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## Income-Related Subsidies for Universal Health Insurance Premia: Exploring Alternatives Using the SWITCH Model

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*Abstract:* The Programme for Government indicated that under a Universal Health Insurance system, the State would "pay insurance premia for people on low incomes and subsidise premia for people on middle incomes". This paper examines issues in the design of such a subsidy scheme, in the context of overall premium costs as estimated by Wren et al. (2015) and the KPMG (2015) study for the Health Insurance Authority. Subsidy design could involve a step-level system, similar to the medical card and GP visit card in the current system; or a smooth, tapered withdrawal of the subsidy, similar to what obtains for many cash benefits in the welfare system. The trade-offs between the income limit up to which a full subsidy would be payable, the rate of withdrawal of subsidy with respect to extra income and overall subsidy cost are explored.

*Keyword(s):* Universal health insurance (UHI), premium, subsidy

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# 1. Introduction

The Programme for Government (Department of the Taoiseach, 2011) states that

> *Insurance with a public or private insurer will be compulsory with insurance payments related to ability to pay. The State will pay insurance premia for people on low incomes and subsidise premia for people on middle incomes.*

The recent White Paper on Universal Health Insurance (Department of Health, 2014) reiterated this approach. The present study represents an initial exploration of how this policy objective might be put into practice. It considers a number of different designs of subsidy scheme, and examines how subsidies would be distributed over the population under the rules of each of these schemes. It does not seek to recommend one particular scheme, rather it tries to identify the different outcomes which these schemes could generate, so that these can be weighed in the balance when choosing a preferred scheme, or when seeking to further refine the design.

This report is the second in a series developing the ESRI's SWITCH model[1] to examine key issues in relation to income-related healthcare entitlements, and the potential transition from the current system to one based on Universal Health Insurance. The first study (Callan et al, 2015) developed the methods by which SWITCH could model or "simulate" entitlement to medical cards and GP visit cards, and examined a number of issues arising from this. This paper looks at issues relating to the structure and level of income-tested subsidies under a UHI framework, complementing the macro picture provided by Wren et al. (2015) with detailed microsimulation analysis of alternative subsidy designs. Future studies will be able to build on this framework and develop it to address questions about the overall impact of potential reforms at household level, taking into account the value of existing entitlements, the value of new entitlements, current payments on private health insurance, and potential adjustments to taxation and/or USC arising from a partial shift from tax-financed to UHI-premium financed healthcare. These perspectives are needed to provide a much fuller overview of the potential impacts of Universal Health Insurance.

The current report is structured as follows. Section 2 outlines the broad approach to modelling of subsidies for UHI premia, drawing on statements of policy in the Programme for Government and in

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[1] SWITCH stands for Simulating Welfare and Tax Changes, as the model was initially developed to deal with tax and welfare issues.

the White Paper on Universal Health Insurance. It highlights some of the key choices in the design of a subsidy scheme for UHI premia. Section 3 reviews the evidence from Callan et al. (2015) relating to the modelling of existing or "baseline" entitlements to medical cards and GP visit cards, and draws out the implications for the introduction of a UHI subsidy scheme. Section 4 presents results on the costs of alternative subsidy schemes, with premium levels varying according to the "basket" of services included in the UHI package. Section 5 considers the distributive aspects of the subsidy from three distinct viewpoints: distribution across income groups (deciles of income per adult equivalent), distribution across family types, and distribution across categories of existing health care entitlements. The main findings and key issues for future research are highlighted in the concluding section.

## 2. Income-Related Subsidies for UHI Premia: Design Issues

The system of Universal Health Insurance proposed in the White Paper would represent a major structural change in the healthcare system. Currently most healthcare expenditure is financed by taxation. Under the proposed UHI structure, a new compulsory insurance premium would substitute for a substantial portion of the tax financing of healthcare. An income-related subsidy, financed from taxation, is a central element of the proposed policy, but the Programme for Government and the White Paper give only a very broad indication of the nature of the income-related subsidy envisaged:

> *The State will pay insurance premia for people on low incomes and subsidise premia for people on middle incomes.* (Department of Health, 2014).

Subsidy designs compatible with this statement could include:

- A full subsidy up to a given income limit
- An income limit defined in terms of either gross or net income, and adjusted depending on family size and composition
- A stepped or "tiered" approach, with income cut-offs defining successively higher income bands for which lower subsidy levels would apply
- A "tapered" approach, as is common with many cash transfers under the social protection system, whereby subsidy levels would reduce by some proportion of the higher levels of income.

The way in which the subsidy is structured determines not only the aggregate cost of the subsidy, but also the pattern of its distribution across incomes, and the associated pattern of financial incentives faced by individuals.

The current system of income-related medical card and GP visit card entitlements can be seen as providing a stepped or "tiered" approach.[2] Families on the lowest incomes obtain the full benefit of a medical card, covering *inter alia* GP visits, prescription drugs (subject to a prescription charge of €2.50 and capped at €25 per family per month), and exemption from acute hospital inpatient charges and charges for emergency department attendance.[3] If income exceeds these levels, they may obtain a lesser benefit, through the GP visit card which covers GP visits only. If income exceeds the cut-off for the GP visit card, the family would not qualify for either the medical card or the GP Visit Card.

The fact that an increase in income may lead to a family losing its eligibility for a medical card has implications for the financial incentive to work faced by those medical card holders who are currently unemployed, or not in the labour market. If their in-work income were to exceed the medical card income limit, they would lose some or all of the value of that entitlement. The gain in cash income from taking up employment would then be reduced by the step down from a medical card to a GP visit card, or from a medical card to no card. As the value of a medical card will depend on the size of a family, unemployed people with families are more likely to experience such disincentives. There are measures in place to address the possible impact of medical cards on the financial incentive to work: persons who have been unemployed for 12 months or more can retain their medical card for 3 years on returning to work even if above the relevant income limit. Persons who take up approved training/work schemes retain their medical card for the duration of the scheme.[4] Some initial analysis of these issues is contained in Savage et al. (2015).

One approach which could help to reduce the impact of loss of medical card benefits was recommended by the Expert Group on Resource Allocation and Financing in the Health Sector (2010). Their recommendation involved a move to four levels of primary care card – labelled standard, standard plus, enhanced and comprehensive. Such a system would allow a more gradual withdrawal of benefit than the current two step system.

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[2] The recently introduced GP visit cards for those aged under 6 and over 70 add a universal element of coverage for those age groups. Our focus here is on the income-related cards, as these relate more closely to the structure of an income-related UHI premium subsidy.

[3] Non medical card holders are liable for a €100 fee to attend Accident and Emergency and are charged €75 per night for a hospital stay, capped at €750 per year.

[4] Under Budget 2014, it was decided that a person returning to work after a period of unemployment would retain a GP visit card for 3 years irrespective of their level of income. This change was not introduced as the Government later decided to let the 3 year medical card retention rule stand.

Subsidies could be structured in a similar way to existing cards or the four-level system proposed by the Expert Group. However, the shift from a "card" based system to one with explicit subsidies raises another possibility. As entitlement to the subsidy depends on a means test, the amount of the subsidy could vary smoothly with income, with a full subsidy up to an income limit, and a reduction in the subsidy of a given amount per euro of income over that level. A "taper" of this sort is common within systems of cash benefits, and helps to avoid a sudden loss as income exceeds a particular cut-off. (The nature and policy implications of these differences is clarified in Figure 1 below and the following text.)

In this report we examine subsidy schemes of each of these types – some with movements between distinct levels of subsidy as income moves over cut-off limits, and others which gradually withdraw the subsidy using a taper, until it is completely withdrawn. Tables 1a and 1b describe five subsidy schemes which are based on working assumptions provided by the Department of Health for the purpose of the UHI costing exercise.

**Table 1a: Potential Alternative Designs for a Subsidy on UHI Premia**

| Scheme | Step_3Level | Step_4Level | Step_3Level_PlusChildren |
|---|---|---|---|
| | 100% subsidy for those below medical card income limit;<br><br>50% subsidy for those above medical card limit but below GP visit card income limit<br><br>25% subsidy for those with incomes above GP visit card income limit, but below 1.75 times the medical card income limit | Income related subsidies as per Step_3Level,<br>In addition, a general subsidy of €200 per adult, €100 per child, for all those above 1.75 times the medical card income limit | Income-related subsidies as per Step_3Level<br><br>Full subsidy for all children, irrespective of parental income |

**Table 1b: Potential Alternative Designs for a Tapered Subsidy on UHI Premia**

| Scheme | Taper_MC_20 | Taper_MC_30 |
|---|---|---|
| | 100% subsidy for medical card holders, using existing income limits for under 70s and over 70s<br><br>Subsidy is then reduced by 20 cent for every euro by which income exceeds the medical card income limit, tapering to zero. | 100% subsidy for medical card holders, using existing income limits for under 70s and over 70s<br><br>Subsidy is then reduced by 30 cent for every euro by which income exceeds the medical card income limit, tapering to zero. |

Note: This analysis examines income-related entitlements, which form the bulk of medical cards. Thus, the term "medical card holder" is used as a shorthand for those qualifying for an income-tested medical card and does not include those holding discretionary medical cards.

Scheme Step_3Level provides

- a full subsidy to those who are eligible for a medical card
- a 50 per cent subsidy to those eligible for a GP visit card (for which the income limit is 150 per cent of the medical card income limit)
- a 25 per cent subsidy to those with incomes above the GP visit card income limit, but below 175 per cent of the medical card income limit
- Children receive the same level of subsidy as their parent(s)

Scheme Step_4Level gives the same subsidies as Scheme Step_3Level, but adds a general subsidy of €200 per adult and €100 per child or student, which is made available to all those above the income limit at 175 per cent of the medical card limit. This takes account of the fact that the White Paper states further that:

Scheme Step_3Level_PlusChildren also starts with the same subsidies as Scheme Step_3Level in respect of adults, but offers a full subsidy for all children and students.

Scheme Taper_MC_20 provides a full subsidy to medical card holders, but reduces the subsidy provided to those with incomes above that level, by 20 cent for every euro by which income exceeds the medical card income limit, falling to zero. Scheme Taper_MC_30 uses the same income-cut off, but a higher taper rate (30 cent per euro of income above the limit), so the subsidy is lower at all income levels above the medical card income limit, and falls to zero more quickly.

Figure 1 illustrates how the level of subsidy varies with income for some different stepped and "tapered" systems. For the purposes of this example we assume a single person living alone facing a premium of €2,000 per annum.

**Figure 1: Illustrative Subsidy by Net Income Level for Selected Subsidy Schemes**
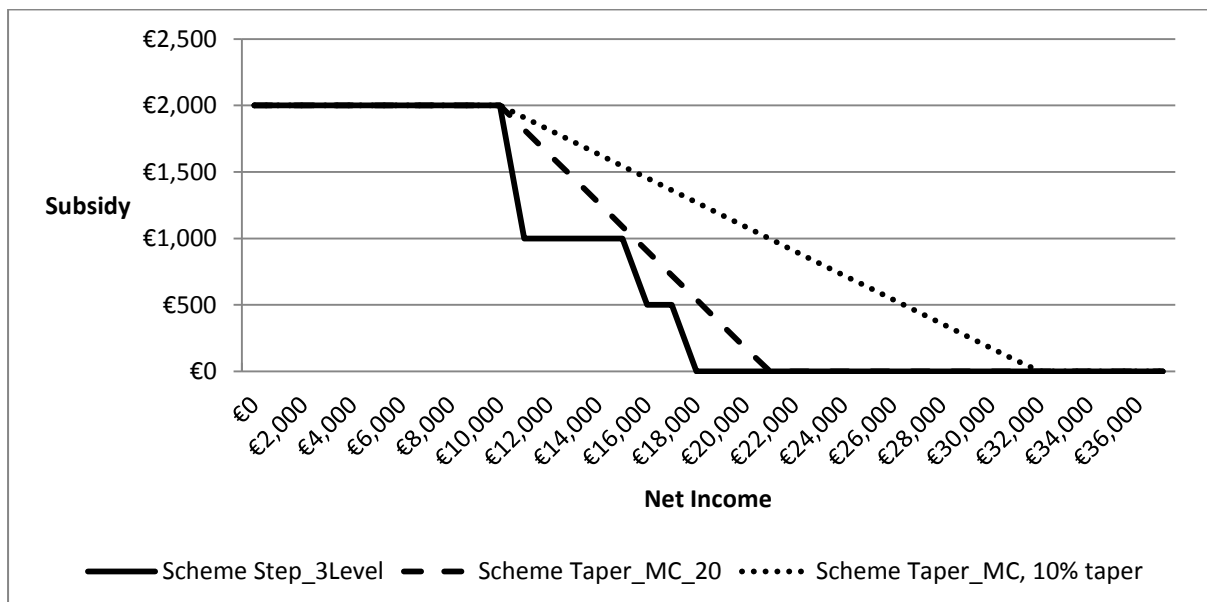


Corresponding to the reductions in subsidy, whether in stepped form, or continuously via tapered system, there is an implicit "subsidy withdrawal rate". For the tapered schemes, this withdrawal rate

is explicit and constant at some fixed percentage of relevant income (10 per cent or 20 per cent in the illustrations). For the stepped scheme the withdrawal is "lumpy", and gives rise to a withdrawal rate which, although zero over the "flat" ranges of the subsidy schedule, then jumps to very high levels at the critical income levels. For example, a small income change can lead to the loss of €1,000 per annum in the subsidy, as the subsidy falls from 100% to 50% of the €2,000 premium.

## 3. Modelling Entitlements to Medical Cards and GP Visit Cards: An Overview

In order to model possible UHI subsidy schemes, we need first to model existing entitlements to medical cards and GP visit cards.[5] The groundwork for this has been by Callan et al. (2015). Here we summarise some of the key features of that work which are relevant to the current study on subsidy design.

It is not enough simply to know from survey data that an individual reports having a medical card or GP visit card. If we are to assess the impact of changes in the rules of the system, we must be able to model or "simulate" the current system and then model the rules of a reformed system. Thus, for each family in the Survey on Income and Living Conditions[6] we must, on a case-by-case basis, use data on age, family composition, income and other relevant variables to assess whether or not the family qualifies for a medical card or a GP visit card. The details of the modelling process are set out in Callan et al. (2015), but can be summarised briefly here.

In order to model entitlement to medical and GP visit cards within the SWITCH model we must first calculate the 'assessable income' of potential applicants. In the model we first calculate income from all relevant sources (i.e. employment, self employment etc) for the applicant and their spouse (if applicable) and deduct income tax, PRSI and USC. We also allow for other applicable allowances such as housing costs, childcare costs (based on the expenditure reported by respondents in the survey) and allowances for children.

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[5] Our analysis includes eligibility based on income, including age-related income limits. It does not include recently announced changes for the under-6s and over-70s.
[6] The data used in the model is currently the revised data for 2010, published by CSO (2013). However, the incomes and key characteristics of the sample (demographic distributions, unemployment and employment levels) are calibrated to represent the 2015 population.

Once assessable income has been calculated this is compared to the relevant income limit for the person's age, family status (with/without children) and living situation (living alone or with family). If the person is below the relevant medical card income limit they, and their dependants, are modelled as having a medical card. If they are above the medical card income limit but below the GP visit card limit they, and their dependants, are modelled as having a GP visit card. If the person's income is above the GP visit card income limit they are modelled as having no card. As the process for evaluating if someone over the relevant income limit would receive a card based on 'undue hardship' grounds is not tightly governed by precise, quantitative rules we cannot model entitlement to cards on this basis. This would require full information on expenses associated with a medical condition which are not available in the survey.

Eligibility for the medical and GP visit card schemes is primarily income-based. Between 2001 and 2008 all those over 70 automatically received a medical card. The over-70s are now also means tested for a medical card, but with a higher income limit than for the standard means assessment. Persons over 70 can apply to be assessed under the standard means tested medical card scheme (which is not age specific) or under the over-70s gross income arrangements. The income limit for the over 70s is based on gross income[7], whereas for younger age groups it is based on income net of taxes, PRSI, USC and some other deductions. As of 5 August 2015, all persons over 70 are eligible for a GP visit card. Universal GP services are also being provided to those aged under 6 since 1 July 2015.

Under the standard means assessment for a medical card, allowances exist for children and rent or mortgage payments, childcare costs and travel to work costs. Eligibility assessment is based on the combined income of the applicant and their spouse after income tax, PRSI and USC have been deducted. In addition, where income is derived solely from Social Welfare sources or HSE allowances and the applicant is over the relevant income limit a medical card will be awarded. Medical expenses are not explicitly allowed against income but applicants and their dependants whose assessable income is in excess of the relevant income limit but for whom the HSE determines refusal of a medical card would cause 'undue hardship' are also awarded a medical card. Often known as 'discretionary cards' the HSE estimates that in 2010 some 5 per cent of medical cards were 'discretionary' as were 15 per cent of GP visit cards. For 2013 these figures stood at 3 per cent and 21 per cent respectively (HSE, 2010 and HSE, 2013). Discretionary cards cannot be included in this survey-based modelling of eligibility for cards. However, as the proportion of total cards which are

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[7] SWITCH currently uses the same income definition for the over 70s as the under 70s when means testing i.e. net income after all allowances. The numbers receiving medical cards over 70 may therefore change slightly but these changes are not expected to be substantial as those over 70 tend not to have housing costs, childcare costs and tend not to have large USC/Tax/PRSI liabilities.

discretionary is now quite low, this would not be expected to have a major influence on the pattern of the results shown here.

**Table 2: Modelled Healthcare Entitlements of Persons Aged 70 or more, 2015***

| *Healthcare entitlement level* | *Percentage of total population aged 70 or over modelled as having this entitlement* | |
|---|---|---|
| | Spring 2015 | Summer 2015 |
| Medical Card | 75 | 75 |
| GP Visit Card | 14 | 25 |
| Neither Medical Card nor GP Visit Card | 11 | 0 |
| Total | 100 | 100 |

* Estimates based on SILC 2010, uprated and calibrated to 2015. Modelled entitlements for Spring 2015 are based on policy as at April 2015. The situation as of 5 August 2015, when over 70s became entitled unconditionally to a GP visit card, is described in the "Summer 2015" column.

Table 2 shows the proportion of over 70s modelled as being entitled to a medical card, GP visit card or neither, as of Spring 2015. This pattern underlies our current analysis. (For information, we also show how the eligibilities have been changed under the new rules, as of 5 August 2015). Under the recently announced policy, it appears that about 75 per cent of the over 70s will qualify for a medical card, and the remaining 25 per cent for a GP visit card. If this group is to be given the same subsidy as other GP visit card holders, then cost estimates would be higher than shown in our analysis.

SWITCH calculates entitlement to a medical or GP visit card as described above. Effectively the model assigns individuals and their dependants to one of three categories – 'medical card', 'GP visit card' or 'no card'. In what follows we will refer to these medical and GP visit cards as 'modelled' cards. The data which forms the SWITCH database is the CSO's SILC 2010 survey. In the survey, respondents are asked directly if they hold a medical/GP visit card or no card. We refer here to these cards as 'reported' cards.

The 'modelled' card status can be seen as an indicator of *entitlement* to a card or not, based on assessable income. The 'reported' card status is just that – whether a person reports holding a medical card, a GP visit card or neither card. Due to the fact that SWITCH is based on 2010 data the preliminary results presented in this report are for the year 2010.

As indicated in Callan et al. (2015) there are several reasons why modelled and reported card status may differ. In the present context, the most important of these is that not all of those who are currently entitled to a card may actually take up that entitlement and be awarded a card. This seems to be particularly important in the case of GP visit cards, as seen in Table 3, which shows the estimated numbers eligible for medical and GP visit cards from SWITCH, as against the numbers of card holders reported by the HSE for 2010. SWITCH estimates of the numbers eligible for a medical card are very close to the numbers of non-discretionary cards reported by the HSE. However, the SWITCH estimate of the numbers eligible for a GP visit card is 626,000, more than 6 times higher than the number of non-discretionary GP visit cards at 100,000.

**Table 3: Medical Cards and GP Visit Cards, 2010: HSE Totals and Estimates of Eligible Population using SWITCH**

|  | Thousands of individuals 2010 |
| --- | --- |
| Total number of medical cards (HSE) | 1,616 |
| Of which: Non-discretionary medical cards (HSE) | 1,535 |
| Estimated population eligible for medical card (SWITCH) | 1,562 |
|  |  |
| Total number of GP visit cards (HSE) | 117 |
| Of which: Non-discretionary GP visit cards (HSE) | 100 |
| Estimated population eligible for GP visit card (SWITCH) | 626 |
|  |  |
| Total population | 4,600 |

Source: HSE Annual Reports & authors' analyses using SWITCH, the ESRI tax-benefit model

Figure 2 shows how the incidence of "reported GP visit cards" and modelled eligibility for cards varies across the income distribution. The population is divided into 10 equally sized income groups, income deciles, ranked from lowest to highest incomes.[8] At very low incomes, SWITCH predicts low levels of GP visit card eligibility, as these cases are eligible for full medical cards. The eligibility rate rises to a peak in decile 3, but then falls as tax units higher up the income scale are above the GP visit card limit. The slightly higher figures in deciles 8 and 9 are likely to be due to the higher income limits for those aged 70 or over.

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[8] These income groups are defined based on current, disposable income, adjusted for family size and composition. We follow the same procedure as CSO in national poverty statistics, dividing total household income by a scale which adds 1 for the first adult, 0.66 for subsequent adults and 0.33 for each child.

The pattern shown by the SWITCH predictions is more in line with what one would expect of this scheme than the pattern of the reported cards which shows a very low incidence and spread evenly across the income distribution.

**Figure 2: Percentage of Tax Units Entitled to and Reporting GP Visit Card by Income Group (Decile of Disposable Income per Adult Equivalent (Equivalised Income Decile)**
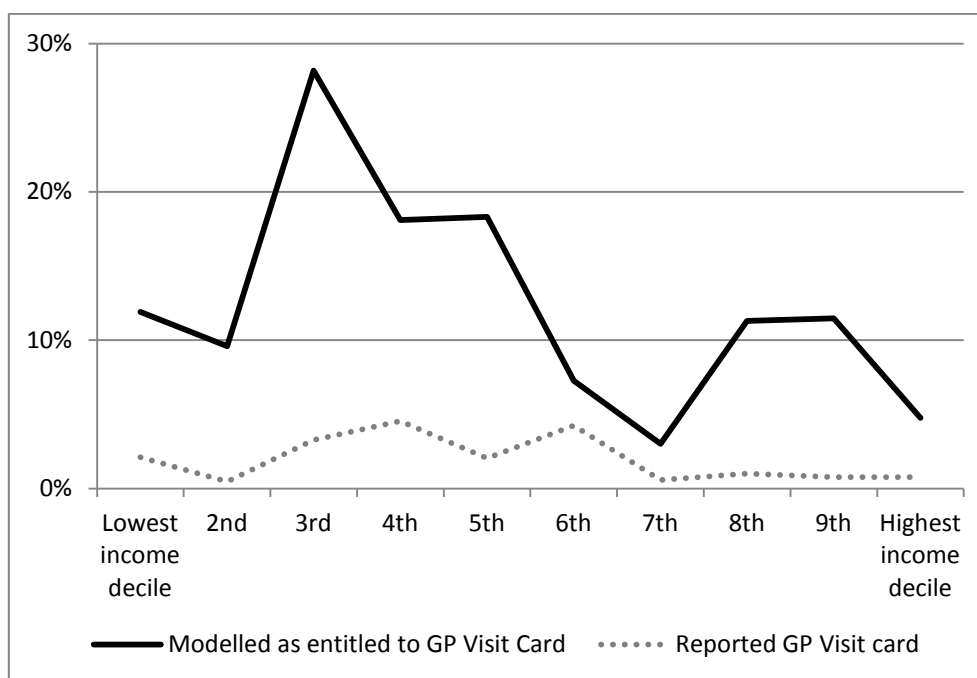


*Source:* SWITCH analysis of SILC 2010. Reported GP visit cards are based on direct answers by respondents in SILC; modelled entitlements are based on SWITCH model calculations based on relevant SILC data.

While further investigation of the scale and nature of the non-take-up is needed, [9] one point is particularly relevant in the present context. Individuals or families may not take up an entitlement to a GP visit card because it has a low expected value (e.g., the cost of one or two doctor visits per year). However, under a UHI system, they may be faced with a substantial new premium. For example, depending on the basket of services included in the UHI scheme, KPMG (2015) estimates[10] of the premium for an adult individual range from just under €2,200 to just under €3,200. A 50 per cent subsidy on such a premium would then have a value of close to €1,100 to €1,600 per year. In our analysis, therefore, we assume that individuals who are eligible for a GP visit card would take up

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[9] In particular, a profile of the types of individuals who appear to be eligible for a GP visit card but are not taking up this entitlement would be valuable.

[10] Prepared on behalf of the Health Insurance Authority.

the subsidy to a new UHI premium – even if they do not currently take up their entitlement to a GP visit card.

# 4. Estimated Costs of Subsidy Schemes

In this section we examine the costs of alternative subsidy schemes, and how they vary with the UHI basket via the size of the premium. The premia used are based on information supplied to us by the Department from estimates produced by KPMG (2015) on behalf of the Health Insurance Authority, building on analysis undertaken by Wren et al. (2015).

Table 4 summarises the aggregate costs to the Exchequer for each subsidy scheme, based on the premia estimated by KPMG (2015) for 3 distinct "baskets" of services which could be covered by a UHI system. The basket options were proposed by the Department of Health in line with the policy direction set out in the White Paper. Further details on definition of the baskets can be found in Wren et al. (2015). We follow the terminology used there in labelling the baskets as

HM_GP:         This basket covers hospital care, mental health care, and GP services.

HM_PC:         This basket covers the same items as HM_GP, and, in addition, other Primary Care services

HM_PCMED:   This basket covers the same items as HM_PC, and, in addition, prescription medications.

The estimated premia used here include an allowance for the cost of pensions and depreciation, as estimated by KPMG (2015) for the HIA.[11] The adult premium for the HM_GP basket is estimated by KPMG (2015) as €2,228 per annum. For the HM_PC basket the adult premium is estimated by KPMG (2015) as €2,557, and the HM_PCMED basket is estimated as having an associated premium of €3,232.

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[11] KPMG (2015) also include estimates which exclude these items, an approach also adopted by Wren et al. (2015). However the findings here regarding the structural features of a subsidy to the UHI premium would not be substantially affected by the exclusion of these items.

**Table 4: Estimated Aggregate Costs of Alternative Subsidy Schemes**

| Scheme label | Subsidy rate for Medical Card, GP visit Card, Others | HM_GP | HM_PC | HM_PCMED |
|---|---|---|---|---|
| | | €m per annum | | |
| Step_3Level | MC100%, GP50%, 1.75MC25%, Others zero | 3,696 | 4,248 | 5,225 |
| Step_4Level | MC100%, GP50%, 1.75MC25%, Others €200 per adult €100 per child | 4,039 | 4,590 | 5,568 |
| Step_3Level_PlusChildren | MC100%, GP50%, 1.75MC25%, Children100%, Others zero | 4,159 | 4,784 | 5,768 |
| Taper_MC_20 | MC100%, Others tapered at 20% of income above MC card limit | 4,536 | 5,473 | 7,271 |
| Taper_MC_30 | MC100%, Others tapered at 30% of income above MC card limit | 4,007 | 4,794 | 6,288 |

Note: Subsidy costs are estimated on the basis of the premia as estimated by KPMG (2015), detailed in the text, and the rules specified in the table concerning income limits and steps or tapering.

As much of the subsidy is specified in terms of a percentage of the premium, the aggregate cost of the subsidy naturally rises with the scale of the premium. Thus, with Scheme Step_3Level (a 100% subsidy for medical card holders, 50% for GP visit card holders and 25% for others below 1.75 times the medical card income limit), the aggregate cost is €3,696m for HM_GP. This rises by about 15 per cent in moving to HM_PC, and by about 41 per cent in moving to HM_PCMED. Similar proportions apply for Schemes Step_4Level and Step_3Level_PlusChildren.

This cost ratio is quite different for the schemes which involve tapering. Scheme Taper_MC_20 tapers the subsidy for incomes above the medical card income limits. For this scheme the aggregate subsidy for HM_PC is 21 per cent higher, and for HM_PCMED some 60 per cent higher than for HM_GP. However, tapering is not necessarily more expensive than other designs. Scheme Taper_MC_30, for example, with a 30 per cent taper on income over the medical card limit, has a lower aggregate cost than Schemes Step_4Level and Step_3Level_PlusChildren in the case of HM_GP. The key issues here are

- at what income level tapering begins, i.e., the income level up to which a full subsidy is provided
- the rate of withdrawal of the subsidy (the taper rate)
- the level of the premium itself.

For all schemes, whatever the design, costs can be altered by respecifying relevant parameters – the level of the subsidy, the income limits and/or the taper rates. Cost is one key consideration – but distributional impacts and the impact on work incentives also need to be taken into account. These issues can be explored in further modelling work.

Table 5 presents an alternative perspective. What proportion of the aggregate premium is covered by the subsidy?[12] For the non-tapered schemes this varies very little, if at all, across different baskets. Scheme Step_3Level covers 44 per cent of the aggregate premium, followed by Scheme Step_4Level at 48 to 47 per cent, reflecting its inclusion of a universal component to the subsidy. Scheme Step_3Level_PlusChildren has a subsidy which is 48 to 50 per cent of the aggregate premium. The percentage of the aggregate subsidy covered by the tapered schemes increases as the basket considered becomes more expensive. [13]

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[12] SWITCH estimates of the aggregate premium differ somewhat from those reported by Wren et al. (2015) and implied by the individual premium estimates reported by KPMG (2015). There are a number of reasons for these differences (See Wren et al., 2015, p.119, footnote 60). Such differences would have relatively small impacts on the subsidy rates analysed here or on the analysis of distributional characteristics in Section 5.

[13] Where the subsidy is tapered, the aggregate cost and the share of the premium covered can depend on the size of the premium. For example, a €1,000 premium tapered by 20 per cent will be reduced to zero by an income which is €5,000 above the cut-off at which tapering begins. However, a €2,000 premium tapered under the same rules would not be reduced to zero until income exceeded the cut-off by €10,000. Thus, with a higher premium, many more individuals would receive some subsidy; and the subsidy for many individuals would be higher. This is reflected in the fact that for Taper_MC_20, the proportion of the aggregate premium covered by the subsidy is 61 per cent for the most costly basket (HM_PCMED) as against 54 per cent for HM_GP.

**Table 5: Aggregate Subsidy as a Percentage of Aggregate Premium**

| Subsidy scheme | Description | *HM_GP* | *HM_PC* | *HM_PCMED* |
|---|---|---|---|---|
| | | Subsidy as a Percentage of Premium | | |
| Step_3Level | MC100%, GP50%, 1.75MC25%, Others zero | 44 | 44 | 44 |
| Step_4Level | MC100%, GP50%, 1.75MC25%, Others €200 per adult €100 per child | 48 | 48 | 47 |
| Step_3Level_PlusChildren | MC100%, GP50%, 1.75MC25%, Children100%, Others zero | 50 | 50 | 48 |
| Taper_MC_20 | Full subsidy for medical card holders, subsidy is then reduced by 20 cent for every euro by which income exceeds the medical card income limit, tapering to zero | 54 | 57 | 61 |
| Taper_MC_30 | Full subsidy for medical card holders, subsidy is then reduced by 30 cent for every euro by which income exceeds the medical card income limit, tapering to zero | 48 | 50 | 53 |

The way in which the taper rate and the income level at which tapering begins influences the overall cost of a subsidy can be seen in Table 6, in the context of HM_GP. This table can be seen as providing a menu for subsidy design, which includes several items within the same cost envelope as stepped schemes. For example, the results suggest that tapering above the medical card income limit at a rate close to between 30 and 40 per cent would give rise to costs similar to those for stepped schemes. On the other hand, tapering from the GP visit card income limit, at a rate of 10 per cent, would imply a subsidy rate of close to 80 per cent. There is no implication that this is a desirable or even a feasible option: it is included simply as part of the mapping of what alternative subsidy designs imply for aggregate cost and subsidy rate.

**Table 6: Aggregate Costs of Alternative Tapers (HM_GP)**

|  | Tapered above GP visit card income limit | Tapered above Medical Card income limit |
|---|---|---|
|  | *€m per annum* |  |
| No taper (zero subsidy above income limit) | 4,071 | 2,982 |
| 100% taper | 4,476 | 3,125 |
| 60% taper | 4,700 | 3,391 |
| 40% taper | 4,946 | 3,709 |
| 20% taper | 5,657 | 4,536 |
| 10% taper | 6,602 | 5,791 |

# 5. Distributional Aspects of the Subsidy Schemes for UHI Premia

In this section we examine how the subsidy would be distributed over the population depending on the structure of the income test involved. We examine the distribution of the subsidy across income groups, across family types, and across existing categories of health service entitlement. This is because the focus at this point is on how the subsidy might be structured, and this is a building block towards a more comprehensive approach which could identify net gains and losses, taking into account not only the UHI premium and subsidy, but also changes in tax policy which might become possible if UHI premia substituted for a part of the tax financing of health services.

## Distribution of Subsidy across Income Deciles

We begin by examining how the subsidy might be allocated over the income distribution as between low, middle and high-income households. Income deciles are defined in the following way. First, households are ranked according to their disposable income (after income tax, PRSI and USC) adjusted for household size and composition: this is termed "equivalised income"[14]. Then the population of households is divided into ten equal-sized groups, each containing 10 per cent of the estimated population of households, ranked from lowest to highest incomes. We then examine the allocation of the subsidy across these deciles or income groups from a number of different perspectives.

Table 7 shows the subsidy as a proportion of the disposable income of each decile of households.[15] Under Scheme Step_3Level, for example, the subsidy is equivalent to 27 per cent of the disposable income of the lowest income decile, 17 per cent for the second decile, and 13 per cent for the third decile. A number of common themes emerge:

- As all schemes offer a 100 per cent subsidy to medical card holders, most of whom are at low incomes, the treatment of the poorest 30 per cent of households is similar across all schemes
- The greatest benefit as a proportion of income is obtained by the lowest income decile, and the proportionate benefit falls with income
- Tapering the benefit by 20 cent per euro of income above the medical card income limit as under Scheme Taper_MC_20 provides somewhat greater benefits to those in deciles 3 to 5 of the income distribution than under a 30 per cent taper
- Scheme Taper_MC_30, which tapers the subsidy more rapidly, with a reduction of 30 cent per euro of income, gives a distributional pattern very similar to that for Scheme Step_3Level, but without the sharp reductions associated with the stepped approach.

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[14] The adjustment is to take account of the fact that households with more adults and more children have greater needs than smaller households. The scale used in making this adjustment is the same as that used by the CSO in national statistics relating to poverty and income distribution. It counts 1 for the first adult in a household, 0.66 for other adults (aged 14+ living in the household) to take account of economies of scale and 0.33 for each child aged under 14. Technically this is termed an equivalence scale, and the adjusted income is income per adult equivalent or "equivalised" income.

[15] The percentage is calculated as the total subsidy to the decile divided by the total income of that decile.

**Table 7: Subsidy as a Percentage of Disposable Income by Household Income Decile (HM_GP)**

| | Subsidy Scheme | | | | |
|---|---|---|---|---|---|
| | Step_3Level | Step_4Level | Step_3Level_ PlusChildren | Taper_MC_20 | Taper_MC_30 |
| Decile | MC100, GP50, 1.75MC25 | MC100, GP50, 1.75MC25, Others 200 | MC100, GP50, 1.75MC25, Children | MC100, Taper 20% | MC100, Taper 30% |
| | Subsidy as Percentage of Disposable Income % | | | | |
| 1 | 27 | 27 | 28 | 28 | 28 |
| 2 | 17 | 17 | 18 | 19 | 19 |
| 3 | 13 | 13 | 13 | 15 | 14 |
| 4 | 9 | 9 | 10 | 12 | 10 |
| 5 | 5 | 6 | 6 | 8 | 6 |
| 6 | 3 | 4 | 4 | 5 | 4 |
| 7 | 3 | 4 | 4 | 4 | 4 |
| 8 | 1 | 2 | 2 | 2 | 2 |
| 9 | 2 | 2 | 2 | 2 | 1 |
| 10 | 1 | 1 | 1 | 0 | 0 |
| All | 5 | 5 | 5 | 6 | 5 |

**Table 8: Average Subsidy by Household Income Decile (HM_GP)**

| | Subsidy Scheme | | | | |
|---|---|---|---|---|---|
| | Step_3Level | Step_4Level | Step_3Level_ PlusChildren | Taper_MC_20 | Taper_MC_30 |
| Decile | MC100, GP50, 1.75MC25 | MC100, GP50, 1.75MC25, Others 200 | MC100, GP50, 1.75MC25, Children | MC100, Taper 20% | MC100, Taper 30% |
| | € per week | | | | |
| 1 | 90 | 90 | 91 | 93 | 93 |
| 2 | 74 | 74 | 76 | 82 | 79 |
| 3 | 58 | 59 | 62 | 71 | 65 |
| 4 | 55 | 56 | 62 | 72 | 63 |
| 5 | 38 | 42 | 45 | 58 | 45 |
| 6 | 29 | 35 | 38 | 44 | 34 |
| 7 | 30 | 35 | 36 | 39 | 33 |
| 8 | 15 | 22 | 22 | 22 | 17 |
| 9 | 19 | 25 | 23 | 21 | 17 |
| 10 | 10 | 16 | 15 | 9 | 8 |
| All | 42 | 45 | 47 | 51 | 45 |

Table 8 shows the average subsidy classified by income decile. This shows the average subsidy declining steadily as income rises, from about €90 per week for the lowest income decile to less than

€10 per week for the top income decile, in schemes which do not have a "flat rate" or "universal" subsidy element. The fall is, of course, even steeper when measured in proportion to income, as in Table 6, given that income rises steadily for each income decile. Scheme Taper_MC_30 would, on average, provide greater support to low income households than Scheme Step_3Level, with average subsidy amounts per decile between €2 and €8 per week higher in the lower half of the income distribution.

**Table 9: Aggregate Subsidy by Household Income Decile (€m per annum)**

| | Subsidy Scheme (for HM_GP) | | | | |
|---|---|---|---|---|---|
| Decile | Step_3Level MC100, GP50, 1.75MC25 | Step_4Level MC100, GP50, 1.75MC25, Others 200 | Step_3Level_PlusChildren MC100, GP50, 1.75MC25, Children | Taper_MC_20 MC100, Taper 20% | Taper_MC_30 MC100, Taper 30% |
| | €m per annum | | | | |
| 1 | 801 | 801 | 809 | 827 | 822 |
| 2 | 651 | 653 | 670 | 730 | 702 |
| 3 | 516 | 522 | 550 | 629 | 578 |
| 4 | 483 | 498 | 544 | 635 | 552 |
| 5 | 334 | 370 | 398 | 509 | 394 |
| 6 | 260 | 315 | 340 | 394 | 306 |
| 7 | 264 | 309 | 318 | 342 | 286 |
| 8 | 133 | 200 | 194 | 198 | 150 |
| 9 | 168 | 224 | 202 | 188 | 147 |
| 10 | 86 | 146 | 134 | 83 | 70 |
| All | 3,696 | 4,039 | 4,159 | 4,536 | 4,007 |

Table 9 shows how the aggregate value of the subsidy is distributed over the income deciles. The amount received by the lowest income decile is more than 9 times the amount received by the top income decile for Schemes Step_3Level, Taper_MC_20 and Taper_MC_30. The amount received by the top decile relates mainly or exclusively to the over-70s age group, to whom a higher income limit applies – except in schemes with a general subsidy for all adults (Scheme Step_4Level) or for all children (Scheme Step_3Level_PlusChildren). The aggregate subsidy going to the top decile would be higher if the UHI subsidy were based on the new rules for GP visit cards, which came into effect in Summer 2015, which allocated a card to all those aged over 70 irrespective of income.

About half (48 to 53 per cent) of the subsidy goes to the bottom 3 deciles (the 30 per cent of the population with the lowest incomes). The lower half of the income distribution benefits from some 70 to 76 per cent of the subsidy across all schemes.

These results show that all of the subsidy designs are strongly targeted towards the lower half of the income distribution, and the lowest 30 per cent by income in particular. The designs differ, however, in their implications for the financial incentive to work – whether to take up a job, or to increase

income when in a job. Further work is needed to identify precisely how the schemes differ in this respect.

## Distribution of Subsidy across Tax Unit Types

Table 10 presents a different perspective, answering the question: what proportion of each family type gains from a UHI subsidy? We exclude Scheme Step_4Level as all family types would benefit from the universal element of the subsidy.

**Table 10: Distribution of Subsidy across Tax Unit Types**

| | Subsidy Scheme | | | |
| | Step_3Level | Step_3Level_ PlusChildren | Taper_ MC_20 | Taper_ MC_30 |
| | MC100, GP50, 1.75MC25 | MC100, GP50, 1.75MC25, Children | MC100, Taper 20% | MC100, Taper 30% |
|---|---|---|---|---|
| Single Employed without Children | 28 | 28 | 46 | 29 |
| Single Unemployed without Children | 73 | 73 | 73 | 73 |
| Employed Lone Parent | 83 | 100 | 85 | 80 |
| Non-Earning Lone Parent | 99 | 100 | 99 | 99 |
| Single Retired Tax Unit | 80 | 80 | 78 | 73 |
| Single Earner Couple without Children | 40 | 42 | 67 | 58 |
| Single Earner Couple with Children | 68 | 100 | 88 | 80 |
| Dual Earner Couple without Children | 17 | 26 | 39 | 23 |
| Dual Earner Couple with Children | 42 | 100 | 71 | 55 |
| Non-Earning Couple (at least 1 unemployed), with children | 100 | 100 | 100 | 100 |
| Retired Couple | 75 | 78 | 82 | 75 |
| All Other Tax Units | 66 | 66 | 66 | 66 |
| All | 52 | 62 | 65 | 55 |

There are major differences here linked to employment status. All, or almost all, of those who are non-earning lone parents and those who are unemployed and have children would be eligible for a subsidy. Other groups with high rates of benefit from subsidy (above 70 per cent) include employed lone parents, those who are unemployed and single, and those who are retired (either singles or couples). Much lower rates of subsidy receipt would be recorded by those who are single employees without children, dual earner couples and single earner couples without children. A sharp distinction emerges in rates of subsidy receipt between the tapered schemes and the stepped schemes in respect of singles and couples in employment. The tapered schemes show a greater incidence of subsidy receipt than the stepped schemes. For example, the incidence of subsidy receipt is 40 per cent for a single earner couple without children under Scheme Step_3Level (which is based on medical card and GP visit card entitlement as at present) but about 60 per cent under a scheme

tapered from the medical card income limit. This feature could have significant implications from the point of view of work incentives. Once again, further work is needed to examine this issue.

## Distribution of Subsidy across Existing Entitlement Categories

Finally we turn to the implications of the alternative subsidy designs for differing categories of existing health service entitlement. We distinguish between those entitled to a medical card, those entitled to a GP visit card, those who are not entitled to a card but who have private health insurance, and those who are not covered by any of these categories (but retain a basic level of entitlement to hospital services).

Tables 11a and 11b shows the aggregate value of the subsidy obtained by different entitlement groups, and the average subsidy per member of that group. Table 11a shows that the aggregate value of the subsidy for medical cardholders remains constant in all of the stepped schemes, reflecting the fact that they obtain a 100 per cent subsidy. For most medical card holders, the same principle also applies under the tapered schemes. However, some families qualify for a medical card on the basis that they have no income except social welfare income. In the case of this tapered schemes, some of the 100% subsidy is withdrawn if the family's total income – in this case, exclusively from social welfare – exceeds the medical card income limit. While it would be possible to design an alternative scheme under which such cases saw no tapering, this would contradict the logic of such tapered schemes.

A similar contrast obtains with respect to the subsidy for GP visit card holders. The aggregate subsidy remains constant for the stepped schemes, but is substantially greater for the tapered schemes which taper from the medical card income limit. This is because the other schemes award 50% of the premium as a subsidy to all GP visit card holders; but the tapered scheme (Taper_MC_20) awards a subsidy which is close to 100% of the premium for those just over the medical card income limit, tapering more gradually with a withdrawal of subsidy of 20 cent for each euro of income. The net effect is that GP visit card holders would on average see a subsidy between €26-23 per week under the tapered schemes, as against an average of about €18 per week for the other schemes.

**Table 11a: Aggregate Subsidy Classified by Existing Health Service Entitlement (HM_GP)**

| Entitlement Category | Subsidy Scheme | | | | |
|---|---|---|---|---|---|
| | Step_ 3Level | Step_ 4Level | Step_ 3Level_ PlusChildren | Taper_ MC_20 | Taper_ MC_30 |
| | MC100, GP50, 1.75MC25 | MC100, GP50, 1.75MC25, Others 200 | MC100, GP50, 1.75MC25, Children | MC100, Taper 20% | MC100, Taper 30% |
| | €m per annum | | | | |
| Medical Cardholders | 2,908 | 2,908 | 2,908 | 2876 | 2,860 |
| GPV Cardholders | 580 | 582 | 662 | 896 | 785 |
| PHI | 103 | 333 | 386 | 375 | 173 |
| Other | 105 | 217 | 204 | 389 | 190 |
| Total | 3,696 | 4,039 | 4,159 | 4536 | 4,007 |

Note: The entitlement categories distinguish between those entitled to a medical card, those entitled to a GP visit card, those who are not entitled to a card but who have private health insurance, and those

who are not covered by any of these categories (but retain a basic level of entitlement to hospital services).

A contrast between Schemes Step_3Level and Step_4Level (i.e., with or without a universal low flat rate subsidy) shows increased subsidies for those with private health insurance and the "other" category of entitlement (no card and no PHI). The amounts involved are of the order of €230m for those with PHI, and €110m for the "other" category. These amounts are spread thinly over the relevant population, without regard to income. Scheme Taper_MC_20, by contrast, allocates a similar aggregate amount to the PHI sub-group, but focused on lower incomes within that population. The income related nature of Scheme Taper_MC_20 also means that it allocate a greater subsidy to the "other" group, due to the fact that this "other" group has lower income, on average, than the PHI group.

**Table 11b: Average Weekly Subsidy Classified by Existing Health Service Entitlement (HM_GP)**

| | Subsidy Scheme | | | | |
| --- | --- | --- | --- | --- | --- |
| | Step_ 3Level | Step_ 4Level | Step_ 3Level_ PlusChildren | Taper_ MC_20 | Taper_ MC_30 |
| Entitlement Category | MC100, GP50, 1.75MC25 | MC100, GP50, 1.75MC25, Others 200 | MC100, GP50, 1.75MC25, Children | MC100, Taper 20% | MC100, Taper 30% |
| | € per week | | | | |
| Medical Cardholders | 34 | 34 | 34 | 34 | 34 |
| GPV Cardholders | 17 | 17 | 19 | 26 | 23 |
| PHI | 1 | 4 | 5 | 5 | 2 |
| Other | 2 | 5 | 5 | 9 | 4 |
| Total | 15 | 18 | 18 | 20 | 17 |

Tables 12 and 13 give further details on the numbers receiving differing categories of subsidy – full, 50%, 25% or none (apart from general subsidies) in the stepped schemes, and full or partial or none in the tapered schemes. A key difference here is that the tapered schemes will necessarily involve some very low rate of subsidy, as incomes approach the levels at which the subsidy is fully withdrawn. Further analysis is required to provide details of the size of subsidy in the tapered scheme, as these can vary from being almost 100 per cent subsidies to very low subsidies. Nevertheless, these basic statistics are a useful starting point.

**Table 12: Percentage of population eligible for each level of subsidy, HM_GP**

| | Percentage of individuals, 2015 | | |
|---|---|---|---|
| | *Step_3Level* | *Step_4Level* | *Step_3Level_ PlusChildren* |
| Entitlement category | *MC100%, GP50%, 1.75MC25%* | *MC100%, GP50%, 1.75MC25%, Others €200* | *MC100%, GP50%, 1.75MC25%, Others: Children* |
| Full subsidy | 36 | 36 | 36 |
| 50% subsidy | 14 | 14 | 14 |
| 25% subsidy | 8 | 8 | 8 |
| Eligible for no subsidy | 42 | 42 | 42 |
| or general subsidy only | (no subsidy) | (€200 subsidy) | (Child subsidy) |
| Total | 100 | 100 | 100 |

**Table 13: Population eligible for each level of subsidy (tapered), HM_GP**

| | Percentage of individuals, 2015 | |
|---|---|---|
| | Taper_MC_20 | Taper_MC_30 |
| *Entitlement category* | *MC100%, Taper 20%* | *MC100%, Taper 30%* |
| Full subsidy | 36 | 36 |
| Tapered subsidy | 29 | 21 |
| No subsidy (tapered to zero) | 34 | 42 |
| Total | 100 | 100 |

# 6. Conclusions and Further Research

SWITCH analysis is based on SILC, the CSO's primary survey related to income and social exclusion. In this study a framework was developed whereby the impact of alternative subsidy designs could be examined. This involved simulating existing income- and age-based entitlements to medical cards and GP visit cards, and exploring how alternative subsidy rules would then affect each family and household in a nationally representative sample. Before examining the detailed micro-results in

terms of distributional impact, we cross-checked estimates of the total premium income from SWITCH against estimates prepared for the HIA (KPMG, 2015). SWITCH-based estimates of the subsidy rate were also compared with estimates in Wren et al. (2015) from information on aggregate sources. In each case, the checks indicated that the SWITCH-based estimates were close to those from the aggregate source.

One significant caveat must be entered regarding the costing approach. The total numbers modelled as eligible for medical cards are close to official numbers of recipients. However, Callan et al. (2015) have found *prima facie* evidence of very substantial non-take-up of GP visit cards. Further and more detailed investigation of these findings is needed. For a number of reasons, one would not expect that such non-take-up would remain a feature of a new system based around UHI. Under the current system, an individual may forego applying for a GP visit card on the basis that they do not currently expect to have a need for more than a few GP visits in coming years. If this expectation is fulfilled, they lose little in cash terms from foregoing their entitlement. However, under a UHI system, they would be required to pay a full premium, and would then be foregoing a substantial cash subsidy if they did not apply for it. Studies of take-up have often found that the extent of take-up is linked to the size of the benefit. Given these facts, a shift to a UHI system would be likely to generate much higher take-up of a UHI subsidy for those eligible for GP visit cards. As a result, our analysis errs on the side of caution in attributing the full subsidy for GP visit card holders to all those *eligible* for a card.

SWITCH analysis was then able to examine alternative subsidy schemes which tapered the subsidy with respect to income, and to examine the aggregate costs associated with such schemes – something which cannot be implemented using only aggregate statistics. SWITCH also produced micro-based analyses of the distributive impact of alternative subsidy schemes, along three dimensions:

- disposable income, adjusted for household size and composition
- family type
- existing category of health service entitlement.

The results in the present study provide information which can guide further exploration of subsidy designs. However, it is important to recognise that this is only one strand in a much wider story,

when designing a transition from the current system to a system based on UHI. In this report we have analysed the structure of the UHI subsidy in isolation. Future work can build on this and extend the framework to include questions about the overall impact of potential reforms at household level, taking into account the value of existing entitlements, the value of new entitlements , current payments on private health insurance, and potential adjustments to taxation and/or USC arising from a partial shift from tax-financed to UHI-premium financed healthcare.

When these elements have been incorporated in the microsimulation model, two kinds of analysis can then be undertaken. First, analysis of a change from the existing system to a new system. This is a perspective which will certainly be of importance both to individual citizens and from a systemic point of view. Second, analysis which compares one potential reform to another – this helps to sharpen the focus on differences between reform options, in order to fine tune the design of reform options and facilitate informed choices between them.

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# Appendix: Analysis of a Variant of Scheme Step_3Level

Wren et al. (2015) analyse a scheme which is close to Scheme Step_3Level, proposed for examination by the Department and analysed here. The key difference in the Wren et al scheme is that the 25 per cent subsidy is applied to 10 per cent of the remaining population, with incomes above the GP visit card limit. Our estimates suggest that this income limit is about 165 per cent of the medical card income limit – somewhat less than the 175 per cent figure in the scheme proposed for examination by the Department.

The schemes therefore have much in common, and in the main text we have focused on a set of options spanning a wide range of possibilities. Here, however, we present similar analysis of the Wren et al option. Given that the two variants have much in common, we label this one Scheme Step_3Level*, and define it precisely in the table below.

**Appendix Table 1: A Variant on Scheme Step_3Level**

| Scheme | Step_3Level* |
|---|---|
| • 100% subsidy for medical card holders<br>• 50% subsidy for GP visit card holders<br>• 25% subsidy for a group defined by an income cut-off identifying the next poorest 10% of the remaining population - approximately 165 per cent of the medical card income limit | |

Scheme Step_3Level* provides a full subsidy to those who are eligible for a medical card, and a 50 per cent subsidy to those eligible for a GP visit card also provides a 25 per cent subsidy to one-tenth of the remaining population. Our estimates based on SWITCH analysis of the SILC database suggest that an income level approximately 10 per cent higher than the GP visit card cut off identifies a group equal to 10 per cent of the remaining population. As the GP visit card cut-off is itself about 50 per cent higher than the medical card income cut-off, the new cut-off is close to 65 per cent higher than the medical card cut-off level.

**Appendix Table 2: Estimated Aggregate Costs of a Variant of Scheme Step_3Level**

| Scheme label | Subsidy rate for Medical Card, GP Visit Card, Others | HM_GP | HM_PCMED |
|---|---|---|---|
| | | *€m per annum* | |
| Step_3Level* | MC100%, GP50%, Next 10% at 25%, Others zero | 3,639 | 5,144 |
| | | *Subsidy rate* | |
| Step_3Level* | MC100%, GP50%, Next 10% at 25%, Others zero | 43% | 43% |

**Appendix Table 3: Subsidy as a Percentage of Disposable Income by Income Decile (Step_3Level*)**

| Decile | Subsidy as % of income | Average subsidy | Aggregate Subsidy |
|---|---|---|---|
| | *%* | *€ per week* | *€m per year* |
| 1 | 27 | 90 | 779 |
| 2 | 17 | 73 | 648 |
| 3 | 12 | 57 | 510 |
| 4 | 8 | 53 | 465 |
| 5 | 5 | 37 | 324 |
| 6 | 3 | 28 | 256 |
| 7 | 3 | 30 | 260 |
| 8 | 1 | 15 | 131 |
| 9 | 1 | 18 | 162 |
| 10 | 0 | 9 | 83 |
| All | 5 | 41 | 3,639 |

| Year | Number | Title/Author(s)<br>ESRI Authors/Co-authors *Italicised* |
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