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RETIREMENT ADEQUACY GOALS FOR SOUTH AFRICAN HOUSEHOLDS

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ABSTRACT
Despite the importance of retirement adequacy goals to public policy, retirement fund design and personal financial planning, there has been little formal research on the estimation of retirement adequacy goals for South African households. This research derived estimated retirement adequacy goals for employed one- and two-adult households. A consumption-smoothing model with a minimum-income underpin was developed to estimate wealth–earnings ratio goals using data from the Income and Expenditure Survey 2005–2006. Household wealth–earnings ratio goals were estimated to be between 10,5 and 18,2 times annual salary depending on retirement age, household composition, income, location, age, education, household income distribution, home ownership and salary support. Considering current retirement savings rates, retirement before age 67 is unlikely to be affordable for most households.

KEYWORDS
Retirement; adequacy goals; South Africa; wealth–earnings ratios

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1. INTRODUCTION

1.1 Retirement adequacy goals can be defined as the wealth or accumulated assets required at retirement to meet retirement needs sufficiently.

1.2 Retirement adequacy goals are a determinant of the required household pre-retirement savings rate (Mitchell & Moore, 1998) under the life-cycle hypothesis, in terms of which individuals accumulate savings during their working lives in order to smooth consumption in later life when they are unable to earn through working (Banks, Blundell & Tanner, 1998). Retirement savings rates, and by implication retirement adequacy goals, are important for household financial planning (Bernheim et al., 2000; Tacchino & Saltzman, 1999; Groyer & Holtzhausen, unpublished), retirement fund design (Groyer & Holtzhausen, op. cit.) and retirement fund investment strategies (Groyer & Holtzhausen, op. cit.; Dietz, 1968).[1] Retirement adequacy goals have particular relevance in South Africa given the government's intended reform of the retirement fund industry. The Department of Social Development[2] and the National Treasury[3] cited inadequacy of retirement benefits in the current system as evidence of the reform's necessity. However, the two government departments initially cited conflicting retirement adequacy goals[4,5] and then failed to state goals at all.[6,7] This inconsistency may be a result of the lack of published research relating to adequacy goals in South Africa (Groyer & Holtzhausen, unpublished).

1.3 Butler & Van Zyl (2012) suggested that some households experience consumption increases on retirement due to rising healthcare expenditure while other households do not experience a change in consumption at retirement. This challenges the appropriateness of retirement adequacy goals that assume a reduction in consumption at retirement.

1.4 This research had three aims:

– to develop a cashflow projection model to estimate retirement adequacy goals for South African households;

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1 cf. also: P. Myners, Institutional Investment in the United Kingdom: A Review, Her Majesty's Treasury, London, 2001; Financial Services Board. *Circular PF No. 130: Good Governance of Retirement Funds*. Financial Services Board, Pretoria, 2007

2 Department of Social Development. Reform of Retirement Provisions: Discussion Document. Department of Social Development, Pretoria, 2007

3 National Treasury. Retirement Fund Reform: a Discussion Paper. National Treasury, Pretoria, 2004

4 Department of Social Development, supra

5 National Treasury, 2004, supra

6 National Treasury, Social Security and Retirement Reform: Second Discussion Paper, Pretoria, 2007

7 Department of Social Development. Reform of Retirement Provisions: Feasibility Studies. Department of Social Development, Pretoria, 2007

– to use statistical models to ascertain the factors influencing the goals; and
– to explore the implications of the results.

1.5 The study was limited to one-adult households and two-adult households where both adults were employed, subject to certain restrictions on income sources. The goals were derived from households that were saving for retirement and that were projected to have comfortably adequate benefit needs too high to be satisfied by relying on the State Old Age Grant (SOAG) alone and who may therefore benefit from private retirement provision. This corresponded to a minimum income level of R24 424–50 per person per annum (p.p.p.a.) in March 2006 terms.

1.6 This research does not assess whether current pensioners receive adequate incomes, nor does it assess the likely financial position of savers at retirement. In addition, the goals should be interpreted in terms of the total wealth requirements of a household at retirement and not as the optimal goal for an occupational retirement fund or retirement annuity fund investment.

1.7 Before proceeding to the modelling and analysis, it is necessary to clarify what is meant by an adequate retirement benefit and to explore sensible ways of expressing adequacy goals. These matters are addressed in Section 2. Section 3 describes the goal-estimation model while the parameters for the model and the data are described in Sections 4 and 5 respectively. Section 6 sets out the statistical analysis of the results. Sections 7 and 8 set out discussions on the level of the goal and factors that influence it. Finally, the findings and implications are set out in section 9.

2. DEFINING ADEQUACY AND EXPRESSING GOALS

2.1 Retirement adequacy goals depend critically on the adequacy definition adopted. The definition of adequacy is discussed in section 2.2.

2.2 DEFINING ADEQUACY

2.2.1 Adequacy can be defined with reference to utility maximisation (Robb & Burbidge, 1989; Chai et al., unpublished; Kotlikoff, Spivak & Summers, 1982; Engen, Gale & Uccello, 1999; 2005), subjective opinions (Cooper, 2002), deprivation levels (Lelli, 2005; Klasen, 2000) or comparing pensioner incomes to the wage level (McGill et al., 1996).

2.2.2 However for this research an adequate income was defined to be that required to maintain the higher of the pre-retirement living standard and a socially acceptable standard of living. Maintenance of the pre-retirement living standard in retirement would necessitate the smoothing of consumption between the pre- and post-retirement phases and this part of the adequacy definition was therefore termed the ‘consumption-smoothing’ element. Consumption-smoothing was adopted by Yuh, Hanna & Montalto (1998), Palmer (1989; 1992; 1994; unpublished) and Mitchell &

Moore (op. cit.). The level of income sufficient to maintain only a minimum socially acceptable living standard was termed 'minimally adequate' and the use of the underpin together with a consumption-smoothing definition is in line with a recommendation in Palmer (1989).

2.2.3 This research was therefore concerned with finding a retirement adequacy goal providing an income above a poverty-line measure that would not require the pensioner to economise on expenditure any more in retirement than during the pensioner's working lifetime.

2.3 EXPRESSION OF RETIREMENT ADEQUACY GOALS

2.3.1 Replacement-ratio adequacy goals, defined as the ratio of annualised income in the month after retirement to salary for the year prior to retirement (McGill et al., op. cit.) have been derived by Palmer (1989; 1992; 1994; unpublished), Burns & Widdows (1990), Mitchell & Moore (op. cit.) and Chia & Tsui (2003). By definition, the replacement ratio refers only to income immediately after retirement without indicating income levels in subsequent years. However, as retirement needs may vary with age (Banks, Blundell & Tanner, op. cit.; Chia & Tsui, op. cit.; Palmer, unpublished), the choice of the annuity factor used in the calculations is critical as this should match the expenditure pattern required in retirement in order to avoid misleading results (Schieber, 1996). Banks, Blundell & Tanner (op. cit.) have suggested that an appropriate commercially available annuity may not be available.

2.3.2 The wealth–earnings ratio can be defined as the ratio of total wealth required for consumption-smoothing (Engen, Gale & Uccello, 1999; 2005) to annualised current income (Moore & Mitchell, unpublished; Engen, Gale & Uccello, 1999; Burns & Widdows, op. cit.). Although the wealth–earnings ratio does not explicitly indicate the drop in income at retirement shown by the replacement ratio, it avoids the annuitisation and communication difficulties associated with replacement ratios while still allowing comparisons with replacement-ratio adequacy measures (Engen, Gale & Uccello, 2005; Chia & Tsui, op. cit.). Wealth–earnings ratios, gross of tax, were therefore used in this research and, where appropriate, goals were also shown as replacement ratios to aid in comparison with previous work.

3. A MODEL FOR ESTIMATING RETIREMENT ADEQUACY GOALS

3.1 THEORETICAL FRAMEWORK

3.1.1 The literature on consumption-smoothing adequacy goals is largely based on the models described in Palmer (1989). The tax and savings (TS) model in Palmer (1989) is an income-led model that estimates post-retirement consumption as pre-retirement consumption adjusted only for changes in tax and savings at the retirement date. The tax, savings and expenditure (TSE) model attributable to Dexter (unpublished) allows for an additional adjustment for changes in consumption due to ageing or retirement, which may be positive or negative (Palmer, 1989). The TS and TSE models were used to estimate retirement adequacy goals by Palmer (1989; 1992; 1994; unpublished), Mitchell & Moore (op. cit.) and Yuh, Hanna & Montalto (op. cit.).

3.1.2 There is considerable debate as to whether consumption-smoothing models should allow for the bequest motive (i.e. the desire to leave an inheritance for heirs). However, the literature suggested that an explicit bequest motive during the retirement period could be ignored (Mitchell & Moore, op. cit.; Modigliani, 1986; Yaari, 1965) so long as post-retirement savings patterns (Modigliani, op. cit.) and gifts (Joulfaian, 2005) were considered.

3.2 DESCRIPTION OF THE GOAL-ESTIMATION MODEL

3.2.1 Introduction

3.2.1.1 A deterministic goal-estimation model was developed that was based on the literature and on the definition of adequacy. A cashflow model was adopted in line with Chia & Tsui (op. cit.) and Milevsky & Robinson (2000). Goal-estimation calculations were performed at a household level, which was consistent with Palmer (1989; 1992; 1994; unpublished) and Mitchell & Moore (op. cit.).

3.2.1.2 The goal-estimation model had eight principal steps, as follows:

- step 1: estimation of current consumption from expenditure;
- step 2: estimation of consumption at retirement;
- step 3: calculation of outstanding mortgage at retirement and associated tax;
- step 4: adjustment for the change in consumption at and during retirement;
- step 5: estimation of the comfortably adequate income required at each age of retirement;
- step 6: calculation of the expected present value of comfortably adequate incomes;
- step 7: adjustment of the expected present value of comfortably adequate incomes for the mortgage outstanding at retirement; and
- step 8: calculation of the adequacy levels.

These steps are explained in sections 3.2.2–3.2.9.

3.2.2 Step 1: Estimation of Current Consumption from Expenditure

3.2.2.1 The model derived consumption from expenditure as opposed to income, given that incomes are typically subject to volatility and under-reporting (Klasen, op. cit.).

3.2.2.2 For certain durable items, such as housing and vehicles, non-healthcare consumption may occur at a different time than expenditure. For example, a household may live in a home after the mortgage has been fully repaid. The housing expenditure may therefore be zero, but they are still incurring housing consumption. In the Income and Expenditure Survey (IES) 2005–2006 data,[8] the non-healthcare expenditure data

8 Statistics South Africa. Income and Expenditure Survey 2005–2006. Statistics South Africa, Pretoria. Source: the South African Data Archive, Old Mutual Platinum Pension 2003. www.oldmutual.co.za/corporate/asset-management/annuity-portfolios/platinum-pension-2003.aspx, Old Mutual, 10 May 2010 accessed 24 March 2010

already reflected housing consumption as opposed to expenditure.[9] The non-healthcare expenditure data were further adjusted for mismatches in the timing of transport expenditure and transport consumption. This involved smoothing the purchase of a new vehicle over the life of the vehicle. This meant that expenditure needed to be adjusted upwards for vehicle owners who had not purchased a car in the last year and downwards for vehicle owners who had made such a purchase.

3.2.2.3 Healthcare expenditure was taken to be equal to healthcare consumption (Miniaci, Monfardini & Weber, unpublished).

3.2.2.4 The model was run first using hypothetical savings rates as suggested by Mitchell & Moore (op. cit.). This was done to test the impact of savings rates on the adequacy goals. Four hypothetical savings rates were considered: 0,0%, 12,5%, 15,0% and 17,5%. Given that approximately 80% of members in retirement funds administered by a large retirement-fund administrator and consultancy, have retirement-fund contributions of between 10,0% and 17,5% of pensionable salary,[10] this range of contribution rates as a percentage of total salary was assumed to be reasonable. It was acknowledged that a uniform savings rate across all households would not be realistic and household savings rates would be influenced by a number of factors including earnings, race, education, marital status, number of dependants and health. The level of savings was assumed to affect non-healthcare consumption. In other words, if households saved less, they consumed more non-healthcare goods and services and vice versa.

3.2.2.5 However, for estimating the retirement adequacy goals for households, actual savings rates were used.

3.2.3 Step 2: Estimation of Consumption At Retirement

3.2.3.1 As suggested by Diamond & Hausman (1984), Robb & Burbidge (op. cit.), Hamermesh (1984) and Shefrin & Thaler (1988), the adjusted consumption calculated in step 1 was projected to retirement age using salary growth net of income tax.

3.2.3.2 Five different retirement ages were considered in order to test for the effect of retirement age on the goals. These retirement ages were 60, 63, 65, 67 and 70, which are consistent with the ages at which South Africans stop working.[11]

3.2.4 Step 3: Calculation of Outstanding Mortgage at Retirement and Associated Tax

It was decided to assume that if there was outstanding mortgage debt when the oldest person in the household retired, the mortgage would be paid in full on the retirement date. In this step, the mortgage at retirement was therefore estimated given the current mortgage instalments and balance outstanding. The tax payable was calculated on the assumption that the money was withdrawn from a retirement fund and that this

9 Statistics South Africa. Income and Expenditure Survey 2005–2006, supra

10 Alexander Forbes. Member Watch™ Survey, 2010: Contributions, Johannesburg

11 Human Sciences Research Council. Multidimensional Survey of Elderly South Africans, 2000

was the individual's only cash withdrawal from a retirement fund. This minimises the tax burden and therefore avoids overestimating the retirement adequacy goals.

3.2.5 Step 4: Adjustment for the Change in Consumption at and during Retirement

3.2.5.1 In this step the level of consumption at each age in retirement was projected. This was based on the consumption at retirement estimated in step 3.

3.2.5.2 Consumption during retirement was assumed to increase with inflation. The model allowed for healthcare and non-healthcare inflation to have different parameters.

3.2.5.3 As introduced in 3.1.1, TSE models allow for consumption to change at and during retirement. The estimation of the extent and direction of any change is non-trivial and is addressed in Butler & Van Zyl (op. cit.). When investigating consumption changes at and during retirement, Butler & Van Zyl (op. cit.) reached two conclusions that shaped the design of the goal-estimation model. First, it was found that non-healthcare consumption would not change at or during retirement if income did not drop. Secondly, healthcare consumption increased sharply at retirement for some households but not others. The goal-estimation model therefore allowed for the change in non-healthcare consumption to be modelled separately to this change for healthcare consumption. In addition, the extent and direction of the change could vary between different households.

3.2.5.4 In addition, an allowance for the loss of economies of scale on widowhood was modelled.

3.2.6 Step 5: Estimation of the Comfortably Adequate Income Required at Each Age of Retirement

3.2.6.1 Step 4 involved the estimation of consumption at each age during retirement. Step 5 involved estimating the income required from savings to fund this consumption and meet tax obligations.

3.2.6.2 The model did allow for salary income from a younger, working spouse to reduce the income need from savings. No allowance was made for income support by other family members or employer subsidies towards medical schemes.

3.2.6.3 Housing expenditure is lower than housing consumption for home owners who have repaid their mortgages. Given that the mortgage is made fully paid at retirement in step 3, the consumption for home owners in retirement is adjusted downwards to calculate their income requirement.

3.2.6.4 As discussed in ¶2.2.2 a comfortably adequate income is defined to be above a minimum income level and therefore provides for consumption above a minimally adequate consumption level. The retirement income requirement, adjusted for the difference between housing expenditure and consumption, was therefore subjected to an underpin of the minimally adequate income level.

3.2.6.5 Income tax is added to the adjusted expenditure in order to estimate the income requirement gross of tax.

3.2.7 Step 6: Calculation of the Expected Present Value of Comfortably Adequate Incomes

The expected present value of the income requirement was then calculated, discounting back to the retirement age.

3.2.8 Step 7: Adjustment of the Expected Present Value of Comfortably Adequate Incomes for the Mortgage Outstanding at Retirement

The mortgage and associated tax, calculated in step 3, is then added to the lump sum required to fund post-retirement expenditure, calculated in step 6.

3.2.9 Step 8: Calculation of the Adequacy Levels

The total lump sum required at retirement, calculated in step 7, is then divided by annualised salary at retirement to give a wealth–earnings ratio goal.

4. PARAMETERS OF THE GOAL-ESTIMATION MODEL

4.1 ECONOMIC ASSUMPTIONS

4.1.1 Salary Inflation

4.1.1.1 The salary inflation basis required assumptions for inflation-related salary increases and promotional salary increases. Since 1982 the real annual salary inflation rate, excluding allowances for improved productivity and promotional growth, has been approximately 2,0%,[12,13,14] which is consistent with Rusconi (2005). It was assumed that the real annual salary inflation rate would be 2,0% a year.

4.1.1.2 After the rate of promotional salary increase in a UK "example" salary scale (PEN)[15] was multiplied by 1,01, the resultant salary scale was found to be similar to the promotional salary increases in the best estimate valuation basis adopted by a large retirement-fund administrator and consultancy.[16] In the interests of transparency, the adjusted PEN scale was used. It was assumed that no promotional salary growth would occur after age 64; the promotional scale was taken as constant to age 69.

4.1.1.3 The combined inflation-related and promotional scale adopted implied that a wage-earner aged 20 at the projection date would experience real earnings growth of 606,5% over the 44 years to age 64.

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12 South African Reserve Bank. Labour Productivity in the Non-Agricultural Sectors: KPB7014L. Source: the South African Reserve Bank, www.resbank.co.za, accessed 26 March 2010

13 South African Reserve Bank. Nominal Unit Labour Costs in the Non-Agricultural Sectors: KPB7015J. Source: the South African Reserve Bank, www.resbank.co.za, accessed 26 March 2010

14 Statistics South Africa. Consumer Price Index History: P0141. Statistics South Africa, Pretoria, www.statssa.gov.za/publications/statsdownload.asp?PPN=P0141&SCH=4796, accessed 1 December 2010

15 Faculty of Actuaries & Institute of Actuaries (2002). *Formulae and Tables for Examinations of the Faculty of Actuaries and the Institute of Actuaries*. The Institute of Actuaries, London

16 Alexander Forbes Best Estimate Salary Inflation Basis. Alexander Forbes, Johannesburg, accessed 22 November 2010

4.1.2 Tax Projection Basis

In order to avoid fiscal drag, the brackets and primary rebate needed to be adjusted for wage inflation. The inflationary salary increase assumption was applied to the brackets and primary rebate in line with historical experience.[17,18,19] Between 2003 and 2010 the secondary rebate had increased annually by approximately 0,5% less than the primary rebate.[20] A real rate of increase of 1,5% a year was therefore adopted for the secondary rebate.

4.1.3 Mortgage-Related Assumptions

4.1.3.1 Fee structures on mortgages were obtained from ABSA Bank Limited, First National Bank (a division of FirstRand Bank Limited), Nedbank Limited and Standard Bank of South Africa Limited. Publically available data relating to market share was difficult to obtain, but according to information compiled in 2007, these banks had a combined reported market share of 94,8%.[21] Average fees, weighted by market shares,[22] were then calculated for different salary and outstanding-balance profiles. The monthly fees ranged from R17 to R63 in March 2006 rands.

4.1.3.2 The income required to settle the mortgage at retirement was taxed according to the scale in the Taxation Laws Amendment Act[23] and the real tax brackets were assumed to remain constant.

4.2 CONSUMPTION-RELATED ASSUMPTIONS

4.2.1 Minimum Income Level

4.2.1.1 Minimum income levels can be defined in relation to poverty lines (Chia & Tsui, op. cit.). South Africa lacks a single official poverty line[24] to use for this purpose, but the means-testing of the SOAG provides an implicit official measure that could be used as an alternative (Woolard & Liebbrandt, unpublished).

4.2.1.2 Since 22 August 2008 the SOAG payable has been based only on income and not on a combination of income and assets.[25] The income above which no

17 Income Tax Act (Act 58 of 1962);Taxation Laws Amendment Act (Act 30 of 2002); Taxation Laws Amendment Act (Act 8 of 2007)

18 Taxation Laws Amendment Act (Act 17 of 2009)

19 Small Business Tax Amnesty and Amendment of Taxation Laws Act (Act 9 of 2006)

20 Alexander Forbes Best Estimate Salary Inflation Basis, supra

21 Heyns, SJW (unpublished). Home Loan Profitability Optimisation in the Financial Industry. Unpublished 2007 MBA dissertation, North-West University-Potchefstroom Campus, accessed 1 March 2011

22 Small Business Tax Amnesty and Amendment of Taxation Laws Act (Act 9 of 2006)

23 Income Tax Act (Act 58 of 1962);Taxation Laws Amendment Act (Act 30 of 2002); Taxation Laws Amendment Act (Act 8 of 2007)

24 National Treasury. A National Poverty Line for South Africa. National Treasury webpage, www.treasury.gov.za/publications/other/povertyline/default.aspx, accessed 2 December 2010

25 Government Notice R898 (2008). Regulations Relating to the Application For and Payment of Social Assistance and the Requirements or Conditions in Respect of Eligibility for Social Assistance. *Government Gazette* 31356, 22 August 2008, 3–81

SOAG is paid has averaged R22 224 p.p.p.a. in March 2006 rands over the period between August 2008 and April 2010.[26,27] This level of income would not be taxable[28] and was assumed constant in real terms. No adjustment was made on the death of a spouse.

4.2.2 Changes in Consumption at Retirement

4.2.2.1 Butler & Van Zyl (op. cit.) explored whether age or work-status influenced consumption in South African households. The consumption-change problem was specifically investigated in the context of South African one- and two-person households, using a similar subset of the IES 2005–2006 data set to that used to estimate retirement adequacy goals in this study.

4.2.2.2 Butler & Van Zyl (op. cit.) used chi-squared automatic interaction detection (CHAID) techniques to assess whether patterns of consumption were different for retired and working households and households of different ages.

4.2.2.3 Empirical results from Butler & Van Zyl (op. cit.) suggested that being retired does not result in a statistically different rate of non-healthcare consumption than working. However; for male-headed households without any medical-scheme members, healthcare consumption increases dramatically on retirement. For all other households, healthcare consumption does not increase significantly.

4.2.2.4 Given the results in Butler & Van Zyl (op. cit.), it was decided to allow for increases in healthcare consumption at retirement for male-headed households without any medical-scheme members, according to Table 1. It was decided to assume that this increase would apply on the date of the oldest person's retirement.

4.2.2.5 As the model estimates the post-retirement income need as post-retirement consumption plus tax, there was no need to make an explicit adjustment for the fact that retirement savings are no longer required during retirement.

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26 Heyns, supra

27 Government Notice 591 (1994). Social Assistance Act General Regulations. *Government Gazette* 5283, 31 March 1994; Government Notice 919 (1997). Increase in Respect of Social Grants. *Government Gazette* 18116, 11 July 1997; Government Notice 882 (1998). Increase in Respect of Social Grants. *Government Gazette* 19010, 30 June 1999; Government Notice 814 (1999). Increase in Respect of Social Grants. *Government Gazette* 20237, 30 June 1999; Government Notice 570 (2001). Increase in Respect of Social Grants. *Government Gazette* 22414, 29 June 2001; Government Notice 1491 (2002). Increase in Respect of Social Grants. *Government Gazette* 24093, 29 November 2002; Government Notice 409 (2004). Increase in Respect of Social Grants. *Government Gazette* 26197, 26 March 2004; Government Notice 294 (2006). Increase in Respect of Social Grants. *Government Gazette* 28672, 31 March 2006; Government Notice 253 (2007). Increase in Respect of Social Grants. *Government Gazette* 29726, 30 March 2007; Government Notice 1243 (2008). Increase in Respect of Social Grants. *Government Gazette* 31630, 21 November 2008; Government Notice 212 (2009). Increase in Respect of Social Grants. *Government Gazette* 31966, 27 February 2009; Government Notice 261 (2010). Increase in Respect of Social Grants. *Government Gazette* 33078, 31 March 2010.

28 Alexander Forbes Best Estimate Salary Inflation Basis, supra

Table 1. Healthcare consumption increases on retirement

Income p.p.p.a.	Increase
R24 424–50—R99 341–00	187,1%
R99 341–00 or more	184,3%

4.2.3 Inflation for Retirement Consumption

4.2.3.1 It was decided to use the assumption that healthcare inflation was 2,5% above price inflation and non-healthcare inflation was 0,19% below price inflation, which is consistent with observed inflation statistics over the period 2001 to 2008.[29,30]

4.2.3.2 Because of the higher inflation on healthcare consumption than non-healthcare consumption, over time the budget share for healthcare, unless capped, would dominate the non-healthcare budget share. In other words, the model would allow pensioners to spend a disproportionately large amount of money on healthcare relative to non-healthcare expenditure. In reality, households have fixed incomes, which they allocate to healthcare and non-healthcare items and allocating more than 10% of the household budget to healthcare can be considered catastrophic. (Russel, 2005; Xu et al., 2003). The cap was therefore applied. It is acknowledged that the treatment of healthcare expenditure is therefore relatively crude. However, a more complex adjustment is beyond the scope of this study. It is also noted that some South African research indicates that pensioners can spend at least 25%[31] of their net of tax pensions on healthcare, however adopting a higher threshold would have only served to increase the retirement adequacy goals.

4.2.4 Loss of Economies of Scale upon Widowhood

4.2.4.1 International studies suggested that the loss of economies of scale on widowhood, defined as the increase in per-capita costs, lie between 6% and 60% (Atkinson, 1992; Warshawsky & Ameriks, 2001). South African studies suggested a factor between 0% and 25% (Streak, Yu & Van der Berg, 2009; Woolard & Liebbrant, unpublished; Yatchew, Sun & Deri, 2003).

4.2.4.2 In line with Streak, Yu & Van der Berg (op. cit.), it was assumed that the comfortably adequate consumption per person increased by 9,25% on widowhood. This implied an immediate decrease in housing consumption on widowhood, which may not be realistic.

29 Statistics South Africa (2006a). Consumer Price Index – Headline: P0141.1. Source: Statistics South Africa, www.statssa.gov.za/publications/statspastfuture.asp?PPN=P0141.1&SCH=3841, accessed 1 December 2010

30 Statistics South Africa P0141, 2010, supra

31 Alexander Forbes. Future of Benefit Design. Hot Topics Summit, Alexander Forbes, Johannesburg, June 2011.

4.3 ASSUMPTIONS RELATING TO THE POST-RETIREMENT INCOME STREAM

4.3.1 Some households would find it preferable to manage their longevity risk by purchasing commercial annuities with their retirement wealth (Levitan, Dolya & Rusconi, unpublished; Albrecht & Maurer, 2002; Kotlikoff & Spivak, 1981). It was therefore decided to use discounting assumptions that would be consistent with those used to price commercial annuities.

4.3.2 Real investment returns net of fees and capital charges on a with-profits annuity series offered by a large South African insurer were approximately 4,0% a year over the eight years to 2010.[32] This investment return was gross of the insurer's expense, risk and profit loadings and is therefore not equivalent to a post-retirement interest rate on a with-profits policy. Consideration of long-dated index-linked bond yields[33,34] and regulatory fee adjustments[35] provided an interest-rate estimate of 2,7% a year. Literature on optimal investment portfolios for retirement savings including Milevsky & Robinson (op. cit.) and Chai et al. (op. cit.) produced a range of assumptions of the real investment return, some of which were consistent with Rusconi (op. cit.), which used a rate of 5,0% a year. In Rusconi (op. cit.) it is acknowledged that the return of 5,0% a year was a pre-retirement real return and the required rate of return for this study is a post-retirement rate. However, the distinction between a pre- and post-retirement rate may be minimal for pensioners who remain invested in balanced investment portfolios after retirement through living annuities. Consequently, a pessimistic rate of 3,0% a year, a best-estimate rate of 4,0% a year and an optimistic rate of 5,0% a year were adopted.

4.3.3 With-profits annuity data[36] suggested a profit margin of 0,5% a year, which was in line with Chia & Tsui (op. cit.). Administration fees were set at 2,04% of each annuity payment. The maximum commission on life annuities of 2,0% (excluding VAT) was also levied on the expected present value of monthly income needs. It was not levied on the wealth required to settle the mortgage outstanding at retirement. These assumptions were consistent with disclosed fees and commissions on with-profits annuities.[37]

4.3.4 Mortality was ignored in the household before the oldest person retired. For retired persons, the South African Annuitant Standard Mortality Tables 1996–2000 Male Lives (SAIML98) and the South African Annuitant Standard Mortality Tables 1996–2000 Female Lives (SAIFL98) developed by Dorrington & Tootla (2007) were used for male and female lives respectively. Mortality improvements were factored through a reduction of one year of age for every twenty years projected from 1998 (Dorrington & Tootla, op. cit.). For simplicity, this was implemented as a simple downrating once every 20 years rather than a smooth improvement.

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32 Old Mutual Platinum Pension 2003. www.oldmutual.co.za/corporate/asset-management/annuity-portfolios/platinum-pension-2003.aspx, Old Mutual, accessed 10 May 2010

33 Human Sciences Research Council, 2000, supra

34 Minimum Reserve Regulations: Board Notice 37 in terms of the Pension Funds Act No. 24 of 1956, 2007

35 ibid.

36 Old Mutual Platinum Pension, 2003, supra

37 ibid.

5. DATA

5.1 The goal-estimation model was used to estimate retirement adequacy goals for a household sample derived from IES 2005–2006.[38] The IES 2005–2006 data were based on 21 144 observed households[39] and covered the period from September 2005 to August 2006. After an extensive data-cleaning and -checking process including the removal of non-savers, a sample of 625 working households was obtained.

5.2 These households all consisted of only one or two employed adults. Self-employed and farming households were excluded as suggested by Hamermesh (op. cit.) and Robb & Burbidge (op. cit.) because self-employed and farming households typically have very unreliable income and consumption data as they are unable to distinguish clearly between their own cashflows and those of their businesses. In order to estimate goals consistent with households that were child-free at retirement, children were excluded from the working sample. The reconciliation of the sample used for goal-estimation purposes and the full IES 2005–2006 data sample is given in Appendix A.

5.3 This sample was small relative to Palmer (1989), who used 2 544 working households. However, the sample size reflects the trade-off between data quality and sample size and it was decided to use a small, clean data sample rather than a larger sample with data of questionable quality or applicability. Although small, the sample was large enough for meaningful analysis.

5.4 The dataset contained variables for income, expenditure, housing consumption and savings as well as various demographic indicators such as household composition, work status age and education. The full list of variables is given in Appendix B and the categorical and continuous variables that were found to be statistically significant are shown in Tables 2 and 3 respectively.

Table 2. Categorical variables

Variable name	Description	Coding
FEMALE1	sex of household head	female head
		male head
HOWNER	home ownership	home owned
		home rented
RURAL	type of settlement	rural
		urban

38 Statistics South Africa, 2008, supra

39 Statistics South Africa. Income & Expenditure of Households 2005–2006: Analysis of Results. Pretoria, 2008

Table 3. Continuous variables

Variable name	Description
AGEGAP	age gap in a two-person household
AGEYOUNG	age of the youngest person in the household
AVGAGE	arithmetic average of ages for two-person households and household head's age for one-person households
INCPOLD	percentage income earned by the oldest person in the household
PPINCOME	cash income p.p.p.a.
RSR	actual retirement savings rate
YRSED1	years of education of the head of the household

5.5 Both income and expenditure data in IES 2005–2006 may have been understated[40] (Streak, Yu & Van der Berg, op. cit.). Part of the expenditure under-reporting related to self-produced food for very-low-income households (Aliber, 2009) and the exclusion of farming households was expected to alleviate part of this under-reporting.

5.6 DESCRIPTION OF THE HOUSEHOLD SAMPLE DATA

5.6.1 Age

The average age over all households was 39,6 years. In similar studies the minimum age for a head of household ranged from 25 (Robb & Burbidge, op. cit.) to 50 (Palmer, 1989; 1992; 1994; unpublished). The average age difference for couples was 4,8 years.

5.6.2 Income and Dwelling Values

The average income p.p.p.a., excluding income in kind, and including it, was R93 748–47 and R100 337–94 respectively.

5.6.3 Savings Rates, Home Ownership and Mortgages

5.6.3.1 About 18,4% of households in the sample owned their homes outright, a further 14,4% having mortgages.

5.6.3.2 Annual savings rates as a percentage of annual income (including income in kind) were 7,7% for retirement and 10,4% for other savings types. The retirement savings rates seem relatively low. For 64,5% of households in the goal-estimation sample, retirement savings rates were less than 10%. However, this is partly because the savings rates are expressed as percentage of income including income in kind. The retirement savings rate as a percentage of cash income was somewhat higher at 9,1%. It should be borne in mind that, because of the convention of expressing

40 Statistics South Africa, 2008, supra

industry statistics as a percentage of pensionable salary, those statistics will reflect higher retirement savings rates. It is also probable that there is an element of under-reporting of employer contributions. The understatement of the retirement savings rate was not expected to be material because expenditure and not income was used to derive consumption and the self-reported retirement savings rates were not excluded from the data.

6. STATISTICAL MODELS TO ASSESS FACTORS INFLUENCING THE ESTIMATED GOALS

After the goal-estimation model was run using actual household savings rates, statistical techniques were used to explore factors influencing the goals. Regression models were used to explore factors influencing the goals ignoring earnings from a younger spouse. The model used and the results obtained are set out in section 6.1. In order to assess the effect of this salary support, regression models were also used to explore factors influencing the goals including earnings from a younger spouse. The model used and the results obtained are set out in section 6.2. Section 6.3 sets out the sensitivity of the goal estimates to the interest rate and section 6.4 details how the retirement age and retirement savings rates affect the goals.

6.1 BEST-ESTIMATE GOALS WITHOUT SALARY SUPPORT

6.1.1 A CHAID algorithm was used to segment households into exclusive and exhaustive sets, where the characteristics of these sets are predictive of the retirement adequacy goal. CHAID was also used extensively in estimating the change in consumption at retirement in Butler & Van Zyl (op. cit.) which contains an extensive description of CHAID.

6.1.2 The CHAID on the retirement adequacy goals suggested that the distribution of goals was significantly different between the following groups:

– female alone, male–female and female–male households ('Group 1'); and
– male alone and same-sex couples ('Group 2').

6.1.3 Income was also a statistically significant determinant among Group 2 households.

6.1.4 Once CHAID had been used to group like households, regression was used to ascertain the statistically significant determinants of the goal level. Regression requires normally distributed error terms (Montgomery & Peck, 1982) and while this requirement was met for the Group 1 households, for Group 2 households it could only be met for households earning R50 000 p.p.p.a. or more. Where the requirements for regression were met, variables were selected using backward stepwise elimination and a 5% significance threshold. In order to identify outliers, dffits statistics, which measure the change in the predicted value by deleting single observations,[41] were used with a cut-off of 1,5.

41 SAS®/STAT 9.2 Users' Guide, 2008

6.1.5 Group 1 Households

For all retirement ages, the estimated retirement adequacy goal could be estimated using a regression model:

$$Target = \hat{\alpha} + \hat{\beta}_1 FEMALE1 + \hat{\beta}_2 RURAL + \hat{\beta}_3 AVGAGE + \hat{\beta}_4 PPINCOME; \quad (1)$$

where:

$\hat{\alpha}$ is the estimated intercept; and

$\hat{\beta}_i$ is the estimated slope coefficient for the associated independent variable.

The estimated regression parameters are given in Table 4.

Table 4. Regression parameters for Group 1 households

	Retirement age				
	60	63	65	67	70
Intercept	13,33 ***	12,09 ***	11,52 ***	10,90 ***	10,00 ***
FEMALE1	1,15 **	1,13 **	1,20 **	1,11 **	0,86 **
RURAL	–1,30 **	–1,28 **	–1,20 **	–1,15 **	–1,12 **
AVGAGE	0,07 **	0,07 ***	0,08 ***	0,07 ***	0,06 ***
PPINCOME	$-5{,}36\times10^{-6}$ *	$-4{,}25\times10^{-6}$ *	$-4{,}72\times10^{-6}$ **	$-4{,}48\times10^{-6}$ **	$-4{,}32\times10^{-6}$ **
R^2	0,1224	0,1337	0,1556	0,1529	0,1442
Model *F*	7,67 ***	8,88 ***	10,60 ***	10,38 ***	9,69 ***

* Significant at the 5% level ** Significant at the 1% level *** Significant at the 0,01% level

6.1.6 Group 2 Households Earning more than R50 000 P.P.P.A.

The goal could be estimated as:

$$Target = \hat{\alpha} + \hat{\beta}_1 HOWNER + \hat{\beta}_2 RSR + \hat{\beta}_3 AGEYOUNG + \hat{\beta}_4 PPINCOME. \quad (2)$$

Table 5 gives the estimated regression parameters after eliminating 12 households from the 100 used for analysis. The age of the youngest household member was significant only for retirement ages of 65 and older.

6.1.7 Interquartile Ranges

6.1.7.1 The spread of the retirement adequacy goals calculated by the goal-estimation model was explored using interquartile ranges. The range between the 25th and 75th percentiles for the three household groups identified by the CHAID analysis is given in Table 6. These goals ignore salary support where salary support was defined as the wages or salary earned by the working person in a semi-retired household.

6.1.7.2 The segmentation suggested by the CHAID analysis was not intuitive. The upper-quartile values for the retirement adequacy goals for each household composition are set out in Table 7.

Table 5. Regression parameters for Group 2 households earning R50 000 p.p.p.a. or more

	Retirement age				
	60	63	65	67	70
Intercept	13,78 ***	12,63 ***	11,29 ***	10,64 ***	9,66 ***
HOWNER	0,78 *	0,75 *	0,70 *	0,66 *	0,63 *
RSR	5,42 **	4,92 **	4,46 **	4,16 **	3,66 *
AGEYOUNG	–	–	0,03 *	0,03 *	0,02 *
PPINCOME	$-9{,}23\times10^{-6}$ ***	$-8{,}55\times10^{-6}$ ***	$-8{,}76\times10^{-6}$ ***	$-8{,}33\times10^{-6}$ ***	$-8{,}43\times10^{-6}$ ***
R^2	0,1134	0,1144	0,1443	0,1442	0,1590
Model *F*	8,82 ***	8,96 ***	8,73 ***	8,72 ***	9,78 ***

* Significant at the 5% level ** Significant at the 1% level *** Significant at the 0,01% level

Table 6. Interquartile ranges for best estimate goals without salary support

Household composition		Retirement age				
		60	63	65	67	70
Group 1	Goal	13,9–17,0	12,9–15,9	12,6–15,5	11,9–14,7	10,7–13,3
	N	226	236	236	236	236
Group 2 (income< R50 000 p.p.p.a.)	Goal	13,4–14,6	12,3–13,4	12,3–13,1	11,6–12,4	10,6–11,3
	N	172	177	177	177	177
Group 2 (income ≥ R50 000 p.p.p.a.)	Goal	12,2–14,2	11,1–13,0	10,8–12,7	10,2–12	9,1–10,8
	N	214	215	215	215	215

Table 7. Seventy-fifth percentile of the best-estimate retirement adequacy goals

Household composition	Retirement age				
	60	63	65	67	70
Single females	18,2	16,9	16,6	15,7	14,3
Single males	14,3	13,2	12,9	12,2	11,1
Male-female and female-male (no salary support)	16,5	15,4	15,1	14,3	12,8
Male-male and female-female (no salary support)	15,8	14,6	14,1	13,2	12,1
Male-female and female-male (salary support)	15,1	14,0	13,7	12,9	11,7
Male-male and female-female (salary support)	14,0	12,8	12,4	11,7	10,5

6.2 THE EFFECT OF SALARY SUPPORT ON THE BEST-ESTIMATE GOALS

6.2.1 The effect of salary support on the retirement adequacy goals was estimated by subtracting the estimated retirement adequacy goal for a household allowing for salary support from the estimated retirement adequacy goal not allowing for salary support. After eliminating outliers, the following model of the estimated effect of salary support on the retirement adequacy goals was found to be consistent for various retirement ages:

$$SS = \hat{\alpha} + \hat{\beta}_1 AGEGAP + \hat{\beta}_2 PPINCOME + \hat{\beta}_3 FEMALE1 + \hat{\beta}_4 YRSED1 + \hat{\beta}_5 INCPOLD. \quad (3)$$

The model fit was remarkably good but was obtained by eliminating 12 outliers from the 100 households analysed. The regression parameters are given in Table 8.

Table 8. Regression parameters for the effect of salary support on the best estimate goals

	Retirement age				
	60	63	65	67	70
Intercept	3,70 ***	3,59 ***	3,53 ***	3,22 ***	3,47 ***
GAP	0,34 ***	0,32 ***	0,32 ***	0,28 ***	0,28 ***
PPINCOME	$5{,}06\times10^{-7}$ *	$6{,}32\times10^{-7}$ **	$6{,}60\times10^{-7}$ **	$5{,}69\times10^{-7}$ **	$4{,}75\times10^{-7}$ *
FEMALE1	0,10 *	0,11 *	0,12 *	0,13 **	0,12 *
YRSED1	0,02 **	0,02 *	0,02 *	0,02 *	0,02 **
INCPOLD	–5,69 ***	–5,45 ***	–5,37 ***	–4,86 ***	–5,07 ***
R^2	0,9866	0,9822	0,9793	0,9786	0,9765
Model *F*	1 176,22 ***	905,19 ***	665,65 ***	750,45 ***	682,01 ***

* Significant at the 5% level ** Significant at the 1% level *** Significant at the 0,01% level

6.2.2 INTERQUARTILE RANGES

The range of the effect of salary support on the retirement adequacy goals from the 25th to the 75th percentile is given in Table 9.

Table 9. Interquartile ranges for the effect of salary support on the goals

	Retirement age				
	60	63	65	67	70
Salary Support	2,2–3,5	2,1–3,3	2,1–3,2	1,9–2,8	2,0–3,0
N	98	100	100	100	100

6.3 SENSITIVITY OF THE GOALS TO THE INTEREST RATE

6.3.1 The effect of a change in the interest rate on the goals and the effect of salary support can be observed by consideration of the interquartile ranges. The interquartile ranges for the goals are given in Table 10.

Table 10. Interquartile ranges of goals for various interest rate assumptions

Household composition	Basis	Retirement age				
		60	63	65	67	70
Group 1	pessimistic	15,5–19,2	14,4–17,7	14,0–17,3	13,1–16,3	11,7–14,5
	best estimate	13,9–17,0	12,9–15,9	12,6–15,5	11,9–14,7	10,7–13,3
	optimistic	12,5–15,3	11,7–14,4	11,4–14,1	10,8–13,4	9,9–12,2
	N	226	236	236	236	236
Group 2 (income <R50 000 p.p.p.a.)	pessimistic	14,8–16,2	13,6–14,8	13,5–14,4	12,6–13,6	11,4–12,3
	best estimate	13,4–14,6	12,3–13,4	12,3–13,1	11,6–12,4	10,6–11,3
	optimistic	12,1–13,3	11,3–12,3	11,3–12,0	10,7–11,4	9,8–10,5
	N	172	177	177	177	177
Group 2 (income ≥R50 000 p.p.p.a.)	pessimistic	13,5–15,8	12,3–14,3	12,0–14,0	11,2–13,1	9,9–11,7
	best estimate	12,2–14,2	11,1–13,0	10,8–12,7	10,2–12,0	9,1–10,8
	optimistic	11,0–12,9	10,2–11,9	9,9–11,7	9,4–11,0	8,4–10,1
	N	214	215	215	215	215

6.3.2. The interquartile ranges for the effect of salary support on the retirement adequacy goals at various retirement ages and on the three interest-rate bases are given in Table 11.

Table 11. Interquartile ranges of the effects of salary support for various interest-rate assumptions

Basis and sample size	Retirement age				
	60	63	65	67	70
Pessimistic	2,2–3,6	2,2–3,5	2,2–3,4	1,9–3,0	2,1–3,2
Best estimate	2,2–3,5	2,1–3,3	2,1–3,2	1,9–2,8	2,0–3,0
Optimistic	2,1–3,3	2,1–3,1	2,1–3,1	1,8–2,8	2,0–2,9
N	98	100	100	100	100

6.4 REPEATED-MEASURES ANOVA AND *POST-HOC* TESTS

6.4.1 Repeated-measures ANOVA tests were performed at the household level to test whether increases in the retirement age affected the goal. The pairwise comparisons of means using a Bonferroni adjustment showed that as retirement age increased, the goal decreased and this effect was significant at the 0,01% level.

6.4.2 Using the simulated goals for hypothetical retirement savings rates and retirement ages, it was possible to assess the effect of varying both retirement age

and savings rate using a repeated-measures ANOVA test. Both these factors and their interaction were found to be significant at the 0,01% level. The differences in least-squares means indicated that as retirement age and savings rates increase, the goal may decrease.

7. DISCUSSION: THE LEVEL OF THE GOALS

7.1 RELATIVE TO PUBLISHED GOALS

7.1.1 The literature indicated a wide range of optimal replacement-ratio adequacy goals, shown in Table 12.

Table 12. Published optimal replacement ratio goals

Author	Recommended replacement-ratio goal
Burns & Widdows (op. cit.)	65%–80%
Malroutu & Xiao (1995)	70%
Greninger et al. (2000)	70%–89%
Kotlikoff, Spivak & Summers (op. cit.)	80%
Engen, Gale & Uccello (1999)	70%–80%

7.1.2 In all cases, the provenance of the recommended goals is unclear. It is unclear whether the goals in Table 12 are gross or net of tax, but they are consistent with gross of tax estimates from Mitchell & Moore (op. cit.) and the various studies by Palmer (op. cit.). Net replacement ratios are higher than gross replacement ratios when the former is less than 100%.

7.1.3 Table 13 shows these results for different household compositions converted to wealth–earnings ratios using annuity factors calculated by the goal-estimation model.

Table 13. Wealth–earnings ratio goals (retirement age 65)

	Mitchell & Moore (op. cit.)	Gross replacement ratio					
		65%	70%	75%	80%	85%	89%
Single male	8,1	8,4	9,0	9,7	10,3	11,0	11,5
Couple (same age)	10,2	9,3	10,0	10,7	11,5	12,2	12,7
Couple (3 year gap)	10,6	9,7	10,4	11,2	11,9	12,6	13,2
Single female	9,6	9,9	10,6	11,4	12,1	12,9	13,5

7.1.4 The inflation-adjusted results for the Palmer (op. cit.) studies for fully-employed households indicated that wealth–earnings goals between 8,8 and 13,5 times annual salary should be adequate.

7.1.5 The derived retirement adequacy goals were found to be higher than, or in the highest ranges of, these goals suggested in the literature. On a best-estimate

basis, the upper quartiles of the retirement adequacy goals ranged between 12,4 and 16,6 times annual salary at age 65 while the goals in the literature ranged from 8,1 to 13,5 times annual salary.

7.2 RELATIVE TO WHAT IS OBTAINABLE THROUGH SAVING

7.2.1 Table 14 indicates the percentage of salary required to be saved annually to retirement age in order to obtain a goal wealth–earnings ratio, using a net real rate of return of 5,0% a year and given different ages at which the household starts to save.

Table 14. Savings rates required to meet a given wealth–earnings ratio goal

Wealth-earnings ratio	Retirement age									
	60		63		65		67		70	
	Start age		Start age		Start age		Start age		Start age	
	22	30	22	30	22	30	22	30	22	30
8									4,2%	6,5%
9					6,1%	9,7%	5,5%	8,6%	4,7%	7,3%
10			7,6%	12,2%	6,8%	10,8%	6,1%	9,6%	5,2%	8,1%
11	10,0%	16,2%	8,4%	13,4%	7,5%	11,9%	6,7%	10,6%	5,7%	8,9%
12	10,9%	17,6%	9,2%	14,6%	8,2%	13,0%	7,3%	11,5%	6,2%	9,7%
13	11,8%	19,1%	9,9%	15,9%	8,9%	14,1%	7,9%	12,5%	6,8%	10,5%
14	12,7%	20,6%	10,7%	17,1%	9,6%	15,1%	8,6%	13,4%	7,3%	11,3%
15	13,6%	22,0%	11,5%	18,3%	10,2%	16,2%	9,2%	14,4%	7,8%	12,1%
16	14,5%	23,5%	12,2%	19,5%	10,9%	17,3%	9,8%	15,4%		
17	15,4%	25,0%	13,0%	20,7%	11,6%	18,4%				
18	16,3%	26,4%	13,7%	21,9%						
19	17,2%	27,9%								

7.2.2 If savings are made consistently from age 22, on a best-estimate and optimistic basis, a contribution rate of 10,9% of income should be sufficient to provide an adequate retirement benefit for most households from age 65 upwards. Even using a pessimistic assumption for post-retirement investment return, a 10% savings rate is sufficient to secure a comfortably adequate retirement income from the ages of 67 or 70 for about 75% of the goal-estimation sample.

7.2.3 However, consistent saving from age 22 ignores the possibility of unemployment and the leakage of retirement savings that may accompany it. The analysis of the savings rates required from age 30 indicates that many households will not be able to enjoy a comfortable retirement should they retire before age 67. A comfortable retirement at age 67 may not be feasible for single women, couples of the same age, and

some poorer single males and same-sex couples, unless post-retirement interest rates are very favourable. However, couples with an age gap of five years or more may be able to achieve their goals at age 67 on a best-estimate basis.

7.2.4 Given that the average retirement savings rate in the goal-estimation sample was 7,7%, the results suggest that retirement before age 67 is not feasible. However, there are a number of stakeholders in the retirement decision, including the state, the retirement fund, the employer and the employee. The Income Tax Act[42] defines 'normal retirement age' as the age at which members of retirement funds become entitled to retire but allows any withdrawal after age 55 to be taxed as a retirement benefit. If the employer's retirement-fund rules were worded to make members ineligible as fund members after the normal retirement age and the conditions of employment necessitate active membership of the retirement fund, there would be no contractual protection for employees to remain employed after normal retirement age. Such provisions may make it difficult for fund members to reach the retirement adequacy goals, especially for normal retirement ages of 65 or less.

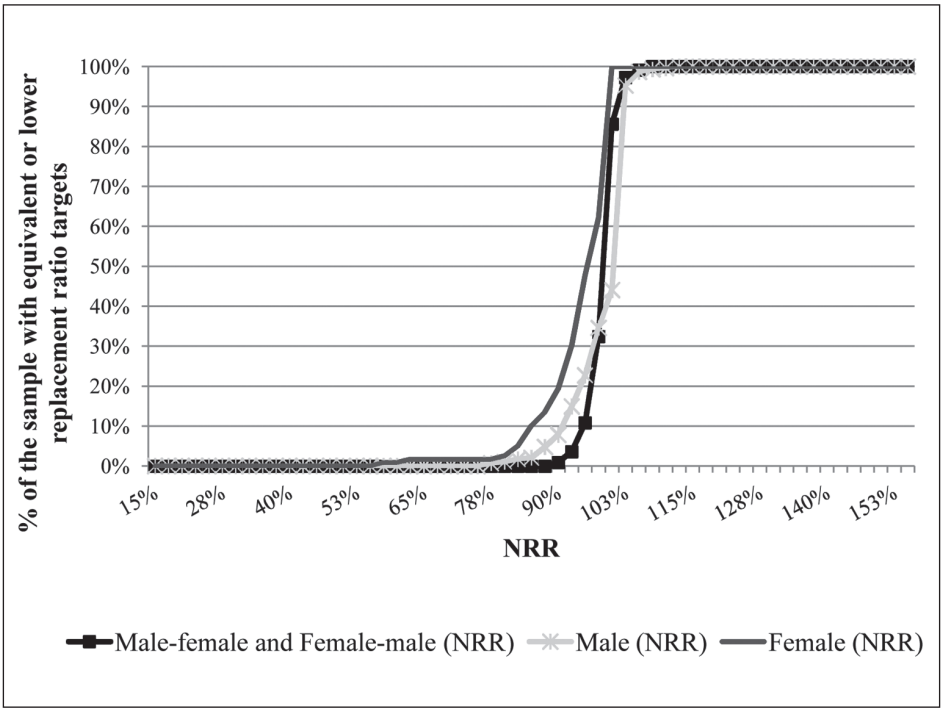

Figure 1. Retirement age 65: retirement adequacy goal: cumulative distribution function on an NRR scale

42 Act 58 of 1962

7.3 RELATIVE TO GOALS USED BY SOUTH AFRICAN RETIREMENT FUNDS

Most retirement funds used a replacement-ratio goal of between 70% and 79%,[43] which the consumption-change estimates suggested by Butler & Van Zyl (op. cit.) and the goals estimated in this research suggest may be inadequate. A gross-replacement-ratio goal of 79% was inadequate for at least 82,0% of single females and at least 88,7% of single males. Allowing for salary support, the goal would be inadequate for at least 50,4% of male–female and female–male households and 40,0% of male–male and female–female households. The cumulative distribution function of the retirement adequacy goals on net replacement ratio (NRR) and gross replacement ratio (GRR) scales, shown in Figures 1 and 2 respectively, implies that an NRR goal of 100% would be adequate for most households.

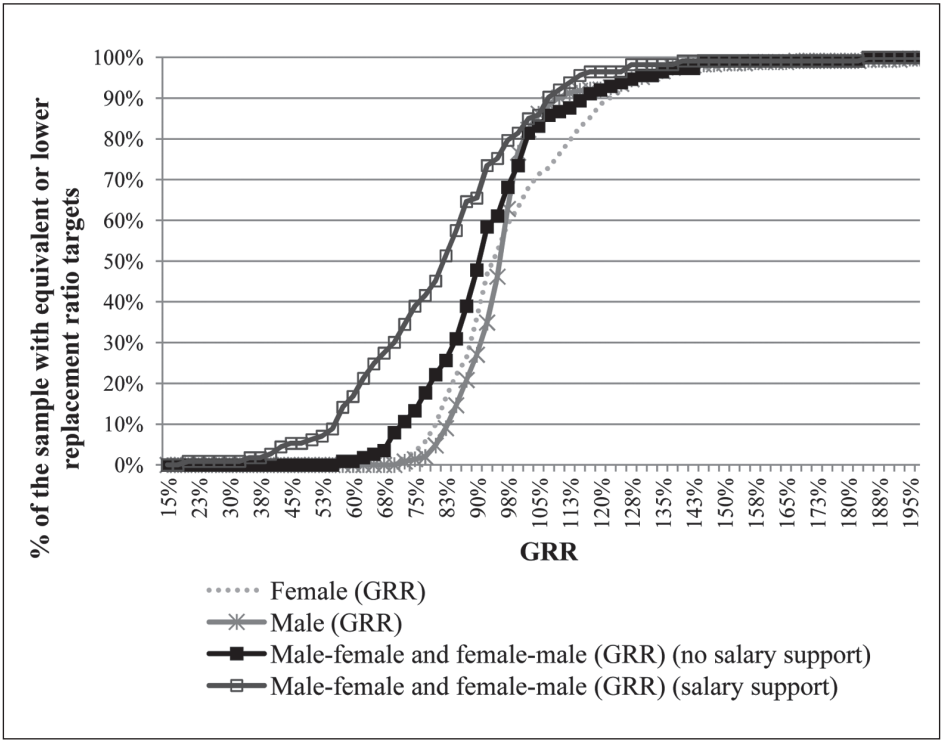

Figure 2. Retirement age 65: retirement adequacy goal: cumulative distribution function on a GRR scale

43 Old Mutual Retirement Funds Survey 2010: Key Findings. www.oldmutual.co.za/documents/Retirement/Survey.pdf, 10 May 2010

8. DISCUSSION: FACTORS AFFECTING THE LEVEL OF THE GOAL

8.1 RETIREMENT AGE AND RETIREMENT SAVINGS RATE

8.1.1 Retirement Age

8.1.1.1 The repeated-measures ANOVA confirmed that as retirement age increases, the goals decrease. The smallest reduction was observed for increasing the retirement age from 63 to 65. For all household types, the reductions were an increasing function of the deferment period.

8.1.1.2 This result was in line with the findings of Mitchell & Moore (op. cit.) for single males. However, Mitchell & Moore (op. cit.) indicated that the increasing of retirement age from 62 to 65 resulted in increased retirement adequacy goals for married couples and single females, although the savings rates for attaining these goals were lower. However, it should be noted that Mitchell & Moore (op. cit.) used replacement ratios and not wealth–earnings ratios. The model output in this research indicated that consumption rose as retirement age increased but the corresponding annuity factor required to calculate the replacement ratio decreased. Consequently, the replacement ratio equivalents of the goals were found to be fully consistent with Mitchell & Moore (op. cit.).

8.1.2 Retirement Savings Rate

The repeated-measures ANOVA on the hypothetical savings rate indicated that the model was calculating goals correctly, and that retirement adequacy goals decreased as the retirement savings rate increased as per Mitchell & Moore (op. cit.). However, using actual savings rates resulted in contradictory findings, which may result from a combination of reporting errors, confounding, spurious selection and the modelled relationship between savings and consumption, detailed in ¶3.2.2.4, which ignores debt.

8.2 OTHER FACTORS

It is difficult to comment on how various factors influence goals for Group 2 households earning under R50 000 p.p.p.a. as an examination of simple correlations may have given spurious results. As there were only 35 same-sex couples and seven female–male households in the goal-estimation sample, results for these households should be interpreted with caution.

8.2.1 Influencers of the Goals without Salary Support

8.2.1.1 The results suggested that goals for the following household groups were different:

- male–female households in rural areas;
- male–female households in urban areas;
- single-female and female–male households in rural areas;
- single-female and female–male households in urban areas;
- single-male and same-sex households earning less than R50 000 p.p.p.a.;
- single-male and same-sex households earning more than R50 000 p.p.p.a that rent; and

– single-male and same-sex households earning more than R50 000 p.p.p.a. that own their homes outright or with a mortgage.

8.2.1.2 There was very little overlap of the interquartile ranges for Group 2 households earning more than R50 000 p.p.p.a. and Group 1 households, suggesting that the goals for Group 1 households may be higher than those of wealthy Group 2 households. This was consistent with the relationships in Mitchell & Moore (op. cit.) and Palmer (1994; unpublished). However, it is noteworthy that Yuh, Hanna & Montalto (op. cit.) and Stoller & Stoller (2003) found that for households with no dependants, the goals for singles and couples were not significantly different.

8.2.1.3 Higher incomes were associated with lower goals as was living in a rural area, which may be associated with lower consumption. The relationship between the goals and income is well documented in Hatcher (1997), Yuh, Hanna & Montalto (op. cit.) and Palmer (1992) although Palmer (1989; 1994; unpublished) suggested that goals may increase at very high income levels. Yuh (unpublished) did not find geographic region to be a significant determinant for retirement adequacy goals.

8.2.1.4 Older households and home owners tended to have higher goals, although this may be a result of higher unpaid housing debt at retirement. A second possible explanation for the home-ownership effect is that owners tended to have higher dwelling values as a multiple of annual salary than renters, and this may have influenced other consumption behaviour such as the payment of higher maintenance costs, rates and taxes. The ratio of dwelling value to annual salary for wealthy Group 2 households was 0,8 for renters and 1,4 for owners, which supported this hypothesis.

8.2.1.5 The effect of a female head of household was generally to increase the cost of the annuity and therefore to increase the goals. This was in line with the use of sex as a control variable by Cooper (op. cit.). Mitchell & Moore (op. cit.) implied that sex was an important control variable; however Yuh, Hanna & Montalto (op. cit.) found that it was not statistically significant.

8.2.2 Influencers of the Salary Support

8.2.2.1 The separation of the dates of retirement for two-person households where there was a discernible age gap resulted in the reduction of the retirement adequacy goal, because the rate of increase of consumption during the semi-retirement phase was suppressed and retirement was deferred.

8.2.2.2 There were a small number of households with age gaps of ten years or more, but the median reduction in the best-estimate goal due to salary support ranged from 2,4 to 2,6 times annual salary, the greatest reductions being for lower retirement ages.

8.2.2.3 Mathematically, the salary-support factor is equal to the annuity factor for the household multiplied by the percentage of the household income earned by the younger person. The effect of salary support on the goals was a function of five different factors, namely the age gap, the income p.p.p.a., the sex of household head, the number of years of education of the household head and the percentage of household income

earned by the older person in the household. However, on closer investigation, the sex of the household head and the number of years of education were both associated with larger age gaps. Higher incomes were associated with higher annuity factors.

9. IMPLICATIONS AND CONCLUSION

9.1 FINDINGS

9.1.1 The results of this research suggest that, although there is significant variation in the level of retirement adequacy goals for different households, a replacement ratio of 70% to 79%, whether gross or net of tax, would be inadequate for the majority of households retiring at age 65. Extension of the retirement age could lower the goal to an obtainable level, but the encouragement of couples to retire at a fixed age instead of when the older partner reaches retirement age could be a more effective strategy.

9.1.2 Retirement adequacy goals were found to be influenced by a number of factors that would make the development of simple heuristics extremely difficult. For example, although higher earners have lower goals than lower earners, all other things equal, home ownership increases the goal. The fact that a household with a female household head would have a higher goal than an otherwise identical male-headed household is another example of how nuanced the retirement adequacy goals can be. This suggests that a more individualised approach to retirement planning is required.

9.2 IMPLICATIONS

The research has practical implications for policymakers, retirement-fund trustees, financial planners and individuals saving for retirement. However, it is also important to note that the achievement of the retirement adequacy goal by an individual does not guarantee an adequate income in retirement. The calculation of the goals was based on certain assumptions, including the transfer of the longevity risk to an insurer though the purchase of an annuity. Should individual behaviour and experience differ from the assumptions, the retirement adequacy goal may be more than sufficient or inadequate.

9.2.1 The Possible Need for Retirement Funds and Policymakers to take Remedial Action to meet Higher Goals

9.2.1.1 Before allowing for post-retirement savings, replacement-ratio retirement adequacy goals of between 75% and 79% may be insufficient for between 40% and 90% of fund members. This depends on the household compositions. To a certain degree, lower goals may be acceptable if households rely on transfers from family members, charitable donations, income from hobbies, private retirement savings and benefits from former employers in the form of post-retirement medical-scheme subsidies. However, these alternative funding sources may not be reliable or available to each member of the fund. If the fund chooses to pursue higher goals, it could:

– increase retirement ages, as per ¶8.1.1;
– encourage semi-retirement in two-person households where there is an age gap, as per section 8.2.2;

– increase retirement savings rates, although, as discussed in ¶8.1.2, this may not reduce the goals themselves; and
– increase the expected investment return net of all expenses.

9.2.1.2 The final point in the preceding paragraph relates to pre-retirement wealth accumulation as opposed to retirement adequacy goals and therefore was not discussed in detail in this research, although the retirement adequacy goals should be considered in setting investment strategies as discussed in Section 1. An investigation into the relative merits of these arrangements is beyond the scope of this research.

9.2.1.3 Given the replacement ratio adequacy goals of 40%[44] and 75%[45] cited in the first drafts of the retirement reform proposals, policymakers may need to increase their expectations of what is sufficient.

9.2.2 The Range of Goals

9.2.2.1 The retirement adequacy goals were found to be complex functions of a number of factors. Although quartile analysis provided insight into what goal may be appropriate for a group of people who are, say, members of the same retirement fund or the goal population for a state retirement savings scheme, changes in the mix of household characteristics could influence the goal for the group.

9.2.2.2 Depending on the household composition, 75th percentiles of the goals were in the region of 14,0 to 18,0 times annual salary for retirement age 60 and reduced to between 12,5 and 16,5 and between 10,5 and 14,5 times annual salary for retirement ages 65 and 70 respectively.

9.2.3 Later Retirement Ages

Given the information in Table 14 and reported savings levels for the goal-estimation sample, a comfortable retirement at age 65 would require a favourable combination of full employment and net real investment returns of 5,0% p.a. or more. The research suggested that retirement at 67 or 70 may allow more households to experience a comfortably adequate retirement. However, the extension of the retirement age needs to be considered in light of the fact that the health of manual labourers deteriorates more rapidly than that of more sedentary occupations (Case & Deaton, 2005). Should the retirement age be extended, the burden on employers to manage incapacity among older workers and the associated reputational risk is likely to increase.

9.3 AREAS FOR FURTHER RESEARCH

9.3.1 This research represents a first attempt to develop retirement adequacy goals for South African households. There were therefore some limitations to the study that will require further research.

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44 Department of Social Development. Reform of Retirement Provisions, 2007, supra
45 National Treasury. Retirement Fund Reform: a Discussion Paper, 2004, supra

9.3.2 The data sample was small relative to international studies as a result of the controls employed to ensure, firstly, the integrity of the data and, secondly, that the households used were appropriate in terms of restrictions discussed in the literature.

9.3.3 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 goal-estimation sample may have included both childless households and households with grown children who had left home. If Stoller & Stoller (op. cit.) are correct, the resultant goals would be sensitive to the mix of these households in both the model-development sample and the goal-estimation sample.

9.3.4 The estimated goals were found to be extremely sensitive to changes in the interest-rate assumption, particularly at early retirement ages. On a related note, the sensitivity of the retirement adequacy goals to the mortality assumptions has yet to be tested.

9.3.5 No allowance was made for income support by family members other than a spouse and this is an area of future model development.

9.3.6 In addition to these limitations, the goals do not reflect the changes that were introduced during the 2011–2012 tax year to personal income tax and to the taxation of cash withdrawals from retirement funds at retirement.

9.4 CONCLUSION

This research suggested that households that are intending to retire without children present in the household may find a 75% replacement ratio goal to be inadequate and that the level of the goal was influenced by a number of different factors with complex interactions. These findings have significant implications for trustees and actuaries working with retirement funds, particularly if households rely solely on these funds for income in retirement.

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APPENDIX A: SAMPLE RECONCILIATION

Table A.1. Reconciliation of full IES 2005–2006 sample and sample used to estimate goals

	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 due to missing rent data	20
Self-employed and commercial farmers	142
Mortgage inconsistencies	40
Probable income under-reporting	629
Retired and semi-retired households	627
Households earning less than R24 450.50 p.p.p.a	1 013
Age gaps of 25 years or more	21
Extremely large retirement adequacy goals	24
Non-savers	411
Goal-estimation sample	625

APPENDIX B: VARIABLE LISTING

The full lists of categorical and continuous variables used are given in Tables B.1 and B.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 to the nearest whole number.

Table B.1. Categorical variables

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

Table B.2. Continuous variables

Variable name	Description
AGE1	the age of the head of the household
AGE2	the age of the partner in two-person households, coded as the head's age in one-person households
AGEGAP	age gap in a two-person household
AGEOLD	age of the oldest person in the household
AGEYOUNG	age of the youngest person in the household
AVGAGE	arithmetic average of ages for two-person households and household head's age for one-person households
HEXPR	healthcare expenditure rate
INCPER1	percentage income earned by the household head
INCPOLD	percentage income earned by the oldest person in the household
JOINTAGE	geometric average of ages for two-person households and household head's age for one-person households
NHCONSR	non-healthcare consumption rate
PPINCOME	cash income p.p.p.a.
PPINKINDINC	income (including income in kind) p.p.p.a.
RSR	actual retirement savings rate
RSR_k	hypothetical retirement savings rate per cent
VDWELL	value of the dwelling
YRSED1	years of education of the head of the household