 11 July 2012*

## ABSTRACT

This paper presents the results of an investigation into whether age or work status are statistically significant determinants of the change in the consumption rate at and in retirement. This research used data from the Income and Expenditure Survey 2005–2006 for households comprising one or two adults. It was found that gifting and non-healthcare consumption, which includes gifting, are not influenced by age or work status. Certain households were found to have higher healthcare consumption after retirement than before retirement. This result challenges the belief that retired households have lower consumption than working households, all other things equal, and may therefore necessitate an upward adjustment to retirement adequacy goals.

## KEYWORDS

Consumption; retirement; life-cycle model

## CONTACT DETAILS

Ms Megan Butler, School of Statistics & Actuarial Science, University of the Witwatersrand, Private Bag 3, 2050; Tel: +27(0)11 717 6264. E-mail: [megan.butler@wits.ac.za](mailto:megan.butler@wits.ac.za)

## 1. INTRODUCTION

1.1 According to the life-cycle hypothesis, individuals accumulate savings during their working lives in order to finance consumption in later life when they are unable to earn through working (Banks, Blundell & Tanner, 1998). Although the life-cycle hypothesis suggests the smoothing of levels of consumption over the individual's lifetime, Banks, Blundell & Tanner (op. cit.) state this need not mean that consumption before and after retirement is equal. They suggest that the utility, or satisfaction, derived from consumption, may be maximised by varying consumption at retirement.

1.2 As the population ages, the change in consumption at and during retirement has become an important consideration in economic policy debate and the interpretation of economic trends (Miniaci, Monfardini & Weber, 2010). The projected change in consumption at retirement is also used in the development of retirement adequacy goals (Palmer, 1989), which are critical for household financial planning (Bernheim et al., 2000; Tacchino & Saltzman, 1999; Groyer & Holtzhausen, unpublished) and the design and management of occupational retirement funds (Groyer & Holtzhausen, op. cit.; Dietz, 1968).<sup>1, 2</sup>

1.3 Despite the importance of this change in consumption, there is no published South African research based on official data. The international literature on the subject suggests that the size and direction of any change are contingent on a number of factors.

1.4 Although some previous research using US and Italian data suggests that consumption may decline at retirement (Hamermesh, 1984; Miniaci, Monfardini & Weber, op. cit.), this result may not apply in general. Some US literature indicates that the results may be sensitive to the dataset used (Palmer, 1992; 1994; unpublished; Bernheim, Skinner & Weinberg, 2001; Haider & Stephens, 2007). In addition, the direction and extent of any change in consumption at retirement may be influenced by demographic factors, such as the family structure of the household (Robb & Burbidge, 1989; Hurd & Rohwedder, unpublished).

1.5 Similarly, although there is some US and UK evidence from Hamermesh (op. cit.) and Banks, Blundell & Tanner (op. cit.) to suggest that consumption declines during retirement, Palmer (unpublished) suggested that consumption during retirement is level until very old age when a reduction in consumption occurs.

---

1 cf. also P. Myners. Institutional Investment in the United Kingdom: A Review. Her Majesty's Treasury, London, 2001

2 cf. also Financial Services Board. Circular PF No. 130: Good Governance of Retirement Funds. Financial Services Board, Pretoria, 2007

1.6 In contrast to the lack of consensus regarding changes in general consumption, Petertil (2005), Cook & Settersten (2005) and Madrian, Burtless & Gruber (1994) all agreed that healthcare consumption rose with age and Stoller & Stoller (2003) found that this increase occurred irrespective of insurance coverage. If healthcare is a significant part of the household budget and the household is not able to cut back on non-health consumption in order to fund healthcare consumption, it is possible that consumption may, in fact, rise with age.

1.7 The literature on consumption changes suggests that careful consideration as to the reason for the change is required, as declining consumption may be involuntary and caused by insufficient income to maintain consumption levels (Cooper, 2002; Shefrin & Thaler, 1988; Hamermesh, *op. cit.*).

1.8 This research used data from the Income and Expenditure Survey 2005–2006<sup>3</sup> to investigate whether South African households change their consumption voluntarily on or during retirement.

## 2. ESTIMATING CONSUMPTION CHANGE FROM CROSS-SECTIONAL DATASETS

2.1 Household datasets may be cross-sectional, in which case different cohorts of households are observed at the same time, or longitudinal, where the same households are tracked over time.

2.2 When longitudinal data are available, the change in consumption can be directly observed; although care needs to be taken to ensure that changes in consumption are voluntary and are not arising from reduced income levels (Cooper, *op. cit.*; Shefrin & Thaler, *op. cit.*; Hamermesh, *op. cit.*).

2.3 When cross-sectional data are used, the estimation of the change in consumption at retirement involves comparing households that differ with respect to age and work status while controlling for other variables that are known to influence consumption and that could therefore bias the result.

### 2.4 RESULT BIAS WHEN USING CROSS-SECTIONAL DATA

2.4.1 Jianakoplos, Menchik & Irvine (1989) argued that wealthier households with lighter mortality will be over-represented in the retired samples and this would be partially offset by the fact that if wages increased in real terms then workers would have higher incomes in real terms than their retired counterparts would have had during their working lifetimes. Jianakoplos, Menchik & Irvine (*op. cit.*) found the former

---

3 Statistics South Africa. Income and Expenditure of Households 2005–2006: Statistical Release P0100. Statistics South Africa, Pretoria, 2008

effect, termed the mortality bias, to be stronger than the latter effect, termed the productivity bias. This was based on national longitudinal survey data collected between 1966 and 1981 for lives aged 45 to 59 in 1966. This finding implied that cross-sectional data would overstate the drop in consumption at retirement if steps were not taken to manage mortality and productivity bias.

2.4.2 However, these biases may result in the drop in consumption at retirement being under-estimated (Schieber, 1996). In Palmer (1989), the productivity bias was controlled by comparing working and retired households of similar ages. However, the property taxes were found to be significantly higher in the retired group despite the rebates for retirees (Palmer, 1989), which suggested the mortality bias.

2.4.3 Therefore, when using cross-sectional data, it is extremely important to ensure that factors that can introduce bias are controlled. Such factors will therefore need to be included in the statistical analysis. The literature identified the following as being important factors to control:

- age (Banks, Blundell & Tanner, op. cit.; Cook & Settersten, op. cit.);
- income (ibid.);
- socio-economic group (Chia & Tsui, 2003; Case & Deaton, 2005; Robb & Burbidge, op. cit.);
- household composition, that is the family structure of the household (Hurd & Rohwedder, op. cit.), and
- health status (Hurd & Rohwedder, op. cit.).

## 2.5 STATISTICAL TECHNIQUES FOR COMPARING HOUSEHOLDS IN CROSS-SECTIONAL DATA

2.5.1 Although the literature suggests that consumption change estimates from longitudinal data are less subject to bias than those derived from cross-sectional data (Jianakoplos, Menchik & Irvine, op. cit.), official datasets on South African households are cross-sectional and cannot be used to create longitudinal data.<sup>4</sup> Statistical techniques therefore needed to be applied that would reduce the bias discussed in Section 2.4.

2.5.2 The literature describes two main methodologies used in previous studies where consumption change was estimated from cross-sectional data: regression and the comparison of average consumption rates for different groups of households. Regression, however, requires underlying assumptions of constant error variance, uncorrelated error terms and normality of the error terms (Montgomery & Peck, 1982), which were violated with the dataset used in this research.

2.5.3 The alternative of comparing households that differ only with respect to work status, also known as a matched-pairs analysis, was used by Palmer (1989; 1992; 1994; unpublished). In Palmer's approach, households were divided into working (not retired and not unemployed and where the breadwinner was aged 50 to 64) and retired (head of household aged 62 to 74) (Palmer, 1989). For each group, disposable income was

---

4 Personal communication with Nozipho Shabalala in her capacity as an employee of Statistics South Africa and a member of the Income and Expenditure Survey team, 14 July 2010

defined in terms of income less pre-retirement savings less applicable tax (Palmer, 1989). Households were then matched by disposable income and the differences in work-related and age-related expenditures were examined (Palmer, 1989).

2.5.4 However, as highlighted in ¶2.4.2, Palmer (1989) did not eliminate differences in wealth between the working and retired groups and may therefore have produced a biased result. This highlights the need to compare retired and working households where all other factors that have been found to influence consumption in a statistically significant way have been eliminated. The establishment of these factors is critical to this sort of analysis.

2.5.5 The literature related to consumption change focused mainly on regression techniques, which as discussed in ¶2.5.2 could not be applied. However, the challenge of finding similar households arises in household surveys where information relating to a particular household is either missing (Little & Rubin, 2002) or probably incorrect (Groves et al., 2004). Discarding these households from the analysis would reduce the sample size and bias the results if errors and missing values were not entirely random (Little & Rubin, op. cit.). The missing or incorrect values are therefore replaced with imputed, or estimated, values.

2.5.6 When imputing missing values in the IES 2005–2006 data file, which was used for this research, Statistics South Africa identified households with similar profiles to the household with missing data and took the average observed value.<sup>5</sup> Statistics New Zealand has also adopted this technique and use chi-squared automatic interaction detection (CHAID) to find similar households (Kuzmich & Wigbout, 2001).

2.5.7 CHAID is a statistical technique in which the dataset is iteratively subdivided into groups, the characteristics of each group being such that the distribution of the dependent variable is statistically significantly different to other groups (Kass, 1980). The groups are termed ‘leaves’ as the iterative process is often depicted pictorially as a tree diagram, called a dendrogram.<sup>6</sup> The structure of the tree is determined by detecting the independent variable or factor with the highest predictive significance using a chi-square test, segmenting the data and repeating the process. The CHAID algorithm, together with an illustrative example, is given in Appendix A.

## 2.6 ADVANTAGES OF USING CROSS-SECTIONAL DATA

2.6.1 Although the result bias that can occur with cross-sectional data should not be underestimated, longitudinal studies are not without their own challenges.

2.6.2 Firstly, household behaviour may be neither optimal nor rational (Engen, Gale & Uccello, 2005).

2.6.3 Secondly, the difference in time period means that any consumption trend for retiring households should be considered in the context of trends for the country as a whole (Hamermesh, op. cit.).

2.6.4 Thirdly, cross-sectional data allow a much broader age range to be

5 Statistics South Africa, 2008

6 SAS®/STAT 9.2 Users' Guide, 2008

considered. Jianakoplos, Menchik & Irvine (op. cit.) studied households over a 15-year period, whilst the data used in this study spanned a 65-year age range, which included households over the age of 85. Jianakoplos, Menchik & Irvine (op. cit.) only considered households up to the age of 74.

2.6.5 It should also be noted that even after Jianakoplos, Menchik & Irvine (op. cit.) published their findings, the limited availability of longitudinal data has resulted in a large number of investigations being conducted on cross-sectional data, including Palmer (1992; 1994; unpublished), Cook & Settersten (op. cit.), Banks, Blundell & Tanner (op. cit.) and Miniaci, Monfardini & Weber (op. cit.). The use of cross-sectional data is therefore justifiable, particularly given the absence of an alternative.

### 3. METHODOLOGY

#### 3.1 DATA

3.1.1 The main data requirement for this research was the household consumption data required to test for changes in consumption at and in retirement. At the time at which the research was conducted, Statistics South Africa monitored South African income and expenditure patterns at five-yearly intervals using the Income and Expenditure Survey. IES 2005–2006 was the most recent survey at time of writing and covered the period from September 2005 to August 2006<sup>7</sup> and was therefore deemed the most appropriate for this research.

3.1.2 IES 2005–2006 sampled 24 000 dwelling units.<sup>8</sup> The sample was spread evenly over 12 months and was nationally representative in each quarter.<sup>9</sup> Usable data were collected from 21 144 households.<sup>10</sup> Each household was assigned a weight so that the weighted population profile corresponded to the 2006 mid-year population estimates.<sup>11</sup>

3.1.3 In order to control for household composition as suggested by Hurd & Rohwedder (op. cit.), only one- and two-person households without children were considered. As expenditure data for households deriving income from self-employment or farming activities are generally considered especially unreliable (Robb & Burbidge, op. cit.) and were noted to be particularly problematic in IES 2005–2006 (Aliber, 2009), these households were also excluded from the analysis. In order to control for work status, households containing unemployed people who were not old enough to be retired were removed from the sample in line with Banks, Blundell & Tanner (op. cit.), who established that becoming unemployed had a different impact on consumption than retirement. The checking process was complicated by the fact that certain households were eliminated after finding inconsistencies between different tables in the IES

---

7 Income and Expenditure Survey 2005–2006. Statistics South Africa, Pretoria, 2007. Source: South African Data Archive, 24 March 2010

8 Statistics South Africa, 2008, *supra*

9 *ibid.*

10 *ibid.*

11 *ibid.*

2005–2006 dataset during cross-checking. The reconciliation of the full dataset and the households used for this analysis is given in Appendix B.

3.1.4 After various data checks, the initial sample of 21 144 households was narrowed to 2 721 households, corresponding to 3 521 person records. In 2 094 households, no one in the household was retired. These were termed ‘working households’. A further 93 household records related to households where one person worked and one was retired. These were termed ‘semi-retired’ households. The remaining 534 households were ‘retired’ households, where everyone was retired.

3.1.5 Although it is interesting to consider the profile of the sample population to the general population, it is not strictly necessary for the interpretation of these results, as the statistical techniques controlled for these demographic factors.

3.1.6 Females consisted of only 41,0% of the sample, whilst the 2006 mid-year estimates for people aged 20 and older suggested that women should comprise 51,6%<sup>12</sup> of the total headcount. However this under-representation was a function of lower employment rates among women and was consistent with the March 2006 labour-force survey statistics.<sup>13</sup>

3.1.7 If age is considered per person, as opposed to per household, the average age in the model development sample was 37,8 which was lower than the national average for persons aged 20 and above of 39,82.

3.1.8 Most households were urban, 38,3% of households being based in rural areas.

3.1.9 Heads of households in the sample had, on average, 9,0 years of education. However, the retired households in this group had only 6,4 years of education on average.

3.1.10 As expected given the differences in educational attainments, retired and semi-retired households had much lower incomes than working households in the sample. The incomes are shown in Table 1.

Table 1. Average income for the sample

	Working	Semi-retired	Retired	Total
Income p.p.a.	R48 846	R35 506	R31 499	R44 985

3.1.11 As was consistent with Palmer (1989), dwelling values were substantially higher for retired and semi-retired households despite their having much lower incomes than working households. Dwelling values for semi-retired households and retired households were respectively approximately 112,1% and 58,3% higher than for working households in the sample.

12 Mid-Year Population Estimates: Statistical Release P0302. Statistics South Africa, Pretoria, 2006

13 Labour Force Survey March 2006: Statistical Release P0210. Statistics South Africa, Pretoria, 2006

### 3.2 CLASSES OF CONSUMPTION

3.2.1 Once the sample of suitable households was identified, the consumption data were divided into non-healthcare consumption and healthcare consumption (Cook & Settersten, *op. cit.*; Stoller & Stoller, *op. cit.*).

3.2.2 Gifting consumption, defined as cash or in-kind maintenance of or remittance to family members and gifts to non-household members, was also isolated for separate analysis. This step was required as, when performing an analysis of aggregate consumption, it is possible that changes in consumption for certain consumption categories, particularly discretionary taxation-driven expenditure on gifts (Dexter, 1984; Palmer, 1994; Palmer, unpublished), may influence the overall result in a manner that is considered misleading.

3.2.3 The gifting and non-healthcare consumption rates were defined as consumption expressed as a percentage of income, including income in kind. For the healthcare consumption rate, healthcare expenditure was used as a proxy for healthcare consumption as suggested by Miniaci, Monfardini & Weber (*op. cit.*).

3.2.4 The non-healthcare consumption data in IES 2005–2006 already contained an adjustment for housing consumption as opposed to housing expenditure.<sup>14</sup> An additional adjustment for vehicle consumption was made.

3.2.5 Total expenditure rates in the sample were remarkably similar across work statuses, despite the differing income profiles. Working households were more generous with gifts than semi-retired and retired households. The consumption and expenditure patterns are summarised in Table 2.

### 3.3 VARIABLES

3.3.1 The coding for categorical variables that were detected as significant determinants of consumption is shown in Table 3.

3.3.2 It is noteworthy that none of the five age variables used to control for productivity bias was detected as statistically significant, but income and wealth variables used to control for the mortality bias were. The full list of variables is set out in Appendix C.

### 3.4 STATISTICAL METHODOLOGY

3.4.1 The statistical significance of age and work status on consumption were tested using CHAID, which is introduced in ¶2.5.7.

3.4.2 Three CHAID analyses were performed in order to identify demographic factors that had a statistically significant effect on the gifting rate, the rate of non-healthcare consumption including gifting and the healthcare consumption rate.

3.4.3 If age and work status appear in the CHAID tree where the dependent variable is the gifting rate, then one can conclude that age and work status are statistically significant determinants of the percentage of income spent on gifts. Conversely, if age

---

<sup>14</sup> Statistics South Africa, 2008, *supra*



and work status do not appear in the CHAID tree then one cannot reject the hypothesis that they do not influence gifting. Similar comments apply when the dependent variable is the non-healthcare consumption rate or the healthcare consumption rate.

Table 2. Consumption and expenditure rates by sample

	Working	Semi-retired	Retired	Total
Healthcare expenditure rate	2,8%	3,4%	3,4%	2,9%
Non-healthcare consumption rate	75,0%	63,9%	75,6%	74,8%
Total expenditure rate adjusted for housing and vehicle consumption	77,8%	67,3%	79,0%	77,7%
Gifting rate	13,2%	2,0%	2,5%	10,7%

Table 3. Categorical variables

Variable name	Description	Value	Coding
<i>FEMALE1</i>	sex of household head	1	female head
		0	male head
<i>HEDUC</i>	household educational attainments	EDUC1_LESS	partner has less education than household head
		EDUC1_SAME	both have same education
		EDUC1_MORE	partner has more education than household head
		EDUC1_0	one-person household
<i>HCOMP</i>	household composition	male–female	male head–female partner
		female–male	female head–male partner
		male–male	two males
		female–female	two females
		female alone	female alone
		male alone	male alone
<i>HOWNER</i>	home ownership	1	home owned
		0	home rented
<i>MEDSCMR</i>	medical-scheme membership	1	at least one person in the household is a medical-scheme member
		0	no medical-scheme members in household
<i>WORKSTAT</i>	work status	W	working
		SR	semi-retired
		R	retired

3.4.4 Where work status was found to be statistically significant, the mean value of the dependent variable for retired households could be compared against that for households of other work statuses. However, this comparison should only be made after grouping households according to all the other demographic factors detected by the CHAID as being statistically significant. Similar comments apply where age was found to be significant. An illustrative example is shown in Appendix A2.

## 4. RESULTS

### 4.1 ESTIMATION OF THE CHANGE IN NON-HEALTHCARE CONSUMPTION AT AND IN RETIREMENT

#### 4.1.1 GIFTING

4.1.1.1 The CHAID analysis indicated that gifting behaviour was highly complex, cash income being identified as the most important predictor. For some categories, work status was highly significant, although for others, controlling for cash income (coded as *PPINCOME*), dwelling value (coded as *VDWELL*), home ownership (coded as *HOWNER*), and educational attainments of the household (coded as *HEDUC*) removed this effect. Any age effect could be completely eliminated by controlling for these factors. The resultant dendrogram from the CHAID analysis is given in Figure 1.

4.1.1.2 A comparison of the means for all leaves suggested that, in most cases, there was a substantial and statistically significant reduction in gifting on retirement. The results are given in Table 4, from which it can be concluded that there was no statistically significant increase in gifting on retirement. This is in contrast to Palmer (1994), who observed substantial increases in gifting on retirement.

#### 4.1.2 GENERAL NON-HEALTHCARE CONSUMPTION

4.1.2.1 Non-healthcare consumption was defined in terms of total consumption of items not related to healthcare, and thus included expenditure on gifting. As no increase in gifting on retirement was observed, it was unnecessary to suppress the increase in gifting as was done by Palmer (1994; unpublished). The CHAID analysis indicated that, controlling for income including income in kind (coded as *PPINKINDINC*), household composition and dwelling were extremely important, and that after these variables were taken into account there was neither an age effect nor a work-status effect. In other words, if dwelling value were not taken into account, age or work status would have been identified as a statistically significant determinant of consumption. The hierarchy, shown in Figure 2, is fully consistent with Hurd & Rohwedder (op. cit.), who emphasised the importance of family composition. The fact that both income and dwelling value appear in the tree confirms that mortality bias would have influenced the results had a CHAID technique not been used to match households.

4.1.2.2 The implications of the CHAID analysis on non-healthcare consumption are that any differences in the non-healthcare consumption rate between retired and working households can be fully explained by differences in income levels, household composition and dwelling value. Any further analysis of mean non-healthcare consumption rates between retired and working households, including a table of comparison,

would thus be misleading as work status was not identified as a statistically significant determinant of non-healthcare expenditure at the 5% significance level. For this reason, a table of comparison is not shown.

Table 4. Mean gifting rates by leaf and work status

Leaf	Working households		Semi-retired or retired households		% reduction gifting in retirement
	number	mean gifting rate	number	mean gifting rate	
A	106	5,2%	2	0,2%	95,5%
B	202	6,7%	294	2,6%	61,9%
C–D	389	17,4%	53	3,2%	81,6%**
E–F	63	8,6%	176	2,7%	68,5%***
E–G	248	11,7%	176	2,7%	77,0%***
E–H	210	25,7%	176	2,7%	89,5%***
E–I	82	5,3%	176	2,7%	49,5%***
E–J	165	11,5%	176	2,7%	76,5%***
E–K	76	13,2%	176	2,7%	79,6%***
L	175	12,9%	2	0,5%	96,0%
M	110	5,8%	63	1,0%	83,0%
N	63	9,0%	0	–	not calculated
O	105	4,2%	8	0,5%	89,2%
P	100	1,6%	29	1,7%	–6,0%

\* significant at the 5% level

\*\* significant at the 1% level

\*\*\* significant at the 0,01% level

## 4.2 ESTIMATION OF THE CHANGE IN HEALTHCARE EXPENDITURE AT AND IN RETIREMENT

4.2.1 The CHAID dendrogram on the healthcare expenditure rate (coded as *HEXPR*), given in Figure 3, indicated that the most significant determinant of healthcare expenditure was medical-scheme membership (coded as *MEDSCMR*). Households with no medical-scheme members had a significantly smaller healthcare budget share than households with at least one medical-scheme member. For medical-scheme members, age ceased to be significant after income (coded as *PPINCOME*) was considered. This may be because under the Medical Schemes Act<sup>15</sup> medical-scheme contributions do not vary by age. Therefore, even in declining health, the increase in healthcare expenditure was not significant, because these costs related only to the increase in expenditure not insured under the medical scheme.

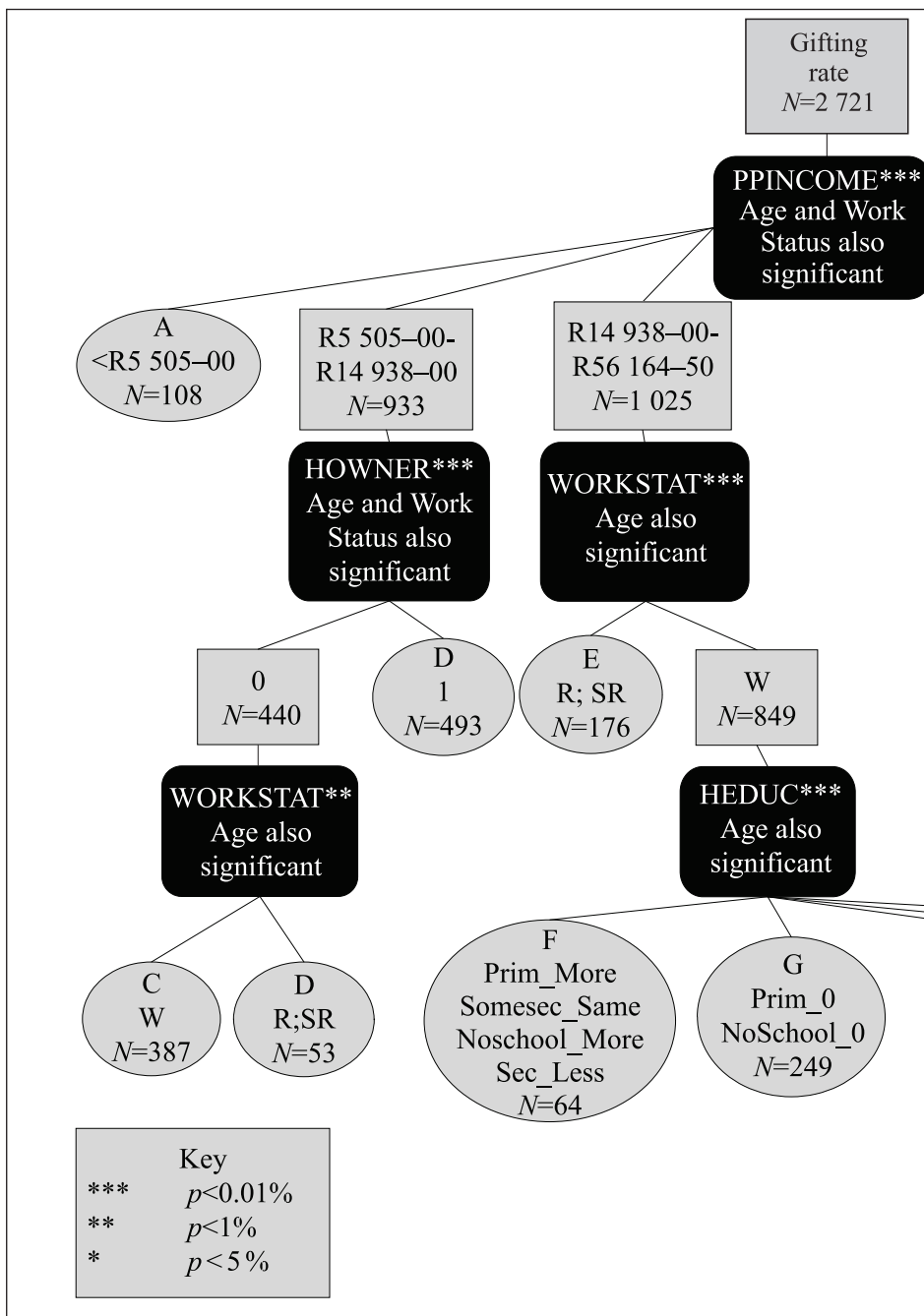
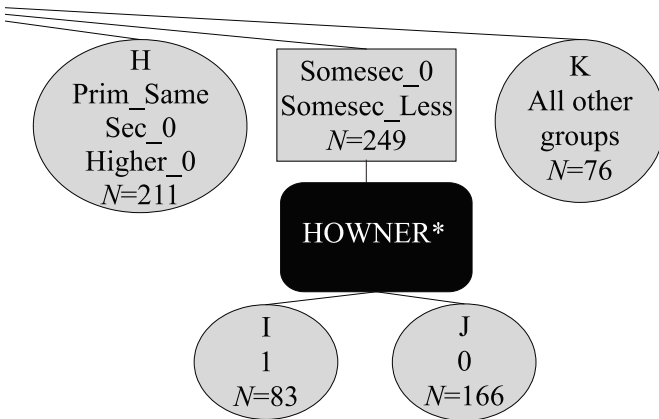
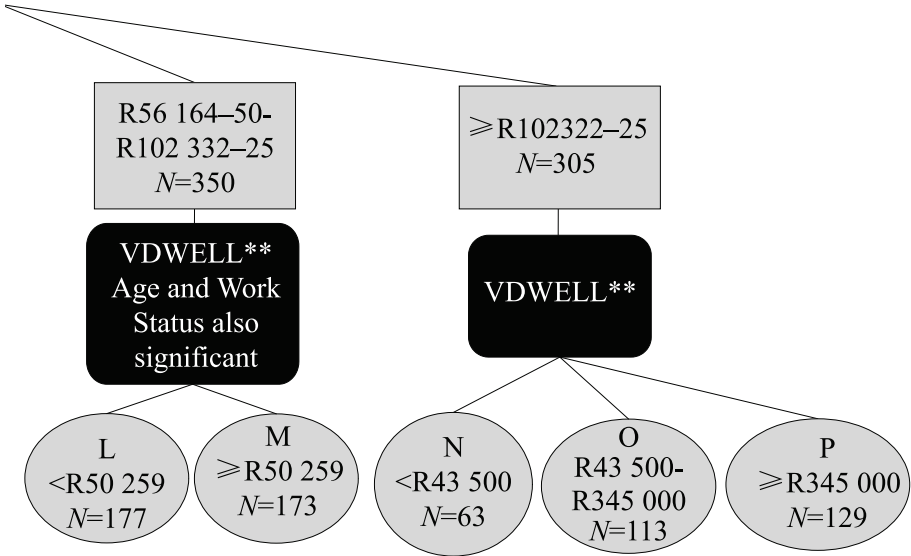


Figure 1. Dendrogram of the gifting rate



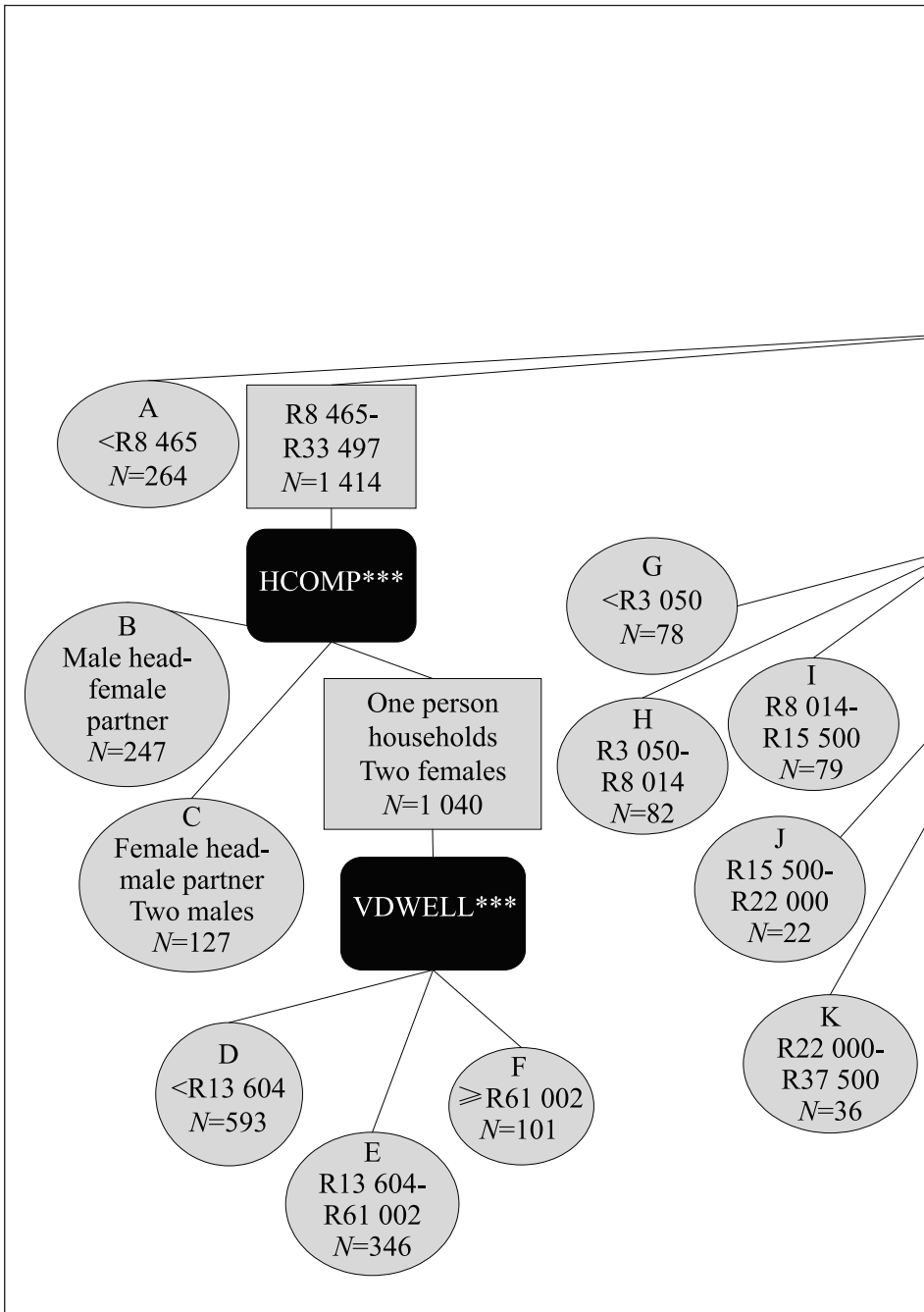
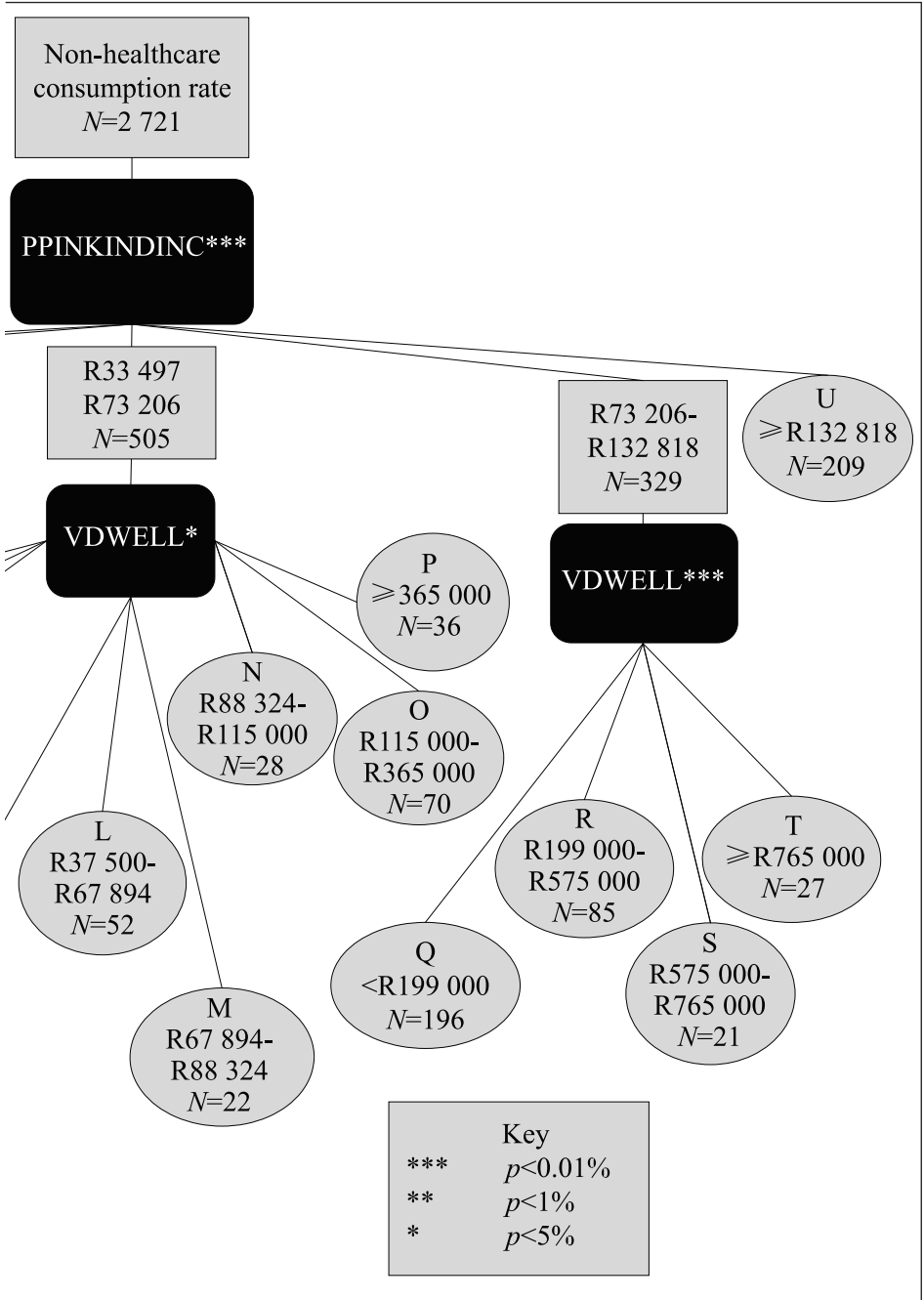


Figure 2. Dendrogram of the non-healthcare consumption rate



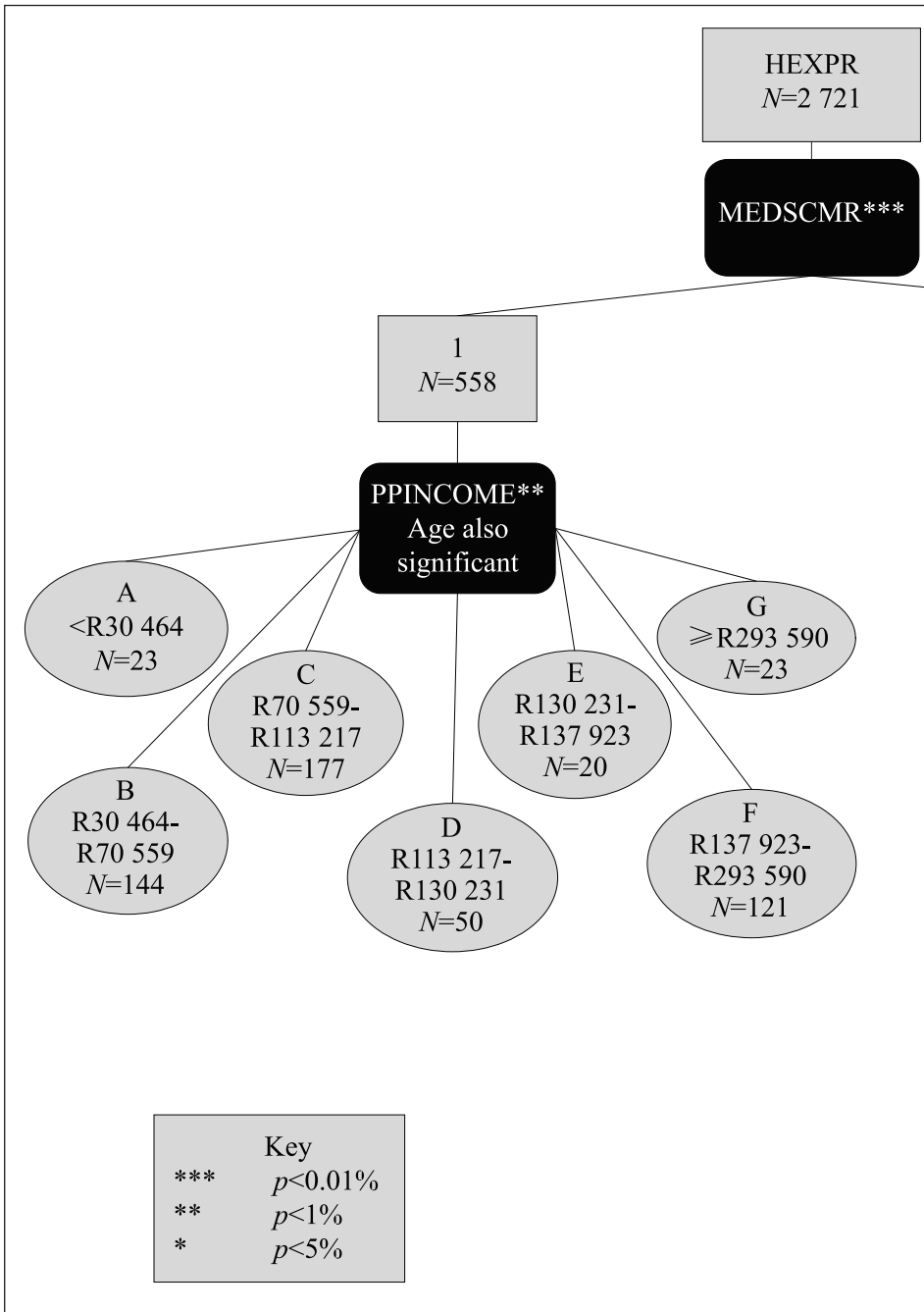
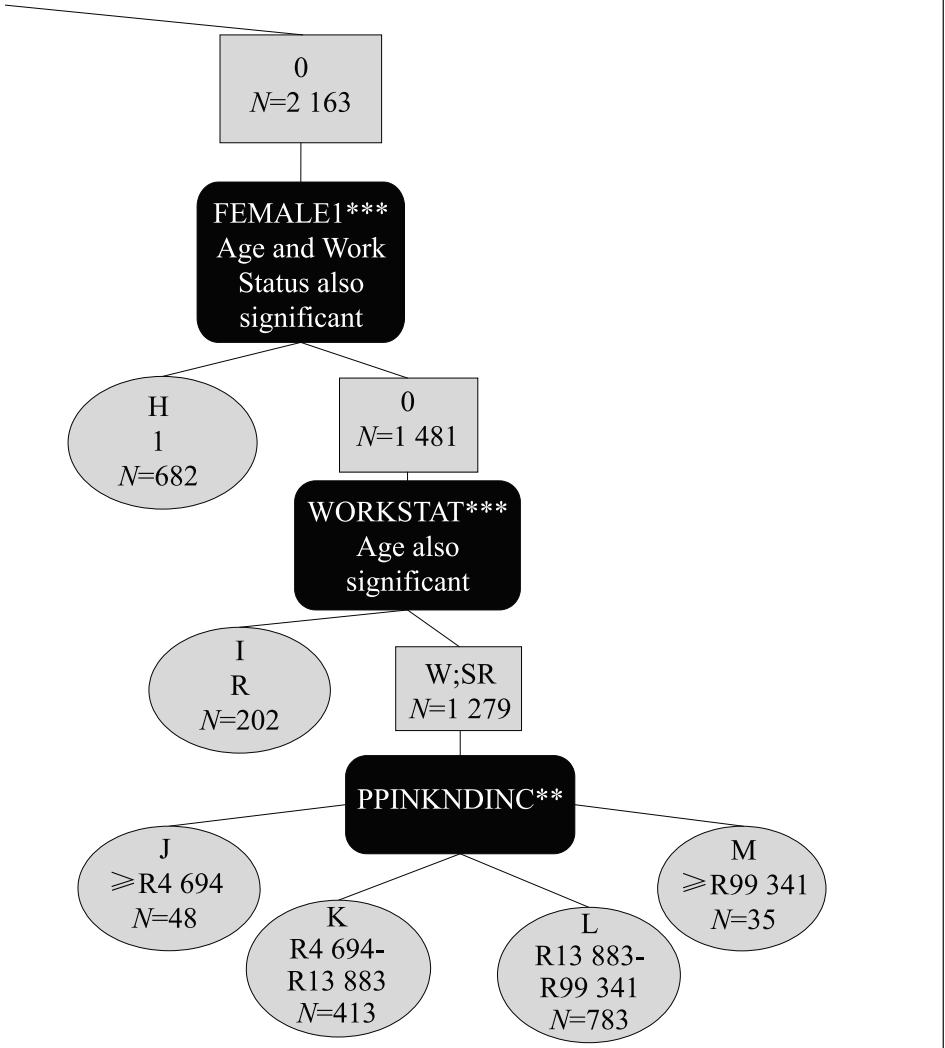


Figure 3. Dendrogram of healthcare expenditure rate





4.2.2 For households with no medical-scheme members, the next most important determinant of healthcare expenditure was the sex of the head of the household (coded as *FEMALE1*), although age and work status were also significant. Male-headed households spent significantly less than female-headed households. Considering only male-headed households with no medical-scheme members, healthcare budget share was much higher in retired households. Cash income, total income (including income in kind) (coded as *PPINKINDINC*) and work status (coded as *WORKSTAT*) were all found to have a significant effect. The mean healthcare expenditure rates are shown in Table 5.

Table 5. Mean healthcare expenditure rate by leaf and work status

Leaf	Working and semi-retired households		Retired households		% increase in healthcare budget share on retirement
	number	mean budget share	number	mean budget share	
A	5	9,7%	18	14,0%	44,3%
B	31	12,8%	113	13,2%	2,4%
C	30	10,1%	147	11,2%	10,4%
D	7	8,7%	43	7,2%	-17,9%
E	1	10,2%	19	10,5%	2,6%
F	10	6,9%	111	7,0%	1,2%
G	2	3,3%	21	2,4%	-27,6%
H	246	1,4%	436	2,0%	41,2%
I-J	202	1,6%	48	1,9%	18,7%**
I-K	202	1,0%	413	1,9%	100,9%**
I-L	202	0,7%	783	1,9%	187,1%**
I-M	202	0,7%	35	1,9%	184,3%**

\* significant at the 5% level

\*\* significant at the 1% level

\*\*\* significant at the 0,01% level

4.2.3 It could therefore be concluded that the data suggested that there was no age effect on healthcare expenditure, after controlling for income, and for some households healthcare expenditure increased significantly on retirement.

## 4.3 SUMMARY

4.3.1 The CHAID analysis indicated that there was no significant change in non-healthcare consumption on retirement. When gifting rates were considered separately, it was found that in most cases there was no work-status effect. However, in cases where a statistically significant effect was found, it indicated that gifting decreased on retirement. Although age and work status were not found to have a statistically significant impact on non-healthcare consumption after controlling for dwelling value,

if households were not matched by dwelling value a statistically significant result would have been obtained.

4.3.2 Households where at least one person was a medical-scheme member did not experience a significant increase in healthcare expenditure as age increased or work status changed. For households without medical-scheme coverage, retirement was associated with an increase in healthcare expenditure, which was significant for some households.

## 5. DISCUSSION AND CONCLUSION

### 5.1 RESULTS

#### 5.1.1 NON-HEALTHCARE CONSUMPTION, INCLUDING GIFTING

5.1.1.1 Non-healthcare consumption was unaffected by age and work status in general, but was influenced by income and dwelling value. This suggested that any decline in consumption at or in retirement observed in sampled households was a result of financial necessity.

5.1.1.2 This is an extremely important result and is consistent with some of the findings in Hurd & Rohwedder (op. cit.) and Miniaci, Monfardini & Weber (op. cit.). An analysis of results in Palmer (1992; 1994; unpublished) suggests that there are certain household profiles that do not experience a change in consumption on retirement. Although there is literature suggesting that consumption drops at retirement, Bernheim, Skinner & Weinberg (op. cit.), Robb & Burbidge (op. cit.), Hurd & Rohwedder (op. cit.) and Palmer (1992; 1994; unpublished) all suggest that the result depends on the dataset and control variables used. Repeated analysis using different datasets would therefore be required before firm conclusions can be made about consumption patterns of South African households generally.

5.1.1.3 Consideration of gifting patterns, a type of non-healthcare consumption, revealed that neither age nor work status indicated a significant increase in the gifting level. Where work status was significant, it was found that gifting decreased on retirement. This was contrary to the findings of Dexter (op. cit.) and Palmer (1992). The households in the model development sample that had a significant reduction in gifting at retirement earned between approximately R5 500 and R56 000 p.p.p.a., and it was hypothesised that during their working lives these households support other family members, as per Maitra & Ray (2003), and that these transfers would cease in retirement. This was supported by the sample data which suggested that for households in this income bracket, on average, each person in working and retired households supported 2,5 and 0,1 people, respectively. The wealthiest 4,7% of households in the sample displayed an increase in gifting on retirement; however, this was not found to be statistically significant.

5.1.1.4 If dwelling value had not been used to match households, and the mortality bias had therefore not been controlled, a spurious statistical relationship between work status, age and consumption would have been obtained. This emphasises the importance of controlling for the wealth and productivity biases.

### 5.1.2 HEALTHCARE EXPENDITURE

5.1.2.1 Households where at least one person was a medical-scheme member did not experience a significant increase in healthcare expenditure as age increased or work status changed. For households without medical-scheme cover and with male household heads, retirement was associated with an increase in healthcare expenditure which was significant for some households. It is possible that this was not a true work-status effect: some retirements may have been due to ill-health, which would be associated with higher healthcare costs around the time of retirement. When combined with the fact that the retired households were on average older than the working households, this may have caused the CHAID to detect a work-status effect instead of an age effect. Although self-reported health status can be subject to bias (Case & Deaton, *op. cit.*), access to this information and the inclusion of it in the analysis may have been beneficial, and would have been consistent with Hurd & Rohwedder (*op. cit.*).

5.1.2.2 Detection of sex of the head of the household as a significant determinant of healthcare expenditure was considered an unusual finding. This unusual result may have arisen from the close relationship between certain variables. Sex of the household head is linked to the sex of the household members and sex is strongly associated with healthcare expenditure (Paulin, 2000) and the rate of increase of healthcare expenditure in old age (Petertil, *op. cit.*). It may, in fact, be that the household composition is influencing the result, but that, because of the close relationship between the two, the CHAID is selecting sex of household head instead.

5.1.2.3 Healthcare expenditure data in IES 2005–2006 were collected only over one month. Given that healthcare expenditure is volatile and healthcare costs were seen to increase sharply for some groups, healthcare data averaged over a longer period may have improved the quality of the estimates.

## 5.2 METHODOLOGY

5.2.1 The CHAID analysis was more sophisticated than the matched-pairs methodology used by Palmer (1989; 1992; 1994; unpublished), which matched households only by income and household composition. The CHAID analysis suggested that income (including income in kind), medical-scheme membership, home-ownership status, dwelling value and education of household head were also significant in assessing consumption levels at and in retirement. The resultant matching was more complex than was suggested by any of the literature. In contrast to Cook & Settersten (*op. cit.*) and Banks, Blundell & Tanner (*op. cit.*), no significant age effect on consumption was detected.

5.2.2 By running the CHAID with wealth and age variables as possible factors that could influence consumption rates, the inherent mortality and productivity biases can be controlled. However, age was not detected as a significant determinant of any form of consumption, although the wealth indicators of home ownership and dwelling value were detected as significant determinants of health and non-healthcare expenditure respectively. This possibly suggests a mortality bias in the data. Failure to control for the productivity bias or the mortality bias may result in spurious results.

## 5.3 POSSIBLE IMPLICATIONS

### 5.3.1 RETIREMENT ADEQUACY GOALS

The replacement ratio goals of 70% to 79%<sup>16</sup> used by retirement funds imply that pensioners can tolerate a substantial drop in income at retirement. This may be acceptable if a number of conditions hold. The first is that consumption declines on retirement; the second is that the percentage of household income saved can be reduced on retirement and the third is that households receive income from a variety of other sources in retirement. However, this research indicates that the first condition may not hold. The total savings rate for working households in the sample was 8,3%, which suggests the second condition may not hold either. The second and third conditions are areas for future research. Given that the results of this research suggest there is no evidence to suggest reduced consumption at or in retirement, there is thus doubt whether a goal of 70% to 79% is adequate. In addition, the influence of medical-scheme membership on healthcare expenditure change might suggest that retirement adequacy goals may differ between medical-scheme members and non-members. However, this may be mitigated by the fact that healthcare expenditure in the households sampled was less than 5% of household budget share.

### 5.3.2 LONGITUDINAL AND CROSS-SECTIONAL DATA ANALYSIS

5.3.2.1 Given the lack of longitudinal data, care was taken to control for the mortality and productivity bias. The CHAID analysis allows for wealth and age effects to be managed if they are found to have a statistically significant effect and should therefore reduce the bias relative to a matched-pairs analysis. The dendrograms suggest that a mortality bias effect in excess of the productivity bias effect was detected for healthcare consumption and controlled.

5.3.2.2 However, without full income histories, these controls are imperfect. A study of a longitudinal dataset containing the consumption, income and savings patterns of households as they near and enter retirement would add considerably to the understanding of income and consumption dynamics of households around the time of retirement.

### 5.3.3 APPLYING THE RESULTS TO HOUSEHOLDS WITH CHILDREN

5.3.3.1 This research focused only on one- and two-adult households in each life stage. The complete removal of children from the sample avoided complicated adjustments for childcare costs, typically assumed to reduce in retirement (Engen, Gale & Uccello, 1999). However, it introduced the implicit assumption that, once children leave home, consumption patterns return to the levels at which they were before the birth of children. Stoller & Stoller (op. cit.) suggested that, because of gifting behaviour, consumption levels may be higher for empty-nesters. The data may have included both childless households and households with grown children who had left home. If Stoller &

---

16 Old Mutual (unpublished). Old Mutual Retirement Funds Survey 2010: Key Findings. [www.oldmutual.co.za/documents/Retirement/Survey.pdf](http://www.oldmutual.co.za/documents/Retirement/Survey.pdf), 10 May 2010

Stoller (op. cit.) are correct, the results of this analysis may be sensitive to the proportion of empty-nesters and childless couples in the data.

5.3.3.2 There is no reason to associate the cessation of childcare costs with retirement. In certain households, childcare costs may cease well before retirement, while in others they continue for years into retirement. Although the traditional nuclear-family model would suggest that many working households have children and adults live alone during retirement, South African data suggest otherwise. According to the 2001 Census, 71% of South Africans aged 65 or older lived in households of three or more.<sup>17</sup> It is therefore possible that children may live in retired households. Thus, the results cannot be applied to households that might contain children in retirement and care is required when applying this result to currently working households with children.

## 5.4 CONCLUSION

In summary, in contrast to the view that certain work-related expenditures need not be replaced in retirement, non-healthcare consumption was not found to change with age or work status. In line with the literature, healthcare expenditure was found to rise significantly on retirement for certain households; however this increase depended on medical-scheme membership. These findings suggest that it cannot be assumed that households can comfortably accept lower incomes in retirement and replacement-ratio retirement adequacy goals based on the premise of reduced consumption in retirement may understate what is required.

## ACKNOWLEDGEMENTS

Grateful thanks are offered to those who provided feedback on this paper in its various stages: two anonymous scrutineers, Dave Strugnell, John Anderson, Roseanne da Silva and the two anonymous examiners of the M.Sc. dissertation on which this work is based. Special thanks go to the staff and students of the School of Statistics and Actuarial Science at Wits for their support and encouragement.

---

<sup>17</sup> Census 2001: Stages in the Life Cycle of South Africans. Report no. 03-02-46(2001), Statistics South Africa, Pretoria, 2005

## REFERENCES

- Aliber, M (2009). Exploring Statistics South Africa's National Household Surveys as sources of information about household-level food security. *Agrekon* **48**(4), 384-409
- Banks, J, Blundell, R & Tanner, S (1998). Is there a retirement-savings puzzle? *American Economic Review* **88**(4), 769-88
- Bernheim, BD, Forni, L, Gokhale, J & Kotlikoff, JL (2000). How much should Americans be saving for retirement? *The American Economic Review* **90**(2), 288-92
- Bernheim, BD, Skinner, J & Weinberg, S (2001). What accounts for the variation in retirement wealth among U.S. households? *The American Economic Review* **91**(4), 832-57
- Case, A & Deaton, A (2005). Broken down by work and sex: how our health declines, 185-212. *In: Wise* (2005)
- Chia, N & Tsui, A (2003). Life annuities of compulsory savings and income adequacy of the elderly in Singapore. *Journal of Pension Economics and Finance* **2**(1), 41-65
- Cook, FL & Settersten, RA (1995). Expenditure patterns by age and income among mature adults: does age matter? *The Gerontologist* **35**(1), 10-23
- Cooper, DR (2002). Family fortunes: a guide to saving for retirement. *British Actuarial Journal* **8**(5), 849-85
- Dexter, MK (1984). Replacement Ratios: A Major Issue in Employee Pension Systems. National Committee on Employee Pension Systems, Washington DC. *Cited in: Palmer* (1989)
- Dietz, PO (1968). Investment goals: a key to measuring performance of pension funds. *Financial Analysts Journal* **24**(2), 133-7
- Engen, EM, Gale, WG & Uccello, CE (1999). The adequacy of household saving. *Brookings Papers on Economic Activity* **1999**(2), 65-187
- Engen, EM, Gale, WG & Uccello, CE (2005). Lifetime earnings, social security benefits and the adequacy of retirement wealth accumulation. *Social Security Bulletin* **66**(1), 38-57
- Groves, RM, Fowler, FJ, Couper, MP, Lepkowski, JM, Singer, E & Tourangeau, R (2004). *Survey Methodology*. John Wiley & Sons, New Jersey
- Groyer, A & Holtzhausen, N (unpublished). How much is enough? a discussion of retirement benefits and communication in defined contribution arrangements. Convention, Actuarial Society of South Africa, Cape Town, 12-13 October 2006
- Haider, SJ & Stephens, M (2007). Is there a retirement-consumption puzzle? evidence using subjective retirement expectations. *Review of Economics and Statistics*, **89**(2), 247-64
- Hamermesh, DS (1984). Consumption during retirement: the missing link in the life cycle. *Review of Economics and Statistics* **66**(1), 1-7
- Hill, T & Lewicki, P (2006). *Statistics: Methods and Applications*, 1st edn., StatSoft, Tulsa
- Hurd, M & Rohwedder, S (unpublished). The retirement-consumption puzzle: anticipated and actual declines in spending at retirement: WR-242, Research and Development Corporation, 2005, [www.rand.org/pubs/working\\_papers/WR242.html](http://www.rand.org/pubs/working_papers/WR242.html), accessed 9 July 2010
- Jianakoplos, NA, Menchik, PL & Irvine, FO (1989). Using panel data to assess bias in cross-sectional inferences of life-cycle changes in the level and composition of household wealth. *In: Lipsey & Tice* (1989: 553-644)
- Kass, GV (1980). An exploratory technique for investigating large quantities of categorical data. *Journal of the Royal Statistical Society Series C (Applied Statistics)* **29**(2), 119-27

- Kuzmich, G & Wigbout, M (2001). *A Longitudinal Look at Some Data of the Household Labour Force Statistics*. Statistics New Zealand, Wellington
- Lipsey, RE & Tice, HS (1989). *The Measurement of Saving, Investment and Wealth*. University of Chicago Press, Chicago
- Little, RJA & Rubin, DB (2002). *Statistical Analysis with Missing Data*, 2nd edn., Wiley, New Jersey
- Madrian, BC, Burtless, G & Gruber, J (1994). The effect of health insurance on retirement. *Brookings Papers on Economic Activity* **1994**(1), 181–252
- Maitra, P & Ray, R (2003). The effect of transfers on household expenditure patterns and poverty in South Africa. *Journal of Development Economics* **71**, 23–49
- Miniaci, R, Monfardini, C & Weber, G (2010). How does consumption change upon retirement. *Empirical Economics* **38**(2), 257–80
- Montgomery, DC & Peck, EA (1982). *Introduction to Linear Regression Analysis*, 1st edn., Wiley, New York
- Palmer, BA (1989). Tax reform and retirement income replacement ratios. *The Journal of Risk and Insurance* **56**(4), 702–25
- Palmer, BA (1992). Establishing retirement income objectives: the 1991 RETIRE Project Report. *Benefits Quarterly* **8**(3), 6–15
- Palmer, BA (1994). Retirement income replacement ratios: an update. *Benefits Quarterly* **10**(2), 59–75
- Palmer, BA (unpublished). *2008 GSU/AON RETIRE Project Report 08-01*, Georgia State University, Georgia, 2008, <http://rmictr.gsu.edu/Papers/RR08-1.pdf>, accessed 14 March 2010
- Paulin, GD (2000). Expenditure patterns of older Americans, 1984–1997. *Monthly Labor Review*, **123**(5), 3–28
- Petertil, JP (2005). Aging curves for health care costs in retirement. *North American Actuarial Journal*, **9**(3), 22–49
- Robb, AL & Burbidge, JB (1989). Consumption, income and retirement. *The Canadian Journal of Economics* **22**(3), 522–42
- Schieber, SJ (1996). Conceptual and measurement problems in contemporary measures of income needs in retirement. *Benefits Quarterly* **12**, 56–68
- Shefrin, HM & Thaler, RH (1988). The behavioral life-cycle hypothesis. *Economic Inquiry* **26**(4), 609–43
- Stoller, MA & Stoller, EP (2003). Perceived income adequacy among elderly retirees. *Journal of Applied Gerontology* **22**, 230–50
- Tacchino, K & Saltzman, C (1999). Do accumulation models overstate what's needed to retire? *Journal of Financial Planning* **12**(2), 62–73
- Wise, DA (2005). *Analyses in the Economics of Aging*, 1st edn., University of Chicago Press, Chicago



## APPENDIX A

### CHAID ALGORITHM AND ILLUSTRATIVE EXAMPLE

#### A.1 DESCRIPTION OF THE CHAID ALGORITHM

A.1.1 The CHAID algorithm is described in Hill & Lewicki (2006) as including the following steps:

- Identify the dependent variable. This variable could be continuous or categorical and continuous variables would need to be converted into categorical variables. For example, the percentage of income spent on consumption is continuous as it can take on an infinite number of values. To create a categorical variable, households could be grouped into four types: very low consumers, low consumers, moderate consumers and high consumers where the categories are based on the consumption rate and there are a roughly equal number of households in each category. A disadvantage of using CHAID for continuous dependent variables is that turning a continuous variable into categorical variables results in a loss of statistical power.
- The independent variables are the factors that might influence the dependent variable. For each independent variable, pairs of categories are compared using a chi-squared test and pairs that are not statistically significantly different are merged, starting with the least significant. Where significant differences are detected, Bonferroni-adjusted  $p$ -values are calculated to indicate the degree of statistical significance. The Bonferroni adjustment is necessary as there is more than one test for significance being performed and the Bonferroni adjustment effectively adjusts the significance level for the number of tests performed and therefore prevents the erroneous identification of non-significant effects as significant (Hill & Lewicki, *op. cit.*).
- The observations are then split into statistically significant categories using the most significant independent variable.

The cycle repeats until no significant differences are detected.

#### A.2 CHAID ILLUSTRATIVE EXAMPLE

A.2.1 Consider a household where  $Y$  is the dependent variable,  $a$  is a continuous independent variable,  $b$  is a binary independent variable that can take on values 0 and 1 and  $g$  is a categorical independent variable with four categories named 1, 2, 3 and 4, respectively.

A.2.2 The following implications can be made from Figure A.1 and the application of Kass (*op. cit.*). The households can be divided into five distinct leaves, each of which is statistically significantly different from the other at a 5% significance level. Each leaf is defined by the split variables used to arrive at the leaf. For example, leaf B can be described as households where  $g = 2$  or 3 and  $a < X$ . The split variables can be considered predictive. For example, for households where  $g = 4$ ,  $a$  is not a statistically significant predictor of  $Y$ . In addition, the dendrogram suggests that it is not necessary to separate households where  $g = 2$  from those where  $g = 3$ . Finally, although non-terminating nodes can be compared, this comparison should be interpreted with caution

as any apparent differences in observed values might be explained by subsequent split variables. For example, if all households where  $g = 4$  were compared with all households where  $g = 1$ , the comparison might be spurious in that households where  $b = 0$  and  $g = 4$  were found to be significantly different from households where  $b = 1$  and  $g = 4$ . Any difference in the observed value of  $Y$  between households where  $g = 1$  and  $g = 4$  may therefore be fully explained by  $b$ .

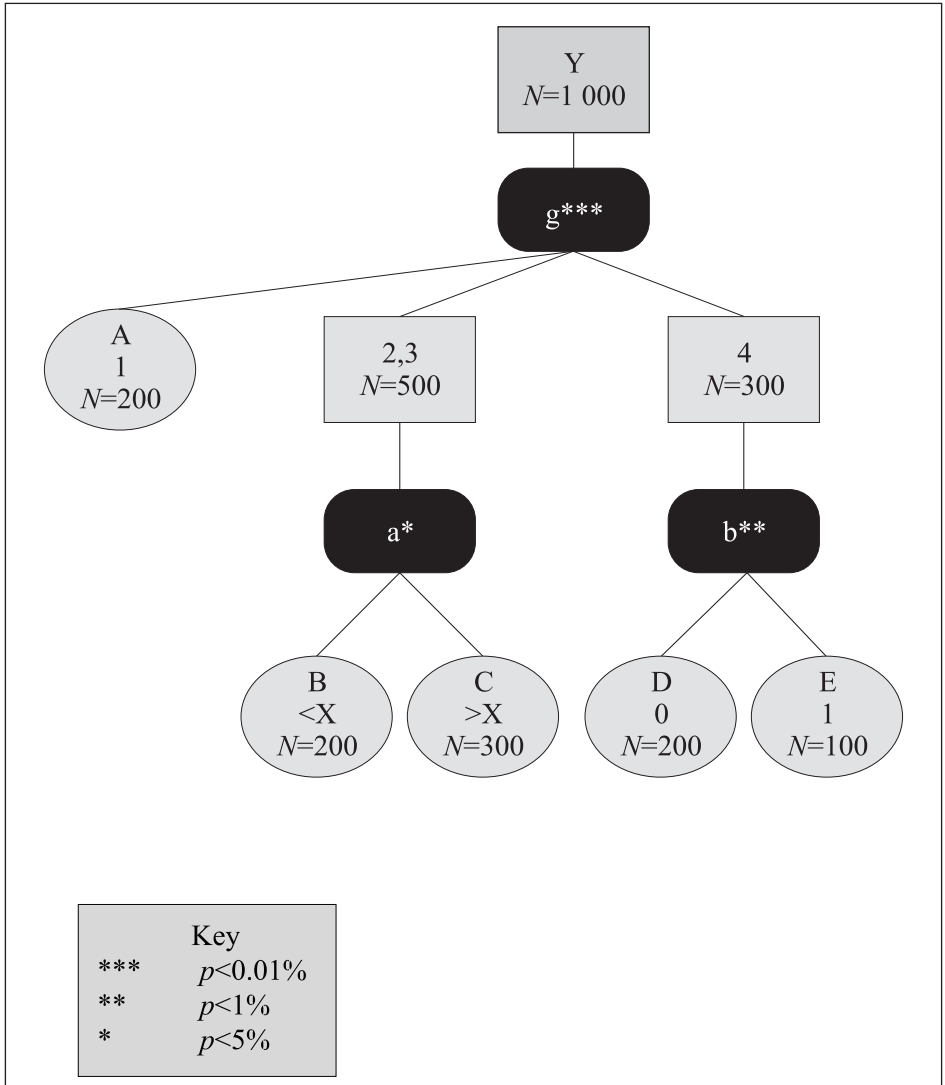


Figure A.1. Illustrative CHAID dendrogram

## APPENDIX B

### REFINEMENT OF DATA SAMPLE

A number of data checks were performed to ensure that only household records that were reasonably free from error and that were appropriate for the purposes of exploring changes in consumption were used. Although a larger sample may have appeared more statistically credible, any results derived from using data with errors or data that the literature indicated should be removed would not have been more reliable than estimates derived from using an appropriate but small sample.

Table B.1. Reconciliation of the data sample with IES 2005–2006

	Household records
IES 2005–2006	21 145
Households of three or more	13 941
Self-employed and commercial farmers	871
Subsistence farmers	16
Unemployed	2 663
Households with children	37
Sample after removing non-relevant records	3 617
Age unspecified	17
Income mis-specified	2
Household size contradiction	1
Home ownership status unclear	33
Highest education unknown	12
Sample after data checks before cross-checks	3 552
Lodgers removed because of missing rent data	20
Households with income from self-employment or hobbies detected during cross-checks	142
Mortgage inconsistencies	40
Probable income under-reporting	629
Data sample	2 721

## APPENDIX C VARIABLES

The full lists of continuous and categorical variables used are given in Tables C.1 and C.2 respectively. The age variables were calculated from the ‘current age’, defined as the midpoint of the five-year age band recorded in the data rounded down to the nearest whole number.

Table C.1. Continuous variables

Variable name	Description
<i>AGE1</i>	the age of the head of the household
<i>AGE2</i>	the age of the partner in two-person households, coded as the head’s age in one-person households
<i>AGEGAP</i>	age gap in a two-person household
<i>AGEOLD</i>	age of the oldest person in the household
<i>AGEYOUNG</i>	age of the youngest person in the household
<i>AVGAGE</i>	arithmetic average of ages for two-person households and household head’s age for one-person households
<i>HEXPR</i>	healthcare expenditure rate
<i>INCPERI</i>	percentage income earned by the household head
<i>INCPOLD</i>	percentage income earned by the oldest person in the household
<i>JOINTAGE</i>	geometric average of ages for two-person households and household head’s age for one-person households
<i>NHCONSR</i>	non-healthcare consumption rate
<i>PPINCOME</i>	cash income p.p.a.
<i>PPINKINDINC</i>	income (including income in kind) p.p.a.
<i>RSR</i>	actual retirement savings rate
<i>RSR_k</i>	hypothetical retirement savings rate of $k\%$
<i>VDWELL</i>	value of the dwelling
<i>YRSEDI</i>	years of education of the head of the household

Table C.2. Categorical variables

Variable name	Description	Coding
<i>EDUC1</i>	highest educational attainment of the household head	no schooling pre-primary or primary some secondary completed secondary any further education
<i>FEMALE1</i>	sex of household head	female head male head
<i>HCOMP</i>	household composition	male head–female partner ('male–female') female head–male partner ('female–male') two males ('male–male') two females ('female–female') female alone male alone
<i>HEDUC</i>	household educational attainments	partner has less education than EDUC1 both have EDUC1 partner has more education than EDUC1 one-person household
<i>HOWNER</i>	home ownership	home owned home rented
<i>HSIZE2</i>	household size	two person one person
<i>MEDSCMR</i>	medical-scheme membership	at least one person in the household is a medical-scheme member no medical-scheme members in household
<i>MORT</i>	mortgage holding	home mortgaged home owned outright
<i>RURAL</i>	type of settlement	rural urban