Cass Business School
CITY UNIVERSITY LONDON

Underinsurance in the UK

NAME : HANG PING CHER

STUDENT NO : 110058177

SUPERVISOR : MR. DAVID SMITH

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ABSTRACT`

This paper investigates the problem of underinsurance in the United Kingdom. We determine the monetary amount of the life assurance protection gap in UK through an analytical study by considering various components of the resources needed and available to households to maintain their current standard of living following the death of a breadwinner. Summing across households, we estimate that the UK protection gap is £3.77 trillion, or an average of £194,455 per household. The average household protection gap is largest among younger households, at over £250,000. We also consider the cover needed for households to maintain a reasonable standard of living, and find that there is still a substantial gap of £1.74 trillion. In general, we find that households need more cover but appear to have little spare cash. We also present a case for decreasing term assurances as a superior form of cover in terms of cost-efficiency. Finally, our model represents a viable method for an individual to easily estimate his or her insurance needs. This allows people to be more aware of the amount of cover that they require.

ACKNOWLEDGEMENTS

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1. INTRODUCTION

Underinsurance refers to a scenario whereby an individual holds insufficient insurance cover against a given risk. In this paper, we will be looking at underinsurance under a life insurance context i.e. the "life assurance protection gap". This is the difference between the resources available to dependents following a breadwinner's death and that required to maintain their standard of living following the death event (Swiss Re, 2004).

Underinsurance appears to be a significant issue in the UK. According to HSBC (2011), around half of UK parents do not own any life cover, a finding echoed by Aviva's (2012) study which found that more than half of UK families did not have life insurance cover in place.

People who do not hold adequate life cover leave substantial risks to the financial wellbeing of their dependents. The death is likely to result in a reduction in household income; however dependents still need to pay off any outstanding mortgages or other debts. If the insurance payout is unable to cover these debt obligations, they will have to make adjustments to their spending habits or face the risk of foreclosure. This is especially serious in UK given that on average, the amount owed per UK adult is over 120% of average earnings (Credit Action, 2012). In addition, underinsurance may disrupt the lifestyles of retirees, who may have to give up their retirement savings to plug the financial gap in the household after the death (Goss, 2011).

Underinsurance can also lead to a reliance on government benefits, since it brings about greater likelihood of financial difficulty for dependents and hence more benefit claims. Meanwhile, with people not taking out sufficient cover, the insurance industry loses revenue. This translates to lost tax receipts for the government, which will face greater financial burdens.

There are several potential causes of underinsurance. Firstly, the presence of social security benefits for dependents (Fitzgerald, 1987) and overestimation of the amount of cover held (Swiss Re, 2010) may cause people to perceive a low need for insurance. Secondly, as households cut down on spending during this period of poor economic outlook, life insurance may be treated as lower priority expenditure. In addition, there may also be optimism bias. This is where people underestimate the chance of being affected by negative health events (Dunning *et al*, 2004).

Finally, the various negative exposures in the media over the years could have led to a poor perception and lack of trust towards the industry (Association of British Insurers, 2011). Companies have been involved in mis-selling scandals, where the benefits of an insurance policy are misrepresented or inappropriate advice is knowingly given to consumers when selling policies, e.g. Equitable Life [1] and Abbey Life [2]. Media coverage of rejected claims creates the impression that insurers are unwilling to pay out claims, even though in certain instances the disputes occurred due to consumers failing to comprehend or comply with policy terms and conditions. These events taint the reputation of the entire insurance industry, causing consumers to even lose faith towards other life insurers that were not directly involved in these incidents.

1.1 Research Objective

The objective of our study is to investigate the current underinsurance situation in UK for life assurances. We will determine the monetary amount of

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[1] Equitable Life was involved in the mis-selling of guaranteed annuity rate contracts. To offset losses arising from investment guarantees, the company paid lower bonuses to policyholders who exercised the aforementioned guarantees, even though the option appeared to be provided without additional charges to consumers at the point of sale (Davis, 2004). This culminated in the company having to pay £1.5 billion in customer compensation (BBC News, 2010a).

[2] Abbey Life was judged to have made inappropriate recommendations to customers in the sale of mortgage endowments during the late 1990s. It was fined £1 million by the Financial Services Authority, on top of customer compensation (Financial Services Authority, 2002).

the life assurance protection gap in the UK at a household level through an analytical study. It will consider various components of the resources available to and required by a household, to maintain their standard of living following the death of a working member. It will then be summed across households in UK to obtain the size of the UK protection gap.

At the same time, we investigate the various components of resources needed and available to the household, the size of the protection gap, and how these change with age. Finally, we seek to produce a model that can be used by an individual to estimate his or her life assurance protection needs.

In this study, we will mainly make use of household level data from the Office for National Statistics, UK (ONS), as well as relevant data from other industry sources.

1.2 Research Motivation

Underinsurance is a topic of interest due to its financial and social effects, as we have stated above. Over the years, a number of studies had been carried out to determine the level and impact of underinsurance in different countries, using a variety of methods (Association of British Insurers, 2008; Auerbach and Kotlikoff, 1991; Bernheim *et al*, 2003; Kelly and Ngu, 2010; Swiss Re, 2004 and 2010). While the different models and approaches will each carry different assumptions and will thus invariably produce different results, one issue is how to make use of these results to help individuals to recognise their own level of insurance needs, as opposed to just publishing a national-level underinsurance figure in the media. Jones (2009) suggests that "personalisation" (i.e. by presenting the numbers in a personal context) will help individuals to relate better to these insurance needs. The media may be publishing large national underinsurance figures, but the question that many consumers really want to know is: how much does my family need?

With this in mind, we seek to produce a method that can be adopted to calculate an individual's protection needs, which allows for such "personalisation". At the same time, we try to keep the process simple, so as to increase utilisation of the tool. We also hope that allowing people to better understand their protection needs will contribute to closing the underinsurance gap.

We also want to study the components of the protection needs and gaps, to understand the factors influencing the size of the protection gap. Finally, we aim to provide a model that can be used over time. This will allow us to track the changes in the protection gap over time by simply updating the inputs.

2. LITERATURE REVIEW

The issue of underinsurance can be examined from several angles. In the past, various methods have been employed by different studies to quantify the extent to which a particular population is underinsured.

Blewett, Ward and Beebe (2006) examines a wide range of measures used to measure underinsurance in a health insurance context. They put forward three dimensions of underinsurance: economic – impact of healthcare costs on the insured after taking any insurance coverage into account; structural – where the comprehensiveness of the health insurance is examined (in terms of whether cover is provided for certain procedures) or where one is uninsured for a certain period of time; and attitudinal – one's perception regarding the accessibility of medical care, as well as how satisfied one is with the coverage provided by his or her policy.

These dimensions of underinsurance can similarly be applied within a life insurance context. The economic dimension could involve examining the impact on household finances following a death event, as considered by Auerbach and Kotlikoff (1991), Bernheim *et al* (2003), Kelly and Ngu (2010). Analysis of the structural dimension could once again look at whether one is uninsured for certain time spells. An investigation into the attitudinal dimension could consider perceptions towards life insurance as covered in Swiss Re's (2010) work, or the causes of consumers not renewing their policies that Association of British Insurers (2010) investigated.

Given that our starting point is to gauge the amount of insurance required by an individual, we will be focusing on the economic aspect of underinsurance for this study. We construct a model to determine the life insurance needs at a household level, before applying it to examine the protection gap of UK. This allows us to obtain a more accurate result as the needs of individual households will be reflected more adequately.

The measurement of the amount of protection needs is an art rather than a science, given that there are many unknowns in the future that could affect the financial situation of a household. We discuss the methods used by other studies that look into the economic dimension of underinsurance, and how they shape the development of our own model.

In their European Insurance Report, Swiss Re (2010) defines the protection needs of a country as ten times the average earnings of the working population with dependents and 0.5 times for those without dependents. This is then reduced by existing assets, social security and insurance cover to yield the protection gap. Given that the study is making comparisons between European countries at a macro level, this simplified approach may be justified as long as the methodology is consistent. However, since we are working at a household level, there is a need to tailor the calculations to the unique circumstances of each household, rather than just multiplying the earnings by a given factor.

A second Swiss Re (2004) protection gap study introduces the concept of an "income replacement multiplier", which expresses the income replacement component of the cover required as a multiple of income, under a set of assumptions. It then determines the protection gap by considering other expenditure needs, debts, social security, savings held and current insurance holdings. This is the methodology that provides the basic framework which our model is built upon.

Auerbach and Kotlikoff (1991) examines life insurance adequacy for middle-aged American households by converting all available resources into annuities based on interest and mortality assumptions, using a Guass-Seidel iteration in the case where annuities are not available. This is done for both before and after the death event, with underinsurance defined as a situation where the size of the annuity falls by over 30% after the death of the spouse. However, such a definition may overstate the degree of underinsurance, as a 30% fall in an annuity will have a larger impact on a household whose original equivalent

annuity is £500 per week, as compared to one that has, say, £5,000 per week. This is because the latter tend to set aside a higher amount for savings (Dynan, Skinner and Zeldes, 2004), but this component does not need to be replaced. When the income is reduced, the high earner can first reduce savings "expenditure" before having to cut back on other expenses, hence it experiences a less significant fall in living standards. To take this into account, our model needs to consider the allocation of household income, with the expectation that households with higher income will allocate a greater proportion of monthly income to savings.

Bernheim *et al* (2003) studies the life insurance holdings and risk of financial consequences among couples. They include the consideration of economies of scale of consumption within a household, when comparing a household's living standards before and following a death event. In terms of the treatment of housing, they cite studies by Venti and Wise (2002) as well as Caplin (2002), culminating in the assumptions that survivors do not change residences due to cost and inconvenience, and that they die with home equity intact since they tend to preserve the equity of their homes. The economies of scale of shared living will be taken into account in our model, and we also assume that survivors will remain in their current residence following the death.

Rather than examining the protection gap as a whole, the Association of British Insurers' (2008) study looks at the protection gap of a household by splitting it into three components: debt, essentials and lifestyle. It also demonstrates how the size of the income gap for each component changes over time. For our study, we modify this idea and take it one step further to consider the expenditure patterns of each household when determining the cover required. Two other categories (*Children*, and *Savings and investments*) are added to improve the model, and these are described in the next chapter.

3. METHODOLOGY

This section presents the model employed to determine the amount of life insurance cover required, as well as the application of the model to examine the underinsurance gap in the UK.

3.1 Assumptions

3.1.1 Inflation and Interest rates

In order to express the protection needs of an individual as a current lump sum, we need to discount the future streams of cash flows to obtain the present value. In other words, the current lump sum is the amount required at present to generate the future cash flow streams, given that interest is earned on the money until the time of payment. The interest rate used to discount these cash flows will depend on the returns that an individual can expect to earn on his or her financial resources. At the same time, we assume that future household expenses will rise in line with Consumer Price Index (CPI) inflation.

As such, the return on index-linked gilts represents a suitable discount rate for our future cash flows, given that it matches the nature and currency of our cash flows. Here, we are essentially making use of the market's expectations for future inflation. The discount rate is the median of ten year index-linked gilt yields for the past 24 months ending in June 2012, from the UK instantaneous implied real forward curve (Bank of England, 2012). This has a value of 1.21%.

We use the median value as a representation of the long term expectations of interest and inflation, as current values may be affected by short term market fluctuations. The discount rate can be updated as the gilt yields change with time, due to the changing economic conditions and other market factors.

3.2 Financial resources required

This consists of two components: income replacement and outstanding debt.

3.2.1 Income replacement

Income replacement refers to the income streams that are required to sustain the living standards of the household. Similar to other studies, (Auerbach and Kotlikoff, 1991; Swiss Re, 2004 and 2010), we start off with the current household income, since it directly influences the level of consumption and hence the amount of cover needed to replace any lost income.

The resources required for income replacement will be expressed in a form similar to that used by Swiss Re (2004): an "income replacement multiplier", i.e. as a multiple of the deceased's income[3]. This is derived by discounting these future cash flows to obtain the lump sum that is required to generate these cash flows at this point in time.

Meanwhile, household expenditure patterns are likely to differ depending on the age of its members as well as the overall household income. For example, a household with older members is likely to have lower expenditure on mortgages or debts. To take into account these differences in the allocation of household income, we split the income into five expenditure groups and determine the resources required under each group as described below:

Essentials

This represents expenditure on basic necessities which tend not to decrease after the death event, such as rental, social protection (e.g. home help, residential homes) and maintenance for the accommodation. In terms of housing outgoings, a household could be renting a property, or making

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[3] As an example, for one whose annual income is £20,000, an "income replacement multiplier" of 10 implies that a lump sum of £200,000 is required to replace the lost income and maintain the standard of living for dependents in the household.

mortgage payments on a purchased property. For the former, rental payments will be considered in this section, since it represents an expense that is incurred at regular intervals over time. For a household with outstanding mortgages, this is dealt with in the *"Mortgage/Debt"* expenditure group, described in a later section.

We assume that this expenditure rises with price inflation, and will be fully replaced until the household reference person reaches age 65 or for 25 years, whichever occurs earlier. The former corresponds with the commencement of government pensions. The latter condition provides adequate support for dependent children until they achieve financial independence as well as caregiver's expenses for any elderly dependents. As defined by the ONS, the "household reference person" refers to the head of the household, with the condition that this person must be staying in the accommodation that was surveyed (Office for National Statistics, 2011).

The full replacement assumption is due to the fact that social protection expenses are unlikely to decrease significantly, if at all, following the death event. Housing related expenditures may fall as households have the option of downsizing, but this may be restricted by rental agreements that are in place. Furthermore, as proposed by Bernheim *et al* (2003), emotional attachments to their houses and the costs and effort required for moving houses means people tend to remain in their current residence, at least in the short term.

Children

This consists of expenditure relating to raising a child, such as education costs, childcare costs, baby accessories, etc. This expenditure is assumed to be required until the child reaches age 21. This implies that members will be cost-neutral to the household upon reaching the age of 21.

The expenditure associated with raising a child is expected to vary with his or her age, with higher costs expected at higher ages when he or she enters higher education, due to associated costs such as tuition fees and living costs. Higher expenses are also expected during early infancy years, possibly the result of higher susceptibility to illness, greater childcare costs and clothing expenditure due to growth. This is supported by a study conducted by Liverpool Victoria (2012), which demonstrated that child raising costs were significantly higher for children between ages 1 to 4 and 18 to 21.

To take this variation into account, we assume that the future expenditure streams increase with inflation, and express the present value of the total cost of raising a child until age 21 as a multiple of the current expenditure on the child. This gives the advantage of being able to incorporate the fact that the current amount spent on raising a child varies with each family, due to factors such as household income and lifestyle. Using the Liverpool Victoria (2012) study, we discount the future cost of raising a child using our discount rate of 1.21%, and express it as a multiple of the current annual spending on the child. (Further details may be found in Appendix A.) The scaling factors are given in Figure 1 below:

Figure 1: Child expenditure scale

Age	Scaling factor	Age	Scaling factor	Age	Scaling factor
0	18.9	7	16.2	14	10.5
1	13.1	8	15.3	15	9.6
2	12.3	9	14.5	16	8.7
3	11.4	10	13.7	17	7.8
4	10.5	11	13.1	18	3.0
5	17.8	12	12.2	19	2.0
6	17.0	13	11.3	20	1.0

Note: The scaling factors represent the cost of raising a child until age 21, expressed as a multiple of the current annual spending on the child of a given age. As an example, for a household currently spending 10% of their income on a child aged 8, the amount required to raise the child till age 21 is calculated as $10\% \times 15.3 = 1.53$ times current income.

Source: The table is constructed by discounting the total cost of raising a child until age 21 based on data from Liverpool Victoria (2012). Further details can be found in Appendix A.

There is a sharp drop in scaling factor at age 18 which can be explained by the fact that the cost of raising a child until age 21 is obtained by multiplying the current spending on the child and the scaling factor. The spending on a child aged 18 is expected to be significantly higher due to education fees, thus the total cost of raising a child until 21 will be a smaller multiple of this larger amount. Similarly, the scaling factor at age 4 is smaller than that of age 5. This is because at age 4, there is relatively higher expenditure on clothing due to growth, and higher childcare expenditure before the child begins receiving formal education.

We assume that the Children Expenditure is distributed evenly among all children, and calculate the replacement amount by multiplying the current expenditure on each child with the corresponding scaling factor based on the child's age.

Mortgage/Debt

This includes repayment of mortgage, loans and other debts. Instead of including this as part of income replacement, we will consider a lump sum that allows the household to pay off any outstanding liabilities. This is because the amount of outstanding debt is known. Mortgages and debt are dealt with in the "Outstanding debt" section below (Section 3.2.2).

Savings and investments

The portion of income spent on savings and investments will not be replaced. Rather, any accumulated savings and financial assets will be considered as part of the resources available, which reduces the protection needs of the household. This is discussed in Section 3.3.

Others

Having accounted for the four expenditure groups above, the remaining portion of the income will be allocated to miscellaneous items for the household, such as household goods or recreation expenses. These expenses are assumed to increase with price inflation and the replacement period will be until the household reference person reaches age 65 or for 25 years, whichever is sooner.

When determining the amount of income replacement for these miscellaneous expenses, we also need to consider economies of scale of shared living, i.e. joint consumption. If there are more than two person living in a household, the cost of some resources are shared among members, e.g. central heating, which reduces per head living costs. To account for this, we make use of factors from the Organisation for Economic Cooperation and Development's (OECD) modified equivalence scale (Office for National Statistics, 2011). This is widely used across Europe and UK government departments to adjust household income, so that standard of living comparisons can be made across households of different sizes and composition (Office for National Statistics, 2011).

Given that we already have a separate category for Children Expenditure, we only consider the spending of members above 21, and members aged 18 to 21 who are not in full time education. We assign a factor of 1.0 to the first adult of the household and 0.5 for any additional adult. The factors are summed for each household before and after the death event of the adult, and the ratio provides the proportion of original expenditure (under "*Others*") required to maintain household living standards after the death.

Lastly, a single member household will be assigned a value of zero for income replacement.

3.2.2 Outstanding debt

As mentioned earlier, outstanding liabilities will be expressed as a lump sum, which will allow the household to fully fulfil any debt obligations following the death. Debt obligations include mortgages, loans and other liabilities. This entire amount will be added to the protection needs of the household.

Once again, in our treatment towards housing-related debts, we implicitly assume that households do not move or downsize, even though this possibility exists in real life.

3.3 Financial resources available

The financial resources available to a household following a death of an income earner include savings and financial assets held by the deceased, life insurance cover held by the deceased, as well as any social security payments that the household is entitled to.

We only consider financial assets here, as it is assumed that the family will want to hold on to any physical assets after the death event. Meanwhile, life insurance cover held by the deceased include both individual and group life cover, as well as any attaching spouse's pension that is triggered on death. In the UK, the government offers several bereavement benefits that are directly triggered on death and they are considered in our study.

3.4 Examining the UK underinsurance gap

For the purpose of examining the UK underinsurance gap, we use data from recent UK household surveys conducted by ONS, as well as insurance data from Scottish Provident and Swiss Re. By basing our analysis on data collected on a nationwide scale, we can minimise distortions from random sampling errors.

To determine the resources required by households, we utilise the 2010 Living Costs and Food Survey conducted by the Office for National Statistics and Department for Environment, Food and Rural Affairs (2011). Data collected in this survey is weighted to produce population-level figures, allowing for non-response and the population distribution (Office for National Statistics, 2011). We will conduct our analysis taking these weights into account.

3.4.1 Age bands

We assign the households in the sample to four age bands based on the age of the household reference person. The four age bands are: Below 30, 30 to 39, 40 to 49 and 50 to 64. These age bands are selected such that they represent different life stages with regards to career and family status, and as such we will expect to see differences in their income and expenditure patterns.

3.4.2 Household expenditure patterns

The 2010 Living Costs and Food Survey also provides us with insights on household expenditure patterns. Using expenditure data from the survey, we calculate the percentage allocations to the various expenditure groups (namely: Essentials, Children, Mortgage/Debt, Savings and investments, and Others) for the household.

The full list of items that are allocated within each expenditure group can be found in Appendix B.

3.4.3 Outstanding debt

Outstanding debt includes outstanding mortgages and any outstanding credit card bills. For each household, these are obtained directly from the 2010 Living Costs and Food Survey.

We also consider any outstanding loans and hire-purchases. These are estimated based on the household's debt repayment expenditure and the principal amounts of these transactions.

3.4.4 Household income

The corresponding household income data is obtained from the sample in the 2010 Living Costs and Food Survey. This also includes government allowances and social security benefits, e.g. Job Seekers Allowance. The data has been anonymised by top-coding the income of the top few percent of earners, which will have the effect of understating the protection gap. On the other hand, this reduces the distortion to our results caused by households with extremely high incomes.

3.4.5 Household savings/Financial assets

This comprises of savings, shares, investment products and other financial assets held by the household. As mentioned above, physical assets are not considered as we assume the family will continue to hold on to and make use of those assets after the death event – it forms part of the conditions to maintain their current standard of living. To determine the amount of financial assets held by households, we use data from the 2009-2010 Family Resource Survey, conducted by the Department for Work and Pensions, National Centre for Social Research and Office for National Statistics (2011).

3.4.6 Social security

In our analysis, we consider three such benefits:

- **Bereavement payment:** a lump sum of £2,000 claimable upon the death of a spouse.
- **Widowed Parent's Allowance:** a benefit payable to widowed parents bringing up children, until the children reach a given age.

- **Bereavement allowance:** a weekly benefit paid to the surviving spouse who is not bringing up children, for up to 52 weeks following the death event. (Directgov, 2012)

Similar to our treatment of income replacement, these social security payments are discounted to obtain the lump sum amount that is required to generate these future cash flows. The discount rate used is 4.96%, which is the median yield on ten year gilts over the last 24 months ending in June 2012 (Bank of England, 2012). Similar to the index-linked gilt yields, this is subject to fluctuations over time, and can be updated accordingly.

Where the death event occurred as a result of serving in the Armed Forces, dependents may be eligible for benefits under the Armed Forces Compensation Scheme. This is a specialised benefit, and we do not consider this due to a lack of household information on members serving in the Armed Forces, which affects the eligibility to claim under the scheme. Furthermore, cases of death from serving in the Armed Forces are very rare.

There may be other means-tested benefits triggered on death, e.g. Funeral Payments and Community Care Grants. The death event may also indirectly affect eligibility of other benefits or financial support, if the occurrence of the death causes household income to fall below a certain level. For government schemes, this is usually accompanied by a prerequisite that total capital of the household is less than £16,000. The actual size of these benefits tends to be determined on a case-by-case basis, depending on the circumstances of individual households and often also by any bereavement benefits being claimed. Without detailed information on the characteristics and financials of the household (e.g. tax payments, physical/mental disabilities among household members, household capital), we would not be able to identify or estimate the resulting change in the current benefits received with any certainty. As such, these benefits are excluded from our analysis.

3.4.7 Life cover

To determine the total amount of life cover owned by households in the UK, we consider both individual and group cover. The individual cover held is estimated using Scottish Provident's (2012) data on the average life assurance cover owned, broken down by gender and age groups. We take the average life assurance cover from the relevant age group and weigh it according to the number of adult males and females in the household. This is then multiplied by the number of life assurance policies held by each household based on data from the 2010 Living Costs and Food survey. The life cover held by UK households for each age group is derived by summing across all the households in the group.

Given that Scottish Provident has a substantial portfolio[4], the numbers should represent a suitable proxy to gauge current life insurance holdings in UK. Nevertheless, we acknowledge that Scottish Provident may be focusing on particular market segments, which may affect the numbers obtained. Thus, the results should be interpreted with care, perhaps until our results can be substantiated with improved household-level insurance data in future.

For the group cover, we use the total group cover data from Swiss Re (2011) and apportion it to the households in the sample based on the wage and salary income for each household, since death benefits within group schemes are usually linked to salary. The Swiss Re (2011) data also considers dependents' death-in-service pension benefits by capitalising them using a factor of 30.

3.5 Summary

The methodology adopted for calculating the protection gap in this study can be summarised in the flowchart below:

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[4] Royal London Group (Bright Grey and Scottish Provident) is among the top five in term assurance sales for 2011, with more than 100,000 policies sold (Swiss Re, 2012).

Figure 2: Flowchart for calculating UK protection gap

Age of Household Reference Person

Essentials

Income replacement multiplier

Children

Child expenditure scale

Household Income

Mortgage/ Debt

Savings and Investments

Age of children

Required resources

Others

Shared living adjustment

PROTECTION GAP

Household Composition

Mortgage and Outstanding debt

Outstanding debts

Social security

Financial assets

Available resources

Insurance cover

Note: Items in the black boxes represent input variables, the ovals represent adjustments, and the other variables are derived from the inputs and assumptions.

4. RESULTS

4.1 Expenditure patterns

Using data from the 2010 Living Costs and Food Survey, we calculate the proportion of total expenditure spent on the five expenditure groups. The results are presented below:

Table 1: Expenditure patterns by age of household reference person

	Age of household reference person			
Expenditure split	**Below 30**	**30 to 39**	**40 to 49**	**50 to 64**
Essentials	19.9%	12.3%	9.7%	8.1%
Children	4.7%	3.8%	3.6%	1.6%
Mortgage/Debt	13.0%	20.8%	19.1%	14.3%
Savings and investments	0.7%	0.9%	0.9%	1.1%
Others	61.7%	62.2%	66.7%	74.9%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Household income (£)	*30,841*	*41,842*	*44,313*	*38,625*

Note: The table shows the average expenditure patterns for households, based on the age of the household reference person, i.e. the head of the household that lives in the residence surveyed. Household income includes wages and government social security benefits.
Source: This table is constructed using data from Office for National Statistics and Department for Environment, Food and Rural Affairs (2011). Further details can be found in Appendix B.

Essentials account for almost 20% of expenditure for younger households and falls over time. This is due to rental being included in the category and the lower household income of the Below 30 group. As such, Essentials represents a large component of their expenditure. As the incomes of households increase over time, the proportion of spending on Essentials falls. In addition, they start to take out mortgages as they purchase their own properties. Thus, we see a shift in housing expenditure from Essentials to the Mortgage/Debt category. This leads to the observation that Mortgage/Debt forms the largest proportion of expenditure at 30 to 39, a reflection of most mortgages being taken out within that age group. For the 40 to 49 group, even though the proportion of

income allocated to Mortgage/Debt falls, we find that the actual amount spent on that category is greater, since households within this age band have higher incomes. This may be due to households upgrading to bigger houses and taking out new mortgages, led by greater affluence and perhaps increases in family sizes. Finally, the expenditure allocated to Mortgage/Debt decreases for the 50 to 64 group as more liabilities are paid off.

We find that the proportion spent on Children is highest in the lowest age group. This observation can be explained by the lower income of the Below 30 group. In fact, we observe that the actual expenditure on Children for the Below 30 group is lower than the 30 to 39 and 40 to 49 groups. This is reasonable, since the middle two groups are likely to contain more young children and hence incur higher expenditures in that area.

Finally, we also note that the proportion spent on savings and investments increases with age. This is in line with expectations since they have higher incomes (Dynan, Skinner and Zeldes, 2004) coupled with the lower mortgage expenditure for the oldest group. They are also likely to increase savings in preparation for retirement, or perhaps as precautionary savings. However, the increase is very slight, with values being generally low at around 1%.

4.2 Individual cover held

As at the end of first half of 2012, the average sum assured of all in-force life cover for Scottish Provident is as follows:

Table 2: Average in-force Sum Assured – Scottish Provident

Age band	Male	Female	Total
Below 30	137,482	130,593	133,676
30 to 39	148,522	135,845	141,865
40 to 49	136,199	113,341	125,164
50-64	101,582	79,787	92,091

Note: The sum assured values include joint life policies; the covers arising from such policies are treated as being held by both males and females. Values are in British pounds (£).
Source: Scottish Provident (2012).

On average, the Below 30 group holds £133,676 of life cover. This increases to £141,865 for the 30 to 39 group, which holds policies with the highest average sum assureds. Life assurance policies are used to protect the financial well-being of dependents by providing resources to replace the income lost in the event of death, and its demand tends to increase with greater affluence and the presence of children (Diacon and Mahdzan, 2008). Therefore, this higher sum assureds for the 30 to 39 group is expected, given higher incomes and greater likelihood of households containing children. Consumers may also purchase life insurance to provide cover for mortgages that are taken out, and we have observed that Mortgage/Debt expenditure is higher for this age group. In spite of this, we will see in the following section that the increase in cover is insufficient to meet the actual needs of the household.

The amount of cover held then falls with age. This effect could be caused by the some of the policies being decreasing term assurances that provide cover for mortgages, where the sum assureds fall over time as the mortgages are being paid off.

In general, males tend to have more cover than females, in terms of higher sum assureds. This may be due to the fact that males tend to have higher earnings than females (BBC News, 2010b) and thus have more income that needs to be replaced. The difference in sum assured widens with age, possibly

due to more women switching to part-time work or becoming housewives upon childbirth.

4.3 Protection gap

Based on the methodology described earlier, we set out to determine the protection gap for UK:

Table 3: Protection gap analysis by age of household reference person

	Age of household reference person			
	Below 30	**30 to 39**	**40 to 49**	**50 to 64**
Household income[a]	30,841	41,842	44,313	38,625
Income replacement multiplier[b, c]	9.5	8.7	7.9	3.3
Income replacement amount	**322,492**	**403,390**	**388,793**	**160,367**
Outstanding debt[d]	31,838	68,972	64,324	28,597
Total lump sum needed	**354,330**	**472,362**	**453,117**	**188,965**
Savings/Financial assets[e]	3,031	9,025	17,669	27,424
Social security[f]	6,633	19,755	15,634	6,383
Total cover required	**344,665**	**443,582**	**419,813**	**155,158**
Individual life cover[g]	45,845	94,419	113,681	61,871
Group life cover[h]	34,250	49,165	51,622	37,136
Protection Gap per household	**264,571**	**299,998**	**254,511**	**56,150**
Weighted number of households ('000)[i]	2,811	4,406	5,138	7,019
Protection Gap (UK)	**0.74 trn**	**1.32 trn**	**1.31 trn**	**0.39 trn**
			Total protection gap	**3.77 trillion**

Note: The values above are averages of the sample households. Except for the income replacement multiplier, values are in British pounds (£).
Sources: a, b, d, f, i) Office for National Statistics and Department for Environment, Food and Rural Affairs (2011); c) Liverpool Victoria (2012); e) Department for Work and Pensions, National Centre for Social Research and Office for National Statistics (2011); g) Scottish Provident (2012); h) Swiss Re (2011).

The cover required starts out at £344,665 for the Below 30 group and increases to £443,582 for the 30 to 39 group, due to higher incomes that

require replacement. Having peaked at the 30 to 39 group, it then falls as age increases. The reason for this is a decrease in replacement period offsetting the increase in income, coupled with older households owning more financial assets. Finally there is a sharp drop between the 40 to 49 and 50 to 64 groups due to a significantly shorter replacement period, as shown by the income replacement amount.

The magnitude of the income replacement multiplier figures appear consistent with Swiss Re's (2004) analysis of several countries.

4.4 Sensitivity testing

Our model makes use of several assumptions with regards to interest rates and household characteristics, which influence the amount of cover required. We use best estimates as our model input; however these values can and do change with time, and the actual outcome may thus differ from expected. Therefore, sensitivity tests are conducted to examine how the calculated value of the protection gap changes when these assumptions are varied. By using alternative parameter values to re-run our model, we can observe the potential deviations from our calculated results. This also allows us to understand the relative importance of the assumptions that are driving our results.

4.4.1 Discount rates

The following graph shows the yield curve for ten year UK index-linked gilts, which we use as the discount rate to value the amount of resources required for replacement of future income lost:

Figure 3: UK 10-year index-linked gilt yield
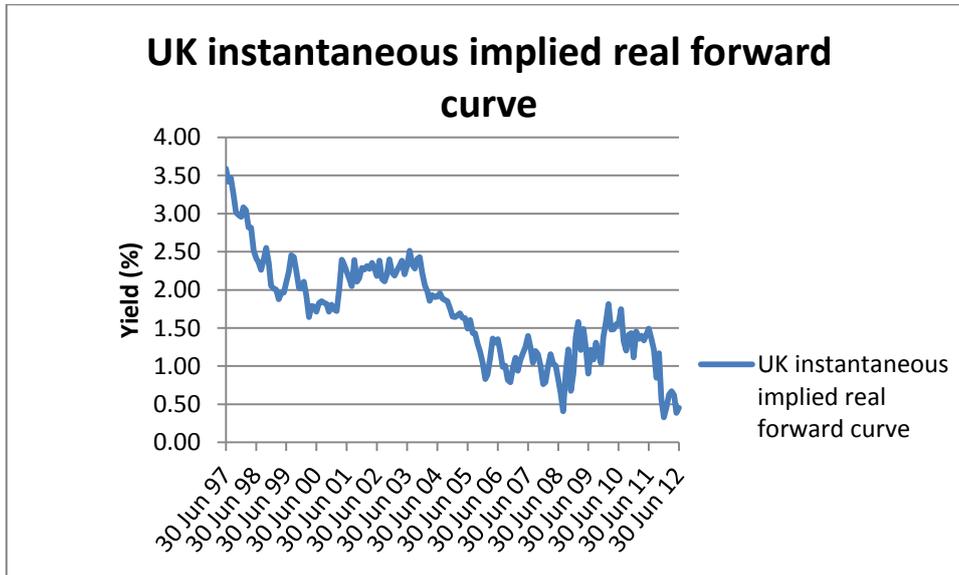
Note: This is the change in ten year index-linked gilt yields for the past 15 years, up to 30 June 2012.
Source: Bank of England (2012).

The gilt yield has remained near the 2% level since 1998, before falling towards the end of 2003. For the past seven years, the gilt yield tended to vary between 0.5% and 1.5%. Depending on future market conditions and the amount of success in controlling price inflation, the yield might move back towards the 2% level in the long term. However, this cannot be known with certainty.

Thus to see the effect of potential future changes in gilt yields on the calculated protection gap for both the short-term and long-term, we conduct a sensitivity test on our discount rate with 0.25%-point variations. This is shown in the following table:

Table 4: Sensitivity analysis: Discount rates

		Discount rate (based on index-linked gilt yields)				
		0.71%	**0.96%**	**1.21%**	**1.46%**	**1.71%**
		-0.50%	*-0.25%*	*Original basis*	*+0.25%*	*+0.50%*
Change in Protection gap per household (£)	Below 30	+19,163	+9,376	**264,571**	-8,985	-17,599
	30 to 39	+23,471	+11,484	**299,998**	-11,005	-21,555
	40 to 49	+18,824	+9,238	**254,511**	-8,906	-17,493
	50 to 64	+4,230	+2,091	**56,150**	-2,045	-4,046
Change in Protection gap per household	Below 30	+7.2%	+3.5%	**N/A**	-3.4%	-6.7%
	30 to 39	+7.8%	+3.8%	**N/A**	-3.7%	-7.2%
	40 to 49	+7.4%	+3.6%	**N/A**	-3.5%	-6.9%
	50 to 64	+7.5%	+3.7%	**N/A**	-3.6%	-7.2%
Total UK protection gap (£ trillion)		**4.05**	**3.91**	**3.77**	**3.63**	**3.5**
% change		+7.53%	+3.69%	**N/A**	-3.55%	-6.97%

Note: The original basis used in our model is given in the middle column. The values above are averages of the sample households.

In terms of absolute change in the protection gap per household, a change in the discount rate will have a larger impact on groups with longer income replacement periods as well as groups with larger income replacements. The 30 to 39 group experiences the largest change in protection gap due to a combination of its long replacement period and a relatively higher income compared to the Below 30 group.

When the size of the absolute change is compared to the original protection gap in percentage terms, the 30 to 39 group again experiences the largest impact. The Below 30 group experiences the smallest percentage change in protection gap, due to the large size of its original protection gap. Overall, the UK protection gap changes by around 3.6% for every 0.25%-point variation in discount rate in the opposite direction.

Given the results above, the discount rate is an important assumption. However, it is difficult to predict it with certainty, since interest rates are

constantly changing with market conditions. Nevertheless, the value chosen is felt to be appropriate for our cash flows.

4.4.2 Children's Expenditure

In this analysis, we consider the effect on our results when we ignore the adjustment for the variation of Children Expenditure with age. In effect, this maintains the Children Expenditure at the current level and it is only affected by price inflation. This expenditure will be replaced until the child is age 21.

Table 5: Sensitivity analysis: Children's Expenditure

		Original basis	Children adjustment removed	% change
Income replacement amount (£)	**Below 30**	322,492	324,406	+0.6%
	30 to 39	403,390	404,947	+0.4%
	40 to 49	388,793	385,539	-0.8%
	50 to 64	160,367	159,231	-0.7%
Protection gap per household (£)	**Below 30**	264,571	266,485	+0.7%
	30 to 39	299,998	301,555	+0.5%
	40 to 49	254,511	251,256	-1.3%
	50 to 64	56,150	55,013	-2.0%
UK protection gap		**£3.77 trn**	**£3.75 trn**	**-0.3%**

Note: The "Children adjustment removed" column shows the effect of removing the adjustment for the variation of Children Expenditure with age. The values above are averages of the sample households.

The protection gap obtained is £3.75 trillion, slightly lower than our original result. For the two youngest age groups, removing the adjustment for Children Expenditure increases the income replacement and the associated protection gaps.

This is because households in these two age groups are more likely to contain young children aged 1 to 4. The lower scaling factors for children aged 1 to 4 compensates for the relatively higher expenditure experienced during this period, since expenditure is expected to fall as the child grows older. Without this adjustment, expenditure on Children is assumed to remain at this higher

level and replaced for each year until the child is 21. This leads to larger calculated income replacement amount for households with children of ages 1 to 4. Nevertheless, the magnitude of the change on each of the four age groups is small.

4.5 Additional analysis

It can be argued that instead of having a target replacement income that allows a household to maintain its current living standards, which may be above average, what a household realistically need is an income that allows it to maintain a reasonable standard of living. We take the median income, i.e. the level of income earned by the household in the middle of the sample when arranged in ascending order of income, as our definition of "reasonable".

We then re-run our model by setting an upper limit to the income being replaced. This maximum corresponds to an equivalised income equal to the equivalised median income of our sample, calculated on the original OECD scale used by the Office for National Statistics (2011)[5]. In other words, this sets the maximum replacement income to be the level that allows the household to have a standard of living comparable to a single adult household earning the median income of our sample. This has the value of £332 per week, or £17,323 per annum (Office for National Statistics, 2011). Our findings are presented below:

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[5] In the OECD scale used by the Office for National Statistics (2011), a factor of 1.0 is assigned to the first adult of the household, 0.5 for any additional adult or child aged 14 and above, and 0.3 for a child below 14. For the adapted scale we use in Section 3.2.1, we excluded dependent children from the analysis to avoid double-counting.

Table 6: Additional analysis: Median income

		Original basis	Median income
Income replacement amount (£)	**Below 30**	322,492	232,650
	30 to 39	403,390	251,114
	40 to 49	388,793	251,480
	50 to 64	160,367	98,883
Protection gap per household (£)	**Below 30**	264,571	174,729
	30 to 39	299,998	147,722
	40 to 49	254,511	117,198
	50 to 64	56,150	-
UK protection gap		**£3.77 trn**	**£1.74 trn**
% change		**N/A**	**-54%**

Note: The table compares the resources required by households to maintain a reasonable standard of living, given in the "Median income" column, with that required to maintain current living standards. The values are averages of the sample households.

In this case, the protection gap shrinks to £1.74 trillion. This figure signifies the minimum amount of additional cover required by UK, which ensures that dependents have a reasonable standard of living following a death event. A protection gap does not exist for 50 to 64 group, which holds £99,007 of life cover on average. This is more than the £93,673 required after outstanding debts and other resources available are taken into account. For the younger households, significant gaps still exist.

5. DISCUSSION AND CONCLUSION

5.1 Discussion

The results from Table 3 above can be summarised in the following figure:

Figure 4: Protection needs and gaps
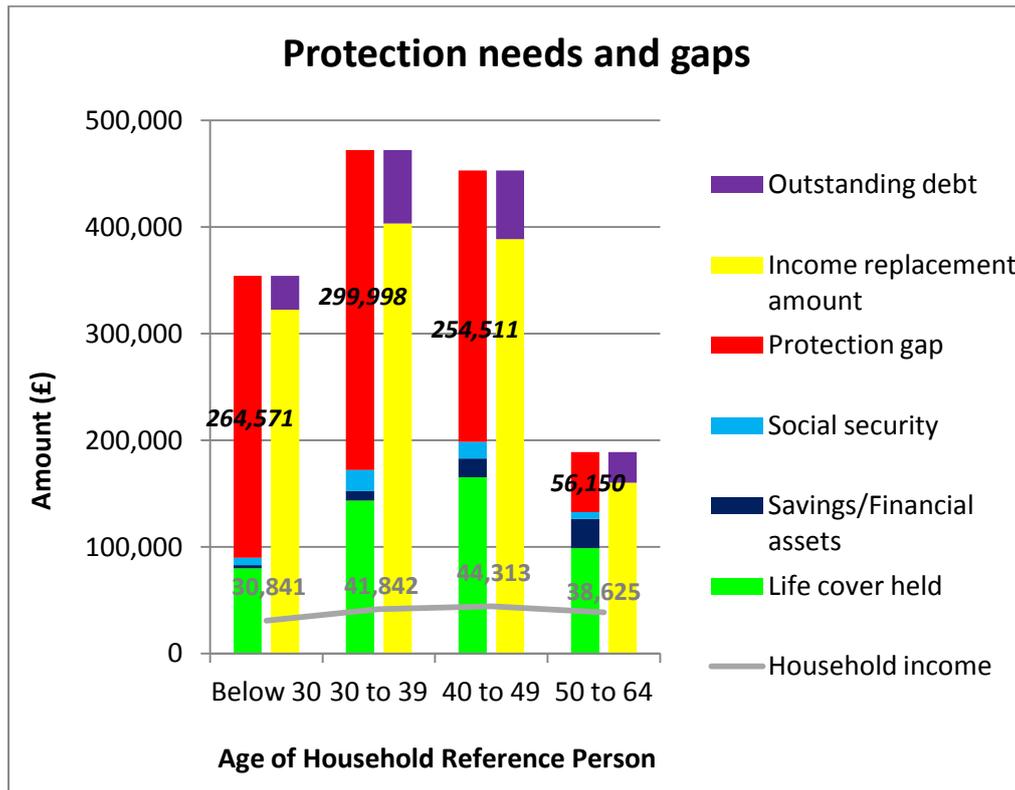
Note: In the figure, the numbers on the red columns indicate the size of the protection gaps, whereas the numbers on the grey line indicate the household income for the given age groups.

The protection gap is the biggest for the group aged 30 to 39, due to high levels of income and debt. The protection gap then falls with age, as households build up more assets and take out more cover, with a corresponding reduction in cover required.

The fall in protection needs between the 30 to 39 and 40 to 49 groups is small compared to the reduction between the 40 to 49 and 50 to 64 groups. For the first two groups, outstanding debt has not fallen substantially, possibly due to

households upgrading to larger properties and taking out new mortgages. The decrease in the income replacement amount is small, with higher incomes and the presence of more dependents as households become larger.

Relative to the amount of life cover held, the size of the protection gaps for the age groups below 50 is large. Households in these age groups need more than double their present life insurance holdings to maintain their current standard of living following a death event. The figure also shows that the amount of social security benefits that are typically triggered on death represent only a small proportion of the actual household needs.

5.2 Implications

The results of our study signal a need for households to increase their expenditure on insurance. However, this is a tough ask considering that the amount spare cash available is generally low, as demonstrated by the fact that UK households are spending a high proportion of their income, reflected in the low savings rates in Table 1. This is especially so for the lower income groups, which may have little or no savings.

In particular, the large sizes of the protection gaps for the younger age groups imply that younger households appear to be substantially underinsured and a significant amount of risk exists within that segment of the population. Given that the probability of death is low at younger ages, optimism bias may cause consumers to underestimate the likelihood of death (Dunning *et al*, 2004). As they deem it to be an event that is unlikely to happen to them, they do not feel the need to purchase life insurance, resulting in the large protection gaps observed. This segment of the population represents a potential target market for insurers, and the government may also focus on this group in terms of education and promoting awareness.

At the moment, there are no tax reliefs provided on purchases of life assurance products in UK. The Life Assurance Premium Tax Relief and tax reliefs for Pension Term Assurances were abolished in 1984 and 2007 respectively. The government may consider implementing tax reliefs to increase life assurance purchases, since it results in a lower effective cost to consumers. This can be targeted at certain groups, e.g. parents with children below 16, through the use of eligibility criterion. However, a tax relief scheme will involve running costs on top of the direct cost of providing the benefits itself, i.e. lost tax revenues, which the government may be unable or unwilling to meet. Also, the UK government may be placing greater importance on reducing public debt (Wheatcroft and Bale, 2010).

Meanwhile, even though low income households with little assets may obtain additional financial support, we see that the amount of social security benefits triggered after a death event is low compared to the amount required to maintain a household's current lifestyle. The high cost of providing social security plus the fact that overall government expenditure is forecasted to exceed tax receipts for the next few years (HM Treasury, 2011) suggest that these benefits are unlikely to be increased significantly in the near future. Therefore, there is a need for consumers to take personal steps to safeguard their dependents' financial wellbeing.

5.2.1 A case for decreasing term assurances

Given the way we specified the protection needs of an individual, where the main purpose of a term assurance is to convert one's survival-contingent income stream into a lump sum paid in the event of death (Auerbach and Kotlikoff, 1991), there is a case for the purchase of decreasing term assurances. These are policies where the sum assureds decrease over the term of the contract. This is because income replacement, which tends to form the bulk of the cover required, generally falls over time as one approaches retirement and dependent children grow up. The other major component of resources required

is the outstanding mortgage, where a decreasing term assurance is a natural match.

The advantage of a decreasing term assurance is that it allows the "correct" targeting of benefits, i.e. to avoid purchasing unnecessary cover. Similar to the amount of life cover required, the sum assured of the policy decreases over time. Because of this, the cost of such policies is lower than a level term assurance, where the sum assured remains constant throughout the duration of the contract. An example is shown in the table below:

Table 7: Monthly premiums comparison

	Level Term Assurance	Decreasing Term Assurance	Cost savings
Age 35, policy term 25 years	£13.48	£ 9.79	27%
Age 35, policy term 30 years	£15.32	£10.97	28%
Age 40, policy term 25 years	£19.53	£13.22	32%

Note: The values are monthly premiums, based on the average of quotes from Legal & General, Liverpool Victoria and Aviva. The policy offers £200,000 of life cover (without critical illness) for a male non-smoker.
Source: Quotes are obtained from Confused.com, an online price comparison site: http://www.confused.com/life-insurance [Accessed: 14 August 2012].

Compared to a level term assurance, a decreasing term assurance is significantly cheaper. Even though the sum assured of the typical decreasing term assurance policy (used to generate the quotes above) may not decrease in exactly the same way as the cover required according to our model, it takes on a similar form, and Table 7 highlights the potential for significant cost savings to the consumer. This is important given that cost appears to be a key barrier among consumers when taking out life insurance products, especially in the current economic climate (Association of British Insurers, 2009).

Currently, level term assurances account for a majority of term assurance sales – in 2011, sales volumes for level term assurances are 60% higher than decreasing term assurances (Swiss Re, 2012), with a tendency for decreasing term assurances to be associated with mortgage-related cover.

However, it could be worth exploring the possibility of offering decreasing term assurances as a cheaper and more efficient way of ensuring one has adequate cover, even under a situation where there is no mortgage consideration. That being said, there may be a lack of consumer awareness or understanding with regards to decreasing term assurance products. One solution to improve consumer understanding of products is to create summary sheets of key technicalities and explaining them using layman terms or diagrams.

5.2.2 Estimating cover needed using our study

Given that cost is main barrier to seeking advice from independent financial advisors (Association of British Insurers, 2011), our model provides a quick and simple way of estimating the desired level of an individual's insurance needs (Appendix C). This helps in a situation where consumers know that they need cover, but are not sure how much cover to purchase.

Even though it may not entirely replace professional advice, it can provide individuals with a rough idea of how much cover is required, and signal when there is a need to review the amount of life cover held. The individual can then decide whether he or she needs to seek advice from independent financial advisors, based on the estimates obtained. While we may not expect the gap to be fully closed, hopefully this will spur people to adjust their insurance holdings to better match their needs.

5.3 Limitations

Due to a lack of household-level insurance data, we use average figures when considering financial assets and insurance holdings. The protection gap will be understated if these holdings are skewed, since we are assuming that any surplus resources and cover that households own will offset the protection gaps of other households.

The protection gap may also be understated due to the effects of Inheritance Tax. In UK, Inheritance Tax is payable when an estate exceeds the threshold of £325,000. However, an estate that is left to a surviving spouse in UK is exempted from paying Inheritance Tax regardless of its size, also known as "spouse or civil partner exemption". At the same time, the unused Inheritance Tax threshold is transferred to the surviving spouse, which increases the threshold to up to £650,000, to be applied upon the second spouse's death. Since the tax applies only to very large inheritances received by non-spousal members of the household, it is likely to only affect a small proportion of the population who amass a large amount of assets as they get older. Thus, we do not expect the effect to be significant, and exclude Inheritance Tax from our analysis.

On the other hand, some social security benefits for a household are income dependent. When an earner dies, the benefits receivable may increase as household income falls below a given level. As mentioned earlier, the actual increase in such benefits takes into account several other household circumstances and is hard to ascertain. Hence, this is not taken into account in our calculations, and will have the effect of overstating the protection gap.

Finally, there are certain expenses where the amount of consumption attributable to the children in the household cannot be established with certainty. Rather than allocating an arbitrary portion of these expenses to Children, they have been categorised under Others. Examples include household items such as appliances, groceries or holiday trips. When allocating these Children Expenditure to Others, only a portion of these expenses will be replaced, albeit usually for a longer period of time. The overall effect on household protection gaps depends on the relative length of the replacement period for the two categories, and other characteristics of each household.

On balance, we feel that the model is likely to understate the protection gap. Furthermore, we exclude households where the household reference person is aged 65 or above. The presence of any unmet protection needs within that group will mean that the actual protection gap is larger than our calculated figure.

5.4 Avenues for Future Research

Other ways to expand on our current work in life insurance include tracking of results over time, repeating the investigation using updated figures to see how the size of the gap has changed. Future studies into the UK protection gap can also include other means-tested social security benefits, perhaps using micro-simulation models similar to that used by Kelly and Ngu (2010) for their research in Australia[6], for a more comprehensive analysis.

In the absence of household level data with regards to life insurance ownership, we estimated the protection gap by aggregating the average sum assured of life assurance policies across households that own such policies. However, this fails to reflect the actual insurance holdings of households in different circumstances. The level of life insurance ownership may be dependent on the amount of mortgage outstanding, since a common use of life insurance policies is to repay a mortgage in the event of death. It is also dependent on household income, where wealthier households could be more than adequately covered while low income households find themselves lacking protection.

The large amounts of sum assured held by these wealthy households will lead to higher average figures, even though some of them may own surplus cover above that required to cover a protection gap. Using these average figures will cause the surplus cover to be included among the insurance held by the

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[6] Kelly and Ngu (2010) makes use of STINMOD, an enhanced micro-simulation model which assesses the change in the disposable income of a base hypothetical family following different insurance events, including death and disability of either husband or wife. Tax and other transfer income are also incorporated into the model.

population, causing the protection gap to be understated. Future studies may conduct the analysis by using household-level insurance data containing sum assureds of life cover held, to obtain a more accurate reflection of the size of the protection gap.

Lastly, future research may look into the protection needs of households where the household reference person is age 65 and above. The retired segment of the population may still be paying off mortgages or loans, or may wish to leave an inheritance for dependents in the event of death. The cost of obtaining long term care will also be among their consideration. At the same time, government pensions and financial support from dependents will affect the amount of cover required. With a different set of post-retirement needs, our current model is a poor fit to their requirements. However, there is still a need for them to hold life cover and a further protection gap may yet exist.

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APPENDIX A: Children Expenditure

According to Liverpool Victoria (2012), the cost of raising a child in UK is as follows:

Table I: Cost of Raising a Child

Age	Cost per year
0	£10, 261
1 to 4	£14, 140
5 to 10	£7, 679
11 to 17	£7, 536
18 to 21	£17, 459

Note: The table shows the annual cost of raising a child based on his or her current age.
Source: Liverpool Victoria (2012).

To obtain the scaling factors that we use in our analysis, we first discount the total cost of raising a child until age 21 based on the values above. The discount rate used is the median yield on 10 year index-linked gilts over the last 24 months ending in June 2012, and has a value of 1.21%. This is also the discount rate used for calculating the present value of the other income replacement components, and is in line with our assumption that Children Expenditure increases with inflation.

This is then divided by the cost required to raise the child in the current year based on his or her age, so that the amount needed to raise a child until age 21 is expressed as a multiple of the current annual expenditure on the child. This is shown below:

Table II: Deriving the Child expenditure scale

Age	Cost per year	Total discounted cost of raising child	Scaling factor
0	10,261	193,534	18.9
1	14,141	185,490	13.1
2	14,141	173,423	12.3
3	14,141	161,209	11.4
4	14,141	148,848	10.5
5	7,679	136,337	17.8
6	7,679	130,214	17.0
7	7,679	124,018	16.2
8	7,679	117,746	15.3
9	7,679	111,399	14.5
10	7,679	104,975	13.7
11	7,536	98,473	13.1
12	7,536	92,037	12.2
13	7,536	85,523	11.3
14	7,536	78,931	10.5
15	7,536	72,258	9.6
16	7,536	65,505	8.7
17	7,536	58,670	7.8
18	17,459	51,752	3.0
19	17,459	34,709	2.0
20	17,459	17,459	1.0

Note: The annual cost of raising a child is based on Liverpool Victoria (2012). The discount rate used is 1.21%. This is the median yield on ten year index-linked gilts over the last 24 months, ending June 2012. The scaling factor is obtained by dividing the total discounted cost (third column) with the current annual cost (second column).

APPENDIX B: Expenditure groups

The 2010 Living Costs and Food Survey (Office of National Statistics and Department for Environment, Food and Rural Affairs, 2011) provides details on household expenditure patterns for the UK. The following presents the list of variables used to derive the values for the various expenditure groups for our study. This is based on the survey's Specification documents (Volume F: Derived Variable User guide, and Volume G: Derived Variable Flowcharts), which are used by the Office for National Statistics in producing the Family Spending 2011 report (Office for National Statistics, 2011). These documents are provided as part of the data file.

Table III: List of variables under each expenditure group

Expenditure group	Description	Variable (as found in the survey)
Essentials[7]	Residential homes Home help Net rent Second dwelling – rent Maintenance and repair of dwelling Water supply and miscellaneous services relating to the dwelling	CC4111t CC4112t B010, B020 C41211t B102, B104, B107, B108, C43212c, C43111t, C43112t B050, B053p, B056p, B060, B159, C44211t
Children	Children's clothing and footwear Education	C31231t, C31232t, C31233t, C31234t, C31313t, C32131t B160, B164, CA1111c, CA1112c, CA2111c, CA2112c, CA3111c, CA3112c, CA4111c, CA4112c, CA5111c, CA5112c, CA1113t, CA2113t, CA3113t, CA4113t, CA5113t

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[7] Household expenditure for "Water Supply – Second dwelling" and "Council tax, mortgage" is estimated using national average figures, amounting to an average of £1.74/week.

	School meals	B260t
	Baby toiletries and accessories (disposable)	CC1317t
	Baby equipment (excluding prams and pushchairs)	CC3222t
	Prams, pram accessories and pushchairs	CC3223t
	Nursery, crèche, playschools	CC4121t
	Child care payments	CC4122t
	Money, cash gifts given to children	CK5212t, CK5213t, CK5214t, CK5215t, CK5216t
Mortgage/Debt	Interest on credit cards	B237
	Capital repayment of mortgage	B200, B203, B204, B150
	Loan/Hire Purchase of vehicles	C71112t, C71122t, C71212t
	Purchase of motor caravan (new and second-hand) - loan/HP	C92114t, C92116t
	Housing: mortgage interest payments, council tax etc.	B130, B150, B2081, B030, B038p
	Pay off loan to clear other debt	CK5316t
Savings and investments	Savings and investments	CK5111t, CK5113t, CK2111t

APPENDIX C: Individual-level protection needs

Based on our sensitivity testing on the Children category above, we find that the protection need results are close to that calculated by our original model even when the adjustment to Children Expenditure is removed. Hence, a possible simplified method that can be used by an individual to calculate his or her protection need is shown below:

Figure I: Calculation of individual-level protection needs

What proportion of income do you spend on the following: (in decimal format, e.g. 0.15 for 15%)
Mortgage/Debt **A**
Savings/Investments **B**
Essentials* **C**
Children **D**
Others **E**

Note: A, B, C, D and E should add up to 1.

***Essentials** includes: Social protection (e.g. home help), rent and other essential expenditures.

F: Household composition (including yourself)

No. of adults (members above 21, or members above 18 who are not in full-time education)	2	3	4	5
Value of F:	0.667	0.750	0.800	0.833

For how many years do you want your income to be replaced (assuming death)?

Years	1	2	3	4	5	6	7	8	9	10	
Value of G	0.994	1.977	2.949	3.910	4.861	5.800	6.729	7.647	8.555	9.453	
Years	11	12	13	14	15	16	17	18	19	20	25
Value of G	10.340	11.218	12.085	12.943	13.791	14.630	15.459	16.278	17.089	17.890	21.762

To obtain an estimate of the cover you may need:

1. Multiply **E** by **F**; **E** × **F** = _____
2. Add **C** to your answer: _____
3. Multiply by the value of **G**, with regards to your non-children expenditure: _____
4. Multiply **D** by the value of **G**, with regards to your expenditure on children. Add this to the value obtained in step 3: _____
5. Multiply by your annual income: _____
6. Add outstanding mortgages/debts: _____
7. Subtract savings/financial assets held; this is the estimated amount of cover that you need. _____